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Environmental Context and Team Structure

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Abstract

Drawing on contingency and information processing theory, this study examines how environmental complexity and unpredictability influence team structure, namely the vertical hierarchy and the horizontal specification. These relationships are tested empirically using worldwide data from the video game industry covering the period 1995 to 2007. Results show that both, the levels of hierarchy and specialization, increase when teams face a complex environment. Meanwhile, the extent of vertical hierarchy as well as the degree of specialization decrease when teams are exposed to an unpredictable environment. Thereby a trade-off between emphasizing efficiency or choosing a more flexible structure exists.

Keywords: Team structure; external environment; contingency theory; hierarchy; specialization.

1. Introduction

Just as buildings have a structure with stairways, numbers of floors and walls that divide rooms, an organization has a structure, which can analogously take different forms in terms of the hierarchical arrangements and the division of roles. In both cases the underlying structure will have an influence on individuals' activities. As Dalton, Todor, Spendolini, Fielding, and Porter (1980) noted the structure is the anatomy of an organization and forms the foundation of working processes, information flow and coordination between employees. Besides creating an infrastructure within the organization, the structure has an influence on individual's behaviour when regarded from a psychological perspective. As the origin of future actions, the structure of an organization is a widely studied topic. Thereby the main premise is that there is no one optimal structure which fits all organizations. In fact, structure will be contingent on several factors originating within and outside an organization.

Since early contingency theorists undertook their studies, the nature how work is conducted has changed significantly by shifting the focus to teamwork. Teams can be seen as temporal organizations within organizations established to accomplish a specific goal. Teamwork has been widely adapted and become the norm in the face of fast-pacing technology. Not only the work form changed, there has also been an alteration in the markets teams are operating in as a lot of new markets are emerging, the competitive landscape is unsettled in several markets and a lot of dynamics can be observed. These changes in work organization and environmental properties demand a reexamination of the underlying relationship.

Thus, this paper will address the question how the structure of a team is influenced by factors of the environment a team is operating in. Therefor a team's structure is examined from two perspectives. On the one hand the vertical dimension, which deals with the hierarchy within a team, on the other hand the horizontal dimension, addressing the specialization of team members' roles is studied. These elements are examined separately, linking each to both, the complexity and the unpredictability of the external environment. The hypotheses derived from this nexus are tested empirically on the basis of a dataset drawn from the video game industry, which is largely based on team work. Results show that in the context of environmental complexity teams set up more hierarchical layers and increase job specialization. In contrast, the extent of vertical hierarchy and the degree of specification decrease when facing an unpredictable environment.

This bachelor thesis has the following outline. It begins by giving an overview over prior research on structural contingency theory. Then the hypotheses regarding the influence elements of the external environment have on the vertical and horizontal dimension of team structure will be developed. This is followed by a description of the data used for the analysis, the operationalization of variables, and the

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methodology of this analysis. Subsequently results are presented, which is followed by their interpretation. Finally, the paper concludes with a discussion of these findings.

2. Literature Review

The notion that structure is contingent on the characteristics of an organization's environment has been introduced by several scholars in the 1960s (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Thompson, 1967). Thereby Burns and Stalker (1961) established the distinction between a mechanistic, namely a formalized, centralized, specialized organization, having many authority levels on the one hand and an organic organization, which is rather decentralised, informal, less specialized and only has few authority levels on the other hand. Subsequently they link these two types of organizational structures to the nature of innovation and the rate of change in a firm's environment. Burns and Stalker (1961) suggest that a stable environment leads to a mechanistic organisation, while an organic organization is the response to a dynamic environment. Though differing in their definitions of structure and a firm's environment early contingency theorists support this view.

When studying the environmental characteristics of an organization several discordant definitions have been introduced. Lawrence and Lorsch (1967) propose that an environment can have differing degrees of diversity and unpredictability, whereas Duncan (1972) attributes complexity and dynamism to an environment. There have been several attempts to merge the varying definitions of environmental properties into a typology (Jurkovich, 1974; Tung, 1979).

On the other hand, structure has been similarly examined from different perspectives, whereby the dimensions of structure have been studied individually in many cases rather than generalizing to mechanistic and organic organizations. Galbraith (1974) and Tushman and Nadler (1978) state that structural alterations are induced by a change in the amount of information an organization needs to process, which in turn depends on the uncertainty an organization faces. The information processing view has become an important basis when examining the hierarchy of an organization, a widely studied field among organization theorists (Reitzig & Maciejovsky, 2015). Keum and See (2017) linked the extent of hierarchy to the innovation process and argue that the degree of hierarchy is contingent on the situation. While a higher degree is beneficial as it improves information processing capacity and coordination, they found it hinders the generation of new ideas. Similarly, Zhou (2013) points to the ability of steeper hierarchies to coordinate complex and interdependent tasks. The degree to which departments or individuals are specialized implies a trade-off between specialization and thereby becoming an expert on the one hand and the need to coordinate among employees on the other hand (Becker & Murphy, 1992). Applying specialization to the individual level, several scholars have pointed to the effect specialized or general roles, by determining the degree of autonomy, have on creativity (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Oldham & Cummings, 1996).

When studying the structure of a team Bunderson and Boumgarden (2010) as well as Stewart and Barrick (2000) proposed examining the arrangement of vertical hierarchy and the specification of employees' jobs as shall be done in the present study. In the literature addressing team structure some attempts have been made to apply the ideas of contingency theory to the team level, however only few studies exist while each examines different aspects. Shenhar (2001) stresses the assumption that all projects should be managed in the same manner by investigating the impact of differing levels of technological uncertainty on management style and project organization. Hollenbeck et al. (2002) and Moon et al. (2004) have applied structural contingency theory to teams in terms of role specification and argued that a functional departmentation translates into specialized roles and divisional departmentation translates into more general, independent roles at the team level. While Hollenbeck et al. (2002) additionally study the fit between team structure and persons, Moon et al. (2004) investigate how shifting structure from divisional to functional and vice versa impacts performance. Both their empirical studies suggest that in a stable and predictable environment teams with specialized roles outperform teams with a low degree of role specification whereas in unstable and unpredictable environments teams with broadly defined roles perform better.

This paper aims to contribute to existing literature by applying the main ideas drawn from organizational contingency theory to the team level. Thereby a model is offered, which defines a team's structure by consisting of a vertical and a horizontal dimension. Furthermore, it tests the link from a team's environment to its structure based on a large dataset drawn from one the fastest growing industries, which is not limited to one country but provides worldwide data on teams.

3. Theory and Hypotheses Development

Drawing on structural contingency theory, the main assumption made is that there is no one structure that fits all situations, rather structure is conditional on both, internal and external factors. Since it shall be examined which structural configuration is most suitable dependent on external factors a distinction must be made between the differing environments a team can face. Firstly, one can distinguish between a complex and an uncomplex environment. While in an uncomplex environment fewer critical information categories exist, a complex environment is characterized by imposing a high amount of information on a team, while the likelihood of exceptions increases. A higher number of environmental considerable components exists and changes are more likely to occur in complex environments, resulting in higher pressure on the team. Examples for environmental complexity are intense competition, technological changes or shifting customer demands. An important implication for teams is that a higher amount of critical information needs to be processed.

Besides environmental complexity, a further type of environment can be defined as being unpredictable, which implies the inexistence of knowledge in- and outside a team about task accomplishment as well as uncertainty about the existence of customer demand and the features of customer requirements. The most common example of an unpredictable environment exists in the course of establishing a new market by the introduction of a new type of product. Thereby it is important to note that a complex environment need not necessarily be an unpredictable environment as long as the complexity remains analysable (Liedtka, 1985).

Both types of environments will have an impact on a team's structure, which shall be addressed in the following. When speaking of team structure, one can divide it into the vertical distribution of roles and the horizontal division of tasks (Bunderson & Boumgarden, 2010; Stewart & Barrick, 2000). As different incentives underlie to apply each, they are examined separately.

3.1. Vertical Hierarchy

It is indispensable to direct one's attention to the composition of the hierarchy when studying team structure. The vertical hierarchy refers to the number of layers from the person in the highest position to the individuals in the lowest layer. When looking at an organizational or team hierarchy, one can see how many levels it takes to pass critical information to the person in the team having the most global perspective over all operating procedures. A hierarchy establishes an internal information infrastructure. While information flows up the hierarchy, control and decisions come down the hierarchical layers. This is due to the tendency of hierarchical teams to be centralized, while in a flat structure decision rights are shared among multiple individuals. At the same time tighter control can be exerted (Dalton et al., 1980). In teams with fewer hierarchical levels one supervisor is in charge of overseeing a higher number of individuals than in a team with more hierarchical layers, all other factors being equal. Cognitive limitations cause that he or she cannot control the individuals reporting to him or her as tightly as if an additional intermediate hierarchical level was employed. With an additional hierarchical level fewer persons are reporting to one supervisor, implicating a narrower span of control, which results in tighter control mechanisms. A hierarchy is often referred to being a means to coordinate individuals working in a complex system (Keum & See, 2017; Zhou, 2013).

The question of interest is whether the team structure will contain additional hierarchical layers or reduce the levels of hierarchy when facing a complex environment.

Since a complex environment imposes more infrequencies on a team and requests a higher amount of information to be processed, the team needs to implement a structure which allows to process the amount of information quickly and in the most efficient way. When a team member is confronted with a critical information, which he or she wishes to pass on, the transfer of information and decision making will occur in different ways in teams with differing extents of hierarchy. If there is a flat structure and no particular person is in charge of decision making, many interconnections in form of communication lines will arise. This may result in a very profound examination, however, at the same time it will require a lot of time as redundant communication is caused, effort needs to be coordinated and conflict is more likely to occur in the absence of a decision maker. This can be detrimental under the pressure which arises from the complex environment. In contrast, in a hierarchically structured team, every individual noticing infrequencies will aim to pass the information to a person having a more global perspective to take the decision. As environmental complexity will lead to many critical information needed to be passed on, the hierarchy will soon be overloaded (Galbraith, 1974). This problem can be solved by employing an additional, intermediate level of hierarchy. Not only will this expand information processing capacity as information can flow more efficiently, it also economizes on communication by coordinating it to a higher degree (Keum & See, 2017). When creating vertical communication channels, the likelihood of inefficient, redundant and dublicated communication decreases. The steeper the hierarchy, the more coordinated and predetermined working processes and information flow are (Halevy, Chou, Galinsky, & Murninghan, 2012; Zhou, 2013). This reduction in communication and coordination costs saves time and allows teams to exploit on routine behaviours, which matches the external pressure as it leads to a quicker responsiveness to environmental requirements.

Furthemore, the coordinated processing of critical information leads to higher efficiency in decision making and reduces decision mistakes. Reducing mistakes is particularily important when facing a complex environment since its properties, like intense competition, can easily lead to the penalization of mistakes in form of loosing one's position in the market landscape. A narrower span of control additionally contributes to the minimization of costly mistakes. This results from the fact, that there will be more interaction between a single team member and his or her supervisor as in the case of narrower spans of control fewer employees are supervised by one individual resulting in more time a supervisor can spare on each employee. Therefore a supervisor can oversee working processes more closely and address problems that might occur faster. In addition to that team members can receive more extensive and prompter feedback (Gittell, 2001). Overall a narrower span of control will speed up processes and allow focusing on the efficient execution of tasks.

Thus, the impact that environmental complexity has on the vertical hierarchy of a team is formalized in the following hypothesis.

> Hypothesis 1a: The higher the degree of environmental complexity, the more hierarchical layers will be employed in a team.

As previously stated a complex environment induces a team to work as efficient as possible by imposing more hierarchical layers. When an environment becomes unpredictable the efficiency strategy ought to be reconsidered. Since the

contingencies of this environment induce that a team cannot refer to existing patterns or gain knowledge from the external environment, the team's main task becomes exploration and generating new ideas. Therefor employees will need to experiment with options far from existing knowledge and solve problems in non-routine ways (Jansen, Van Den Bosch, & Bolberda, 2006). That implies that possibilities to preplan become restricted, which may result in changing procedures during the course of the project. If so, the regulated infrastructure imposed by a steeper hierarchy may be too static and get in the way of changing procedures. Thus, more hierarchical layers will hinder flexibility. Thereby interdependencies between team members are likewise less predictable implicating a lack of ex ante understanding on how to set up the hierarchy at the outset. During the course of the project and the appearance of unplanned contingencies, interdependencies between individuals will emerge. Hence, communication lines will arise naturally based on the emerged interdependencies. In this case it is more beneficial if individuals build their own communication lines instead of having to follow a predetermined infrastructure. These emerged interdependencies may however be fluid, resulting in a frequent need to reassemble work and therefore high flexibility within the team. Thus, it appears that coordination practices ought to be adaptive and will partially be improvised (Ben-Menahem, Von Krogh, Erden, & Schneider, 2016; Okhuysen & Bechky, 2009). It is therefore not possible to economize on coordination costs by setting up a steep hierarchy, which establishes a highly regulated coordination system, rather coordination must be understood as a dynamic process. The emergence of informal communication patterns will be more time consuming and less efficient than a regulated communication infrastructure. However, the aim to reduce communication costs by implementing more hierarchical levels into a team structure is outweighed by the need for more diverse communication lines to generate ideas and the inability to identify definite interdependencies.

From a psychological perspective, the manager's aim is to create a working atmosphere in which each team member is encouraged to propose, critisize and refine innovative ideas. Thereby a high degree of vertical hierarchy is the least participative structure since decision rights are most likely centralized at the upper hierarchical layers and the decision maker is more distant from the average team member (Olson, Walker Jr, & Ruekert, 1995). Consequently individuals will tend to be more passive when bringing in new ideas is in question, though the genreation of new ideas is the most critical aspect in the face of an unpredictable environment (Keum & See, 2017). When the extent of vertical hierarchy is decreased and decision rights are shared among more employees, decision making is more participative and individuals feel more centrally involved. As communication is less regulated, more exchange between different team members will take place and individuals will be encouraged to communicate more openly.

In accordence with these assertions, the following hypothesis is presented.

> Hypothesis 1b: The more unpredictable a team's environment becomes, the smaller the extent of vertical hierarchy within a team.

3.2. Horizontal Specification

When moving from the vertical to the horizontal dimension of team structure, the specification of team members' roles is of interest, which refers to how differentiated the roles of individuals are. When roles are defined very narrowly and precise, they are considered to have a high degree of specialization, whereas a broad definition implies a low degree of specialization. Thereby the extent of specification implicates the degree of personal discretion, as a very narrowly defined role sets precise expectations and limits the field of responsibilities, while broadly defined roles leave it up to the individuals to find their roles and endow them with more holistic tasks.

As the specification increases, each specialized employee has a smaller overview over the output a group of individuals assigned to the same functional category produces. This results from the process of developing high levels of expertise on one task, but at the same time the understanding of related tasks executed by others decreases. Consequently, the interdependence between multiple employees, executing differing tasks, increases (Moon et al., 2004; Zhou, 2013). The interdependence requires coordination among individuals, which results in more communication (Arrow, 1974). As has been discussed previously, the aim is to reduce coordination costs when facing a complex environment since infrequencies occur often and fast reactions are required. The greater need for communication and coordination of individuals will overload communication lines and slow down processes. In order to achieve a reduction of communication and coordination costs the interdependencies between individuals ought to be reduced. Relative independence of team members is achieved by decreasing specification and formulating their roles more generally (Moon et al., 2004). This may come at the cost of efficiency in task execution itself, however this cost is outweighed by the reduction of high coordination and communication costs as the pressure on communication lines becomes too high in complex environments and the efficiency of the entire output production is in question. A more generally defined role implies a more global, output oriented understanding and coordination requirements are limited between subgroups in a team who execute distant tasks, not covered by the competences required by the range of responsibilities within one individual's role. Besides reducing coordination costs, the broader definition of tasks implicates higher flexibility of team members, which makes it possible for individuals to cover co-worker's tasks due to their wider sphere of competence. This flexibility is beneficial when having to adapt to changes in the environment.

Accordingly, I propose the following hypothesis.

> Hypothesis 2a: The more complex the environment a team faces, the less specialized the roles of individuals working on the team will be.

When considering environmental unpredictability, the question arises whether reduced specification is still beneficial. An unpredictable environment is characterized by imposing a lack of knowledge about how to accomplish a required task. This inexistence of expertise does not only refer to the team, but the entire environment, implying the team can neither resort to familiar procedures, nor leverage knowledge from the outside into the team. The contingencies of an unpredictable environment demand creativity and innovativeness from team members in order to accomplish the desired task. Since creativity does not originate in personality traits exclusively, but is affected by the work environment, it is very critical to design jobs in the way, that mostly enables team members to be creative. One essential aspect is giving autonomy to them, which will signal confidence in their competences, encourage them to think outside the box and pursue more risky ideas (Amabile et al., 1996; Oldham & Cummings, 1996). Additionally, several scholars pointed to autonomy's contribution to developing intrinsic motivation, which will in turn enhance creativity (Hackman & Oldham, 1976; Ryan & Deci, 2000). As less specified roles implicate wider personal discretion and more independence, it is a form of giving autonomy to employees (Moon et al., 2004). The freedom experienced by not being assigned to a specialized job will increase an individual's perception of empowerment and output overview. Moreover, broader job definitions will lead to more creative ideas as they allow individuals to take multiple dimensions of their work into account when looking for new ideas, while narrowly specified roles induce limited perspectives and direct the focus on a smaller range of possibilities.

A further important fact to be considered is that the exact role an individual should take on during a project cannot be foreseen in an unpredictable environment. Since it is impossible to anticipate all contingencies in an unknown task, a team will dismiss and adapt procedures several times during the execution of the project. It is for that reason the requirements for team members cannot be formalized. The jobs will emerge during task execution, whereby the adaptive and proactive behaviour of employees will be of major importance (Griffin, Neal, & Parker, 2007). One can see how the unpredictability of the environment in this manner forces a team into less specialization and leaves it to its members to sort into required tasks.

Hence, the influence an unpredictable environment has on the specification of jobs within a team is formalized in the following hypothesis.

> Hypothesis 2b: The more unpredictable the environment a team faces, the less specified the roles of team members will be.

4. Methods

4.1. Industry and Sample

The dataset used was obtained from the video game industry. The industry has grown rapidly in the past years and is expected to continue growing, with innovation being the main source of profit. In 2019 the revenues of the global games market were forecasted to reach $148,8 billion, with China, the USA and Japan being the three largest geographical markets by game revenue (Newzoo, 2019). For the present analysis the industry is particularly suitable as team-based work is the norm. Generally, the gaming industry is composed of publishers, developing studios and companies and the teams working on the game development. Thereby the publisher provides the finance for a game to be developed, whereas developers are mainly engaged in the technical development, such as programming, game design, art and testing. In several cases the publisher and developing studio are the same company. A characteristic of the industry essential mentioning is that individuals employed in the video game industry tend to change their employer frequently, resulting in a high overall industry turnover rate.

The data for this analysis were drawn from Moby, a website collecting a wide range of information on video games, and NPD, a market research firm. The merged dataset contains 325 700 observations, covers the period 1995 to 2007 and includes games developed in different countries worldwide. The data can be examined at multiple levels, whereby individuals are the smallest unit of analysis. These are nested within teams, developing companies and publishing companies. In the present analysis, the level of interest is the team level. Thereby a team consists of all individuals who have worked on a game for a specific platform. Some of the independent variables are however computed at the developer level.

Prior to merging both datasets, there were over one million observations available. Later nearly 790 000 observations had to be dropped from the sample since they could not be merged. Additional observations were removed if information containing the developer, introduction date of the game, a personal identification or a person's job title was not available, as these are indispensable information to run the analysis.

In order to define the external environment of the analysed teams, there are several possibilities to specify a market. One option is to look at the entire industry as one single market. Alternatively, markets can also be defined more narrowly. Each game can be assigned to at least one of eight broadly defined genres.[1] For the present analysis a team's closest operating market is used, namely the subgenre, a narrower definition, resulting in 121 different markets. Thereby each game belongs to exactly one subgenre.

4.2. Variables

4.2.1. Dependent Variables

The dependent variables are measures of team structure, one measuring the vertical structural element, namely the levels of hierarchy, while the other measures the specification of jobs as the horizontal structural element.

[1] The eight genres are: action, adventure, educational, racing, role-play-games, simulation, sports and strategy.

The number of hierarchical layers in the team is counted to measure the extent of vertical hierarchy. Thereby no difference is made regarding the precise titles the individuals positioned in higher hierarchical levels hold. This is due to the assumption that the differing names for higher-level positions will to a considerable extent result from firm-specific practices. However, it is of interest to know how many hierarchical levels are generally employed in a team, to determine a team's infrastructure provided for information flow and control. Thereby the variable is defined by taking the value of zero if no position in the hierarchy exists that is one level above the other team members. In this case it can be referred to as a flat hierarchy. The maximum of possible hierarchical layers in the underlying dataset are five levels.

To examine the specification within a team, the job titles members have and to what extent they differ within a job category are analysed. Thereby 15 broadly defined job groups, such as designer, artist or programmer, exist, in which jobs can be categorized.[2] In order to measure the job specification a ratio between the number of differing job titles in a job category and the total number of individuals belonging to this job category in the team was calculated. Having determined the ratio for each functional category existing in a team, the mean of these ratios was obtained for every team. The overall team ratio takes a value of one in the case of fully specialized job roles, while a decreasing value indicates more broadly defined job roles.

4.2.2. Independent Variables

In order to test the proposed hypotheses a set of independent variables is computed, which can all be assigned to a team's environment as these factors do not have their origin within the borders of a team. Each of these variables measures a form of environmental complexity or unpredictability the team faces.

A first measure of a complex environment is the number of competitors, as more competition puts a team under pressure. This results from higher competitor response and customers being offered a wider range of options, which increases the likelihood they might buy products from another provider. For this purpose, the number of competitors, namely other developers, that are active at the time a developer releases a game is counted. Therefor all developers are considered who released a game in the same market during the period ranging from twelve months before the introduction of the game and the actual introduction month. The length of the period being twelve months was chosen for the reason that developers themselves would wait twelve months after a game release to introduce a new game in order to not cannibalize themselves.

Besides the number of competitors, market concentration is introduced as an additional measure of environmental complexity. The concentration of a market gives insights about the competitive landscape by measuring the extent to which market shares are concentrated between a small number of market participants. A less concentrated market indicates complexity as competition takes place between a range of coequal market players and is therefore expected to be more intense with developers having to consider a higher number of equally strong competitors. For the present analysis market concentration was computed by the Herfindahl Index, squaring the market share of each developer competing in a given subgenre and thereupon summing the resulting numbers. Therefor market shares were calculated by dividing a developer's revenue generated in the period ranging from twelve months before the introduction of the game and the actual introduction month in a subgenre by the sum of revenues all developers made during the same period in a given subgenre.

Additionally, an interaction term between the Herfindahl Index and a dummy variable, indicating whether a developer is the market leader has been computed. For the creation of the dummy variable the market shares used for computing the market concentration were sorted and the developer with the largest market share within a subgenre in the given time period was assigned a value of one, otherwise the variable takes a value of zero. The interaction effect between both is included to control for possibly differing effects of market concentration on team structure between developers being the incumbent and those who are smaller players in the market. The distinction between both groups is of special interest when market concentration increases since the perceived environment in which a team operates differs.

A further variable employed provides information about a developer's market entry. Entering a new market results in facing a complex environment since a team has to confront a new set of competitors, a new customer group, possibly new technologies while dealing with an overall new task. A dummy variable is introduced to determine the project which marks a developer's temporally first game in a market. Thus, the dummy variable is one in case of a developer's market entry.

All so far introduced variables were measures of environmental complexity. A further variable shall be included in the analysis which measures the unpredictability of an environment. The creation of a completely new market will serve as a measure of environmental unpredictability as the existence of a demand is uncertain and the requirements customers will have, are unknown. Since the market is newly created no expertise knowledge exists on the market. In order to identify a new market creation by the introduction of a game, a dummy variable was created, taking the value one for each first game released in a subgenre.

4.2.3. Control Variables

Besides factors external of the team, the structure of a team will most probably also be influenced by some factors originating within the borders of a team. For this purpose, a set of internal factors are included in the model as control

[2] The full range of job categories are: designer, artist, programmer, tester, scientific advisor, producer, cin-ematics, voice actor, audio, manual packaging, localization, customer service, business legal, human resources, marketing and pr. Not every team employs individuals in all these categories.

variables. Firstly, the size of a team is included, measured by the number of individuals who worked on a game for a certain platform. The importance to control for team size when analysing the vertical hierarchy results from increased coordination requirements in larger teams. When running regressions on job specification, it is important to note, that at some point teams can get larger, but members cannot become more specialized. As the marginal effect of team size depends on the actual size of the team, the logarithm of the variable is included in the model. Additionally, the model controls for the experience a developer has accumulated in a given market. The number of games a developer has already introduced prior to the examined game was used to measure a developer's experience in a subgenre. A further variable provides information about the average experience an entire team has, taking into account all individuals working on the team. Akin to the experience of a developer, the number of games each individual has already worked on is counted and then the team average consisting of all individual members' experiences is build. When looking at the distribution of team size, developer experience and team experience one can notice that for each of these variables the mass of observations is concentrated on the left of the distribution, implicating a right-skewed distribution.

Besides including internal factors, another control variable, namely a dummy variable was employed, which turns one whenever it is possible to play a specific game with more than one player. The reason for controlling for single player and multiplayer games is that it impacts the frequency a customer will buy a new game. It is common that multiplayer games are played for a longer period of time than single player games. Moreover, structures, namely the number of hierarchical layers and the degree of role specification, that had been employed by developers in the project prior to the present one, are included as control variables. For each case the dependent variable is therefore lagged by one developer's project. The reason for doing so is that organizations and teams tend to maintain a structure they have already worked with even when its value is no longer evident because internal or external factors have changed. This organizational inertia can be explained by entrainment theory, stating that a once in a social system established set of norms and habitual activities will remain (Moon et al., 2004; Pérez-Nordtvedt, Payne, Short, & Kedia, 2008). It is important to note that the lag variable is limited in the case of the very first game of a developer as no prior game exists. In these cases, the variable takes the value of the structure implemented in the first game following the stated assumption that managers will stick to known structures. In response to this limitation a further control variable is included, namely a dummy variable, taking the value one for every developer's first game in the dataset.

4.3. Analyses and Results

Ordinary least square (OLS) regressions were run in order to test the hypotheses. Firstly, the variable counting the levels of hierarchy was employed as the dependent variable and the effect the environmental factors have on it estimated. The second set of regressions estimates the effect the same set of independent variables has on job specification. The independent variables and the main control variables, accounting for internal factors, and the correlations among them are presented in table 1.

4.3.1. OLS Regression Results

Table 2 shows regression results for vertical hierarchy, allowing to test Hypotheses 1a and 1b. Model 1 merely includes the independent variables, excluding all control variables. One can notice that all external factors have negative coefficients if internal factors and other controls are not being accounted for. Although all coefficients are statistically significant, the model does only explain a small amount of variance ($R2 = 2\%$). Model 2 includes control variables, which results in a considerable increase of accounted variance compared to model 1, indicating the necessity for including these statistically significant control variables in order to test the hypotheses. In model 3 the interaction effect between the market concentration and the dummy variable indicating whether a developer is the market leader is additionally included.

Hypothesis 1a states that a more complex environment will lead to an increase in levels of hierarchy in a team. In order to test this hypothesis, one should examine the coefficients and their statistical significance of the variables measuring the developer density, the subgenre's concentration and a developer's subgenre entry. The density of developers is found to significantly ($p < 0{,}01$ in model 2 and $p < 0{,}05$ in model 3) influence the number of hierarchical layers. The positive coefficient states that the more competitors a developer faces, the steeper a team's hierarchy c.p., which supports hypothesis 1a. However, the impact the number of competitors has, is very small. As expected, a subgenre's concentration has a negative effect on the number of hierarchical layers. The implication of the effect is that the more concentrated the market shares are among a small number of developers, the less hierarchical levels will be employed within a team c.p.. In other words, a smaller Herfindahl Index, which implies more complexity, leads to an increase in the extent of hierarchy. Thereby the coefficient is also statistically significant at the 1% level ($p < 0{,}01$) in model 2 and model 3, supporting Hypothesis 1a. Model 3 shows that the interaction effect between the market concentration and the market leader variable is positive and statistically significant ($p < 0{,}01$). This indicates that the negative effect a higher market concentration has on the number of hierarchical layers is in amount smaller for developers having the largest market share. When directing one's attention to the coefficient estimating the effect a subgenre entry has on the vertical hierarchy of a team, a positive impact can be observed. The coefficient is statistically significant at the 1% level ($p < 0{,}01$) as can be derived from both, model 2 and model 3. This implies that entering a new market will c.p. positively affect the number of hierarchical layers. Hypothesis 1a is supported by this result as well. Having examined all three coefficients, one can say that it is not possible to reject Hypothesis 1a, in-

Table 1: Summary Statistics and Correlations

Independent variables	mean	sd	min	max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) new_subgenre	0.0194368	0.1380547	0	1	1.00							
(2) subgenre_entry	0.5480225	0.4976893	0	1	0.1279	1.00						
(3) developer_density_sub	7.300953	5.719901	1	35	-0.1536	-0.0405	1.00					
(4) herfindahl_index_sub	0.4614767	0.2693486	0.0645702	1	0.2702	0.0501	-0.7309	1.00				
(5) herf_leader_sub	0.2412854	0.35914	0	1	0.2834	-0.0280	-0.5227	0.7841	1.00			
(6) team_size	190.1751	149.8379	1	1224	-0.0720	-0.2097	0.0616	-0.0703	0.0451	1.00		
(7) developer_experience_sub	1.639383	2.514734	0	14	-0.0880	-0.6510	0.0430	-0.0377	0.0831	0.2839	1.00	
(8) team_experience_sub	0.6221962	0.7814658	0	5.84	-0.1003	-0.3607	0.1116	-0.1517	-0.0518	0.1886	0.5242	1.00
Dependent variables												
hierarchy_levels	3.512001	1.265637	0	5								
specialization	.559869	.1321629	.0409035	1								

Table 2: Results of OLS Regression - Effects on Vertical Hierarchy[3]

	hierarchy_levels		
VARIABLES	(1)	(2)	(3)
new_subgenre	-0.581***	-0.269***	-0.297***
	(0.0166)	(0.0134)	(0.0135)
subgenre_entry	-0.0944***	0.122***	0.121***
	(0.00443)	(0.00484)	(0.00484)
developer_density_sub	-0.00111**	0.00171***	0.000975**
	(0.000562)	(0.000450)	(0.000453)
herfindahl_index_sub	-0.481***	-0.202***	-0.336***
	(0.0122)	(0.00989)	(0.0135)
herf_leader_sub			0.119***
			(0.00820)
ln_team_size		0.692***	0.687***
		(0.00246)	(0.00248)
developer_experience_sub		-0.0356***	-0.0372***
		(0.00102)	(0.00102)
team_experience_sub		0.0566***	0.0565***
		(0.00275)	(0.00275)
Controls	N	Y	Y
Constant	3.806***	-0.765***	-0.700***
	(0.00960)	(0.0146)	(0.0153)
R-squared	0.020	0.374	0.375

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
The full table can be found in appendix 1[4].

dicating that the complexity of the environment a team faces will impact the extent of vertical hierarchy in a team positively.

Hypothesis 1b states that environmental unpredictability will have a negative impact on vertical hierarchy. The coefficient of new market creation is ought to be examined in order to test this hypothesis. Creating a new market will c.p. lead to a decreased number of hierarchical layers. This results from a negative and statistically significant ($p < 0{,}01$) coefficient of the new subgenre variable in both, model 2 and model 3. Hence, Hypothesis 1b is supported as well.

When directing one's attention to table 3 the regression results for job specification are shown. Alike the regressions run on vertical hierarchy, model 1 of table 3 contains regression results if merely independent variables without control variables are included. As can be seen in the increase of R2 when comparing model 2 to model 1, including control variables improves the explanatory power of the model. Model 3 additionally contains the interaction term between the Herfindahl Index and the dummy variable for market leader.

Hypothesis 2a claims that in a more complex environment, the specification of roles in teams decreases. Anew, when examining environmental complexity, the coefficients of developer density, market concentration and market entry ought to be analysed. Firstly, the effect of the number of competitors on the degree of specification is positive and the coefficient statistically significant at the 1% level ($p < 0{,}01$)

Table 3: Results of OLS Regression - Effects on Job Specification[5]

	specialization		
VARIABLES	(1)	(2)	(3)
new_subgenre	0.0192***	-0.00828***	-0.0118***
	(0.00174)	(0.00154)	(0.00155)
subgenre_entry	0.0461***	0.0159***	0.0157***
	(0.000464)	(0.000557)	(0.000557)
developer_density_sub	0.000669***	0.000358***	0.000266***
	(5.88e-05)	(5.18e-05)	(5.21e-05)
herfindahl_index_sub	0.00565***	-5.00e-05	-0.0169***
	(0.00128)	(0.00114)	(0.00156)
herf_leader_sub			0.0150***
			(0.000944)
ln_team_size		-0.0670***	-0.0676***
		(0.000272)	(0.000274)
developer_experience_sub		-0.00237***	-0.00257***
		(0.000117)	(0.000118)
team_experience_sub		0.00815***	0.00812***
		(0.000310)	(0.000309)
Controls	N	Y	Y
Constant	0.526***	0.786***	0.794***
	(0.00100)	(0.00196)	(0.00202)
R-squared	0.031	0.252	0.253

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
The full table can be found in appendix 2.

in model 2 and model 3. This result does not support Hypothesis 2a as it implies that an increase in the number of competitors an organization faces c.p. leads to an increase in the specialization of jobs. Alike the case when running regressions on the vertical dimension of team structure, the influence the number of competitors has on the degree of horizontal specification is thereby very small in amount. Turning one's attention to the impact the market concentration has on job specification, a negative effect can be observed. Thereby the coefficient is not statistically significant in model 2 and becomes statistically significant at the 1% level ($p < 0{,}01$) in model 3. That implies that the more equally market shares are distributed among all developers competing in a subgenre, the more specialized roles will be within a team, which does not support Hypothesis 2a. Model 3 shows that the interaction term between market concentration and the dummy variable for market leader is positive and statistically significant at the 1% level ($p < 0{,}01$). When including the interaction term, one can note that the effect the market concentration has on job specification becomes very small for market leaders, while the effect is still negative. At the same time an increase in market concentration has a negative and according to amount larger impact on job specification in teams whose developer is not a market leader than for those who are. Contrary to the assumption made, the coefficient of subgenre entry is positive and statistically significant at the 1% level ($p < 0{,}01$) as can be derived from model 2 and model 3 of table 3. This means that entering a new market will c.p. lead to an increase in the degree of job specification, which does not support Hypothesis 2a either. Altogether Hypothesis 2a can be rejected, in fact all three effects point in a direction, which implies that the horizontal specification increases when a team faces a complex environment.

Hypothesis 2b states that the more unpredictable an environment is, the less specified team members' roles will be. As shown in both, model 2 and model 3 of table 3, the new subgenre has a negative coefficient, which is statistically significant at the 1% level ($p < 0{,}01$). This entails that a team creating a new subgenre by the introduction of a game will have less specified roles. Hypothesis 2b is supported by this result, as it cannot be rejected at the 1% level.

4.3.2. Robustness Checks

Several robustness checks have been conducted to test the validity of the results of the OLS regressions. In order to undertake a robustness check with hierarchical levels being the dependent variable, an ordered logit model was estimated. This model is suitable since the number of hierarchical layers is an ordered variable, with a team being able to have none up to five hierarchy levels. The estimated coefficients of the ordered logit confirm the results of the OLS estimators as shown in appendix 3.

In order to test the validity of results when regressing on job specification a further robustness check was conducted by operationalising the dependent variable in a different way. Instead of estimating the specialization within a job category,

the specification is computed by the ratio between differing job titles within a hierarchical layer across all job categories and the number of individuals employed in that level of hierarchy. Subsequently the average specification between all layers is built. As can be derived from appendix 4 the coefficients of the independent variables point in the same direction apart from the coefficient estimating the number of developers in a subgenre. However, the coefficient was in amount already very small in the initial regression. Therefore, results are mainly confirmed.

As priorly mentioned a team's environment can be defined more broadly than by the subgenre. Regression results for the industry and genre level can be found in appendix 5-7. The coefficient for the creation of the industry is insignificant as only one project in the dataset takes the value one in this case.

4.4. Interpretation

Although all coefficients indicate a rather small effect in amount, they are in most cases highly significant and clearly show whether managers tend to increase or decrease the extent of hierarchy and job specification. In this context the effects shall be interpreted in the following.

4.4.1. Vertical Hierarchy

Both, a higher number of competitors and a lower concentration in the market, impose pressure from outside on the team as they account for how strong competition is. Though the coefficient of developer density is very small, it shows the tendency that facing more direct competitors results in extending the vertical hierarchy. The positive coefficient of developer density and the negative coefficient of the Herfindahl Index indicate that the reaction to the pressure of competition is to reduce the span of control by employing more hierarchical layers within the team. As customers have a wider range of choices with more or equally successful providers operating in the market, the hurdle to buy a product from another provider is lower. In response to that developers will aim to increase quality and meet customer demands in order to remain competitive. A tighter control aims to reduce costly mistakes, which will be easily penalized in the face of a high number of competitors or a low market concentration as other developers are waiting in the wings to steal market share. A steeper hierarchy will additionally increase the speed of operations and decision making, which will be sought by managers in order to keep up with competitors or even be faster with introductions than they are (Jansen et al., 2006). The implementation of a highly coordinated system with a communication infrastructure will enable to establish routine procedures in the course of time. These will allow to exploit existing knowledge and thereby increase speed and work on quality instead of experimenting with new procedures. The additional inclusion of the interaction term shows that a difference exists in the size of the effect when comparing firms having the largest market share in a subgenre and other market participants. The perception of the environment faced differs as market concentration increases. In highly concentrated markets organizations, which are not the market leader, will most likely have a very small market share. The results show that an increased market concentration will lead to a flatter structure as environmental complexity has decreased, which indicates that the competitive landscape is settled and one or few market participants concentrate a large part of market shares. However, when developers are not the leader in a subgenre, teams are even flatter compared to market leaders. This can be explained by the aim of non-market leaders to challenge the incumbent firm in the market by experimenting with new procedures and generating new ideas in order to gain market share. While market leaders comparatively put more emphasis on efficiency, smaller competitors aim to implement a more adaptive structure helping them to deal with new tasks and possibly achieve the implementation of a new technology faster.

A similar effect can be observed when directing one's attention to the market entry of a developer. The positive impact entering a market has on a team's hierarchy points to the reaction of meeting the higher amount of information to be processed employed by the newness of environmental components by regulated information channels.

Both, entering a market and creating a new market, direct a team into a new environment. However, in case of market entry the environment is merely perceived complex by the team entering, whereas, depending on who the new entrant is, for other participants in the market the only environmental change is facing a new competitor. Contrary to a new market creation, when entering a market, a team has the possibility to observe the market and its participants prior to entering and thereby gain some market insights. Moreover, the deviant result when compared to market entry as the first mover can be explained by a team's possibility to employ individuals from other developers who have already worked in the given market and in this manner leverage knowledge from the external environment into the team. The industry's high turnover rate supports this procedure and indicates that individuals employed in the video game industry are willing to change their job, which is in favour of developers looking for persons with expertise in a market. When the team is composed of some individuals having experience and others working in a market for the first time, the team will be structured in a way that puts expertise knowledge to most efficient use. Employing hierarchy can achieve this in two different ways. On the one hand experienced individuals may be deployed into positions, in which they have a narrow span of control over unexperienced team members, so they can oversee working processes tightly and be able to give feedback. On the other hand, hierarchy improves the use of expertise knowledge by enabling unexperienced employees, who will be confronted with unfamiliar situations, which may not be new to members having priorly worked in the market, coordinated communication with experienced members. This is reached by setting up vertical communication channels, so information can be passed to experienced individuals. The steeper the hierarchy, the tighter the exerted

control and the more coordinated the communication, which explains the positive effect of market entry.

Unlike the entrance of an existing market, creating a new market by being the first mover introduces a major change in the external environment. The response to this situation is the implementation of a flatter hierarchy. In contrast to entering an already existing market it is impossible to hire experienced individuals into the team and positions that enable them to overview working processes. The inability to exploit existing knowledge demands exploration from team members. As different individuals will explore on different fields, information sharing will be essential. Instead of passing information up the hierarchy, which would save time, information exchange will occur on the basis of bilateral communication lines. The emergence of informal networks will be most adaptive as new ideas and changing procedures occur when developing a new product that does not exist in this form yet. The team engages in a risky project when developing a game which creates a new market since it cannot be known whether customers will show interest for the new product. That is why managers will opt to be more flexible allowing for unplanned changes and alternating expectations when predicting customer requirements. Thereby the role of efficiency becomes less important compared to flexibility as the efficiency of working processes comes to the fore when knowledge about an existing customer base exists. This flexibility is achieved to a greater extent when reducing hierarchical layers as that at the same time implies a reduction in predetermined coordination. It is important to note that broader definitions of markets than the one chosen for the present analysis are possible and in the case of defining markets more broadly the effect of creating a new market will probably increase (appendix 7). That results from the fact that more narrowly defined markets might allow for insights from existing markets sharing some similarities with the new market, such as guessing who potential customers may be based on their preferences in existing markets. In broader defined markets however, the unpredictability of the environment increases additionally as the difference to existing markets is larger.

4.4.2. Horizontal Specification

As the pressure from the external environment increases by a more intense competition, one can see that a higher number of competitors as well as a lower market concentration, although insignificant in model 2 of table 3, have a positive effect on the specification of job roles within teams, contrary to the prediction of Hypothesis 2a. This result can possibly be explained as follows. As mentioned above the pressure from competition results in the aim to reduce decision time and increase quality. The increase of job specification may hence be the intent for team members to develop distinctive skills on the narrow task they were assigned to and become an expert on that narrow field. Comparing the expertise an employee can develop on the same narrowly defined task (1) when being assigned to the one task only and (2) when this task is merely one part of the individual's broader defined role, a difference is expectable. In the first case the individual can focus on a narrow task, maximizing the efficiency of executing it, while in the latter case the individual will maximize globally over the whole range of separate tasks belonging to the overall assigned role. That is why in the latter case the individual's knowledge on a broader field increases, whereas the efficiency and possibly quality on the narrow subtask decreases in comparison to the first case. With assigning every team member to a narrowly defined task and thereby initiating an increase in expertise and subsequently efficiency on the execution of this task, the overall quality of the product may increase.

As priorly discussed a higher degree of specification increases coordination requirements since more interdependencies between employees exist. The increased demand for coordination will be more time consuming. This coordination cost may be however accepted by managers in return for increased efficiency on task execution and possibly saving time by precisely allocating roles to team members and thereby eliminating any possible ambiguity resulting from broadly defined jobs. Moreover, the emergence of coordination costs may be decreased in a different way, namely by increasing the number of hierarchy levels. Since bilateral coordination costs have increased due to a lack of understanding the counterpart's work, moving coordination to individuals employed in a higher hierarchical level with a more global perspective can economize on coordination costs. In that way a steeper hierarchy can help managing the trade-off between increasing efficiency by specialisation and the need of coordination (Zhou, 2013). In response to that the degree of specialization has been included as a further control variable when regressing on hierarchical layers in appendix 8, supporting this suggestion. The inclusion of the interaction term between being the market leader and overall market concentration shows that specification decreases in the face of an uncomplex environment, especially for teams whose organizations can only attribute a small market share to themselves. As previously stated, this effect can be explained by the aim of non-market leaders to challenge the big players by coming up with new and innovative ideas to attract customers and survive in the market. Therefor managers aim to enable creativity by giving a higher degree of autonomy to team members.

Similarly, entering a new market induces more specification of job roles within a team. The task novelty and new environment a team is facing may be seen as a disadvantage compared to other competitors who are already experienced in the market. At the same time the team aims to be successful and gain a foothold in the market. The increase in specification can therefore be explained by the aspiration of managers to be as efficient as possible and seek to exploit knowledge from markets they have priorly operated in. Thus, managers will aim to assign employees to tasks they have already worked on before, so they can apply parts of existing knowledge gained while working in another market. If the degree of job specification had been decreased, team members would have been assigned to more challenging tasks,

which might have been beneficial for their motivation, however it would have decreased efficiency. Increasing specification by contrast, decreases the difficulty of the task itself, which may be beneficial in the face of the already imposed difficulty of operating in an unknown market. Thereby the emphasis is placed on adapting to the entered market while organizing work in the most efficient way. In addition, efficiency is increased as role ambiguity is decreased, which may be especially suboptimal in the face of task and market novelty, which already challenge routinized processes. More broadly defined roles may cause role ambiguity as clear boundaries of responsibility are lacking. In order to establish competitiveness in a new market, managers will aim to reduce work ambiguity and enable focus and learning.

Moreover, the clear division of task areas and narrow definition of roles implies that employees only have to give attention to a smaller part of the new environment. This will come at the cost of low coordination requirements as individuals not only have a narrow view concerning the produced output itself, but additionally on the new environment. As previously stated, managers may accept these coordination requirements induced by a higher degree of specialization as they can achieve coordination by adapting a steeper hierarchy. Thereby, individuals can be hired into the team who have already worked in the market and be assigned to coordinate tasks and provide team members with knowledge, which will help them to increase efficiency.

Seeking to develop experts on a given task and decrease ambiguities in order to gain a position in the competitive landscape such as the possibility to achieve coordination through vertical hierarchy may explain a manager's choice to increase job specification when facing a complex environment.

When examining the degree of specification in the context of an unpredictable environment, results show that there is a tendency to define tasks more generally. This confirms the notion that managers put emphasis on fostering creativity within a team when incapable of predicting the properties and development of the newly created market. New ideas and creative processes are important in order to attract potential customers and find technological solutions. That is why managers seek to create a working atmosphere which allows team members to be creative by assigning them to more holistic jobs through broadly defined roles. Instead of exploiting capabilities with a high degree of specialization, individuals are given a more challenging role providing them with more autonomy. As employees will be able to self-select into roles by proactive behaviour their motivation to work on the project, which marks the creation of a new market, may be fostered. Apart from creating a working environment that enables team members to be creative, coordination costs decrease as individuals have a better understanding of the overall output produced. In that way team members will more likely be able to contribute to potential solutions of their colleagues' problems and discussions among multiple employees and the whole team will be based on a higher level of mutual understanding.

A further result stands out particularly, which was not part of the initial focus of analysis, however, yields an unexpected result, namely the negative effect developer experience has on both, the number of hierarchical layers and the degree of job specification. The common assumption is that the more mature a company becomes in a market, the more structured teams will be (Sine, Mitsuhashi, & Kirsch, 2006). In contrast to that the present analysis emphasizes the contrary. More experienced developers in the market tend to build teams with flatter hierarchies and a lower degree of job specification.

5. Discussion

5.1. Theoretical Implications

The present study has illustrated that a distinction must be made between different types of environments. It is not sufficient to subdivide into a simple and complex environment, rather a further distinction based on the predictability of environmental factors is needed as one can see that complexity and unpredictability have opposing effects on team structure. While a complex environment is met with imposing a more regulating structure, namely a higher degree of both, vertical hierarchy and specialization, an unpredictable environment leads to a decrease of both, aiming to foster team members' creativity.

It follows therefrom that the vertical and horizontal dimension of team structure go hand in hand. The central trade-off made is between a more efficient and a more flexible structure. Efficiency is achieved by employing more levels of hierarchy as coordination and communication costs are reduced, decision making is less time consuming and teams can establish routine procedures in that manner. At the same time a higher degree of specification is efficient as individuals can concentrate on a very narrow field and develop distinguished capabilities in accomplishing the respective task. In case of an unpredictable environment teams adjust their structure in order to facilitate creativity, on the one hand by reducing hindering information infrastructures and enabling emerging and fluid interdependencies between employees, on the other hand by motivating through a more participative structure and by giving more autonomy through more broadly defined jobs. Although efficiency is lost in that case, the benefits of efficiency seem to be outweighed by a more enabling work environment and gained flexibility.

This study contributes to existing literature in multiple ways. Firstly, it suggests a typology of team and organizational environment and challenges the validity of studies merely dividing the environment into being simple or complex. Additionally, it tests for both dimensions of structure, namely the vertical and horizontal, separately, following differing mechanisms underlying each of them. The results of this study state that both are increased (decreased) depending on the environment a team faces, suggesting that there may be an interdependence between both and testing for an increase or decrease in the overall extent of structure is

valid. As priorly mentioned one dependence will result from the increase in coordination costs when jobs are specialized to a higher degree, and in turn achieving coordination by employing more hierarchical layers. Moreover, the results shed light into the ambiguity of past results and challenge the widespread assumption that environmental complexity must necessarily lead to a flatter structure. Instead, a coordinated information flow and narrower spans of control yield higher efficiency sought by managers when facing a complex environment. Apart from that, the study tests the main assumption made by contingency theorists on the team level and shows that not only a firm's but also a team's structure is adapted depending on the environmental context. The applicability of contingency theory to the team level is derived from an empirical analysis on one of the world's fastest growing industries and is not restricted to a cultural context as the data covers teams operating all over the world.

5.2. Practical Implications

Constantly changing markets and the emergence of multiple new markets impose a challenge on managers assigned with the task of structuring teams as being responsive to one's environment is indispensable. Several managerial implications can be derived from the results of this study.

When the team operates in a very competitive and yet unsettled market with a high number of market participants and there is no one particular or few incumbent firms who dominate the market, rather market shares are divided equally, managers ought to employ steeper hierarchies. The resulting narrower spans of control enable a regular exchange between employees and their supervisors allowing for feedback and overseeing team members more tightly, which will accelerate working processes. Additionally, employees should be embedded in a regulated work environment, so they know whom to pass on new information and turn to when facing difficulties. In this manner the team can exploit strengths to stay competitive. This can additionally be achieved by assigning employees to specialized roles facilitating them to become an expert on the narrowly defined task and outperform counterparts in the market, working on the same field, but having a broader area of responsibilities. The same holds for entering a new market. As managers perceive the entered market to be attractive, which other firms will perceive equally and the market already has participants, establishing oneself in the market landscape sustainably will be the aim. Entering a market is usually preceded by market studies and observing competitors already operating in the market with the challenges they face. In that way teams explore the market before entering it. When the market is entered managers should put acquired knowledge to best use by coordinating and controlling working processes by setting up steeper hierarchies. This will lead to developing routines while knowing whom to address when facing challenges. Furthermore, managers should seek that their employees gain a high level of expertise on a task and therefor increase job specialization. In turn the developed skills can be used efficiently and teams can produce quality products quickly, which will help establishing oneself in the competitive landscape.

When building up teams for entering a market as the first mover, which implies no predictions can be made, neither if there will be a demand, nor how many further competitors will enter in the future, the emphasis should be put on the development of creative ideas. In order to attract customers, managers should strive for their employees to be enabled to be as creative as possible. Therefor the structure ought to be flatter, so it is more adaptive to new procedures and employees are allowed to build their own networks in the course of the creative process. Furthermore, managers can motivate their team members by assigning them to challenging tasks, namely giving them more autonomy, which can be achieved by not specifying jobs too much.

5.3. Limitations and Future Research

Some potential limitations of the present study should be taken into account. One concern might arise from the high turnover rate in the video game industry, possibly limiting the applicability to industries with a lower overall employee mobility. In response to the industry's high turnover rate, the structure of a team operating in the video game industry might be adapted to meet frequent employee changes by making it decomposable in order to simplify the replacement of an individual. A further point to be considered is that the observations for the job titles of individuals are drawn from the game credits, which were probably created by the end of the project. Therefore, it cannot be excluded that the job title in the end does not fully correspond the job title given to an individual at the beginning of a project.

Turning one's attention to the regression itself, it would be of interest to conduct a further robustness check by running the regressions with a hierarchical linear model since the present data is analysable at multiple levels. As the dependent variable is on a lower level, namely the team level, than the independent variable counting the number of developers in a market, which is at the developer level, sampling variance might be affected (Hox, 2013, p.148).

Regarding the regression results of a company's experience in a market discussed earlier, it may be of interest to examine the relationship between a company's maturity in a market and the structure it employs more profoundly in future research projects. A further suggestion for future research results from the present analysis' results suggesting that managers increase the degree of both structural dimensions when facing a complex environment, while decreasing the extent of both when operating in an unpredictable environment. Since the effects point in the same direction, future studies should test the effect on the interaction between vertical and horizontal structure on the team level.

6. Conclusion

To sum up, the present study has shown how the external environment, in terms of complexity and unpredictability,

has an influence on a team's structure. Thereby managers face a trade-off between emphasizing efficiency by improving information processing capacity, routinizing processes and specializing jobs or choosing a more flexible structure with emerging interdependencies and a working atmosphere, which enables creativity. Results show that in the face of a complex environment teams tend to have more hierarchical layers and team members' jobs are specified to a higher degree, whereas an unpredictable environment induces managers to reduce the extent of vertical hierarchy and assign individuals to more broadly defined jobs.

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