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Effects of the Use and Coordination of Multiple Corporate Entrepreneurship Units

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Abstract—Corporate Entrepreneurship (CE) has become an established tool to create discontinuous innovations for many established companies. Thus, they have started to implement multiple CE units in parallel. However, despite different positive effects potentially arising from the parallel use and purposeful coordination of CE units, managers and scholars alike have so far widely ignored such holistic perspectives. This study therefore wants to shed light on the effects the parallel use and coordination have on established companies' innovation performance. Following an explorative approach, it investigates quantitatively the relationships between the number of CE units as well as their heterogeneity (in terms of their forms) used by a company and companies' innovativeness. Further, it employs qualitative interview data to gain deeper insights into the effects. Interestingly, the results show that the mere number of CE units does not have a significant effect on the innovativeness, but that more heterogeneous sets of CE units do. This provides an argument for the strategic coordination and co-specialization of CE units in order to make use of positive effects associated with multiple CE units. The study thereby contributes both to Asset Orchestration theory and the CE literature and provides multiple managerial implications as well as different avenues for future research.

Keywords—corporate entrepreneurship, coordination, asset orchestration theory, heterogeneity, innovativeness

I. INTRODUCTION

Driven by dynamic environments and the resulting need to adapt, established companies must create discontinuous innovations [1–3]. This requires more entrepreneurial ways of innovation creation [4], which is why more and more companies are implementing Corporate Entrepreneurship (CE) units. Discontinuous innovations develop through multiple stages, require systems of interrelated innovations and call for new business models, all of which has resulted in corporations starting multiple CE units [5]. Studies also confirm a generally positive effect of CE activities on the innovativeness of companies [6–8]. By cultivating an environment that encourages the exploration of new avenues using entrepreneurial thinking and actions, CE becomes a fertile ground for generating novel ideas. Thus, CE can help companies to create not only more innovations but also different types of innovations (e.g., from product to service, mostly digital, ...) that have a broad impact on the organization (e.g., new business models, different customers, and revenue streams, ...). In the face of these widespread effects, several researchers focused their investigations on distinguishing different CE forms (e.g., accelerators, incubators, corporate venture capital, ...) and exploring the impact of such CE forms on the types of innovations created [9] as well as how this affects the respective organization [10–12]. Building on this, it could be argued that the use of

multiple CE units within the same organization may positively influence the overall innovativeness of a company [13–17].

When companies use different CE forms, this further introduces the dynamics of diversity. The diversity of people and other resources involves diverse perspectives, knowledge, competencies, skills, and ideas that allow for the creation of different creative solutions [18]. The use of heterogeneous CE forms therefore enables them to work on diverse innovations. Furthermore, through purposeful coordination the CE units can integrate their complementary efforts and collaboratively work on specific innovation projects [19]. Thus, it can be assumed that a heterogeneous and coordinated set of CE units can lead to a higher innovation performance than a less heterogeneous set.

Two companies from our data sample back these assumptions. Both companies have relatively high numbers of CE units (11 and 15 respectively) implemented within their organizations and rank among the most innovative companies in Germany. However, a closer look at the CE forms presents different heterogeneity levels. While Company A has 11 CE units and uses four different forms of CE, Company B has 15 CE units using only two different CE forms. One possible explanation for the difference can be found in the geographical location of the CE units of both companies. Since Company A has 11 CE units in only four different locations, it seems likely that in order to justify the implementation of additional CE units, the new units had to be different from the existing ones, which consequently increases the heterogeneity of the CE forms used. In contrast, Company B's CE units are spread across 14 locations worldwide, which means that they were not in 'competition' with other CE units, and so could simply apply the already-existing CE form's respective approach in a different region, resulting in a lower heterogeneity of CE forms. The comparison of the companies' innovation performance reveals that Company A is more innovative. So, the company with multiple CE units that are more heterogeneous turns out to have a higher innovative performance.

While the existing literature investigated the positive effect of CE in general and the effect of individual forms of CE units, it lacks a focused investigation on the effect of the parallel use of multiple and different CE units [13, 16]. We assume that the number of CE units and their heterogeneity in terms of their CE forms both positively affect companies' innovation performance. To investigate the effect that the number of CE units and the heterogeneity of CE forms have on the innovation performance of companies and thereby validate the anecdotal evidence of the two exemplary companies, we pose the following two research questions:

RQ1: What is the effect of the number of CE units on a company's innovation performance?

RQ2: What is the effect of CE units' heterogeneity (of the forms) on a company's innovation performance?

Answering these two research questions is relevant from a managerial perspective because this may indicate whether companies should implement multiple CE units, and if so, how companies can create logical sets of CE units both in terms of number and variety. For example, if homogeneous sets of multiple CE units have a stronger effect on innovation performance than heterogeneous sets, then companies should coordinate their CE units accordingly (or vice versa). In that case the coordination of the similar units could for example focus on learning from each other to avoid reinventing the wheel. Despite the fact that more and more companies are building multiple CE units [5], the research questions highlight a gap in the research that has been recognized for some time but has remained largely underexplored [13–17].

A mixed-methods approach was adopted to answer these questions, with different types of analyses conducted. First, a quantitative analysis was conducted where the correlation between the implementation and the coordination of multiple CE units and companies' performance in terms of innovativeness was studied. Second, we extend the examination by conducting partial correlation analyses in order to yield the 'clean' results of the different correlations. Third, to enhance the quantitative results and deepen the discussion of the relationship between the different variables, we further analyzed qualitative interview data (collected in previous studies) to identify helpful explanations of the phenomena observed.

II. RELATED WORK

With its rapid and profound changes, today's dynamic environment creates both opportunities and risks for all kinds of organizations. Yet, only those companies that adapt to the changes and create innovative solutions stay competitive [20]. In order to be able to adapt to changes and to identify and exploit new opportunities from them, entrepreneurial skills are required [21]. Thus, in dynamic environments, many new startups are emerging and entering the markets with innovative solutions, creating the risk for the established companies to be forced out of the market.

In response, established companies have developed new and more entrepreneurial approaches to innovation development [22–24]. Over the last years, various forms of CE have emerged, such as accelerators [25], incubators [26], CVC units [27], venture clienting programs [28], or company builders [29], with the help of which the established companies try to build up entrepreneurial skills in their organizations and thus also create discontinuous innovations. With its entrepreneurial approach, CE generally promotes and supports new avenues to more open and lateral thinking and pursuing diverse and novel ideas [30, 31]. CE thus enables companies to create new knowledge [32] allowing them to create innovations that fit the most recent requirements of dynamic environments.

Beyond the potentially higher number of innovations, the explorative approach of CE also enables established companies to produce different kinds of innovations [9, 33, 34] that are completely new to the organization and the industry. For example, companies with previously analog

products can also develop digital products and matching digital services. CE also helps to apply new business models. Consequently, the innovations resulting from CE can have a broad impact on the organization [4, 21]. In this way, CE fosters organizations' transformation and strategic renewal by developing new strategies, adapting organizational structures and processes, and changing the fundamental manner of doing business (including targeted customers and key partners). In a nutshell, CE enables the creation of more, different, and far-reaching innovations.

The positive effects of CE inspired some companies to implement multiple CE units in parallel [5, 16, 17]. For example, companies set up multiple similar CE units in different regions in order to tap into the respective innovation potential of each region or to develop solutions adapted to the respective markets. Alternatively, companies set up multiple CE units with different specializations in order to achieve different types of innovation goals and associated outputs [9]. As a result, researchers have investigated the effect of individual CE forms on the performance of companies [10–12]. However, the literature has not considered the effect of multiple CE units within the same organization. Thus, this article empirically examines the effect of the number and the heterogeneity of CE units on innovation performance.

III. METHOD

The study follows a mixed-methods approach, combining the results of a quantitative examination using data from desk research and a qualitative examination using interview data. In what follows, we present the generation and analysis of both kinds of data.

A. Data Collection & Data Sample

1) Quantitative Data

For this study, we decided to collect data on multiple CE units through large-scale desk research. We therefore started by looking at the 100 largest (as CE is still mostly used in larger companies) established companies in Germany. We then added to this list companies that had been identified as CE users in third-party studies. This resulted in an initial list of 165 established companies that were likely to have multiple CE units. Through an intensive screening process, we identified 55 companies that actually used multiple CE units, ranging in size (from 6,000 to more than 600,000 employees) and representing all industries. While all of these companies had 'multiple' CE units, the actual number of CE units implemented in parallel varied from two to 15. Together, the companies had a total of 306 CE units.

In addition, we collected data on the CE forms (according to [9]), identifying that the companies used between one to six different CE forms. By using the number of CE units per company and the information on their respective CE forms, a heterogeneity index [35] could be calculated for each company. This index takes into account the possible number of CE forms ($i = 11$, according to Selig [9]), the frequency of the use per CE form (n_i), and the company's total number of CE units (N_U).

$$H' = - \sum_i p_i \times \ln p_i \quad \text{with } p_i = \frac{n_i}{N_U}$$

For example, the heterogeneity of a company with 11 CE units each of the same form would have a level of $H' = 0$,

while a company with the same number of CE units each of a different form would have a level of $H' = 3.459$. This implies that the level of heterogeneity within our experimental setting, characterized by a maximum of 11 distinct forms, can span the range from 0 to 3.459. In a hypothetical scenario where the number of forms and units approaches ∞ , the heterogeneity would also tend toward ∞ .

Finally, secondary data was used [36] regarding the innovativeness of German companies. This data is based on a large-scale survey among 3720 innovation experts from different industries, asking them to name companies they consider innovative and evaluate the aggregated list of companies in terms of their innovativeness. This was operationalized using specific attributes, such as the creation and popularity of innovative products, services, and processes as well as cultural and social innovations. A five-point Likert scale was generated, presenting a weighted value about the companies' overall innovation performance. This information was then matched with the data from 55 companies, which resulted in an overlapping data set of 40 companies (N).

2) Qualitative data

On the qualitative side, this study uses interview data collected through 12 interviews conducted with established German companies between 2018 and 2022. The interviewees were in different but all CE-related positions and from different companies in different industries. The semi-structured interview guide covered several topics, such as a characterization of the CE units, their emergence, key activities and interactions, as well as the (overarching) organization and coordination. From this a number of relevant statements about the effects of multiple CE units could be extracted.

B. Data Analysis

The data analysis conducted in the course of this study comprises different methods of analysis. First, the quantitative data was analyzed using several Spearman correlation analyses of the relevant variables: number of CE units, heterogeneity of CE forms, companies' innovativeness, and number of employees. Second, to control for the effects of other variables, we further conducted specific partial correlation analyses. Finally, we analyzed the qualitative data by screening the interview statements regarding effects associated with the number of CE units and/or their heterogeneity.

IV. RESULTS

A. Correlation Results

TABLE I. RESULTS OF THE CORRELATION ANALYSIS

Correlation Analysis (Spearman, 1-tailed significance)				
	(1)	(2)	(3)	(4)
(1) Number of CE Units	1			
(2) Heterogeneity	0.372** (0.003)	1		
(3) Employees	0.530** (<0.001)	0.193 (0.078)	1	
(4) Innovativeness	0.303* (0.029)	0.343* (0.015)	0.284* (0.038)	1
* correlation is significant at the 0.05 level, ** correlation is significant at the 0.01 level				

Having followed the mixed-method approach, we conducted a series of different analyses using both

quantitative and qualitative data. We were aware that our quantitative data sample was not particularly large, and thus, the results had to be construed with some care. However, we still produced relatively reliable results indicating tendencies and thus allowing for certain interpretations, which will be presented in the following. The additional qualitative analysis yielded insights that further supported some of the assumptions.

We began the analysis of our quantitative data by performing different correlation analyses of all of our variables (see TABLE I for an overview). To determine which type of correlation analysis was most appropriate, we initially obtained an impression of the data by creating different scatter plots. As the scatter plots showed non-linear relationships, we conducted Spearman analyses exploring the correlation between variables that are (partially) ordinaly scaled. In the following, we will present the most relevant results of the correlation analyses.

First, we analyzed the relationship between the number of employees and the number of implemented CE units. In this way, we wanted to check to what extent the often quickly-made assumption that larger companies also use more CE units is true. The results of the Spearman analysis yielded a correlation coefficient of $\rho = 0.530$ with a significance of <0.001 , thus confirming the assumption.

Second, we looked at a related and ongoing discussion about whether smaller or larger companies are more innovative. While startups are usually considered more innovative due to their agile and highly adaptive working approach, the argument for larger companies is that they not only have proven to be innovative and thus successful for quite some time, but that they have more resources to invest in innovation development and (as confirmed above) have more innovation units supporting the creation of innovations. To contribute to this discussion, we have examined the relationship between the number of employees and the innovativeness of companies, and the analysis shows a correlation of $\rho = 0.284$ and a significance of 0.038, showing that larger companies often demonstrate a higher innovation performance.

Third, we look to see if there is a correlation between organizations' number of implemented CE units and innovativeness. We conducted a Spearman analysis, which resulted in a moderately positive correlation of $\rho = 0.303$ with a (one-tailed) significance of 0.029.

Fourth, the relation between the heterogeneity of used CE forms and organizations' innovativeness was analyzed. The Spearman analysis resulted in a correlation coefficient $\rho = 0.343$ with a (one-tailed) significance of 0.015. This presents a slightly stronger, moderately positive correlation between the heterogeneity of CE units and companies' innovativeness than seen between organizations' number of implemented CE units and companies' innovativeness.

Last, we conducted a correlation analysis between the number of CE units and their heterogeneity (in our view the 'independent' variables) to check for their interaction. The Spearman analysis resulted in a correlation of $\rho = 0.372$ and (one-tailed) significance of 0.003, presenting a highly significant, positive correlation.

Because of this significant and fairly large correlation between those two (independent) variables, we also decided

to perform partial correlation analyses with the relationships most central to this study, being innovativeness.

B. Partial Correlation Results

We conducted partial correlation analyses to (again) examine the relationship between the key variables while taking into account and controlling for the influence of the respective other variables (see TABLE II for an overview).

TABLE II. RESULTS OF THE PARTIAL CORRELATION ANALYSIS

Partial Correlation Analysis (1-tailed significance)		
Number of CE Units & Innovativeness	Control variable: Heterogeneity	0.160 (0.166)
Heterogeneity & Innovativeness	Control variable: Number of CE Units	0.303* (0.030)
* correlation is significant at the 0.05 level		

The first analysis of the number of CE units and the innovativeness of companies, excluding the heterogeneity (of CE forms used), yields a correlation coefficient of 0.160 and a significance of 0.166. Thus, if we remove the influence of heterogeneity, the correlation between number of CE units and innovation performance becomes weaker and insignificant.

The picture was different when analyzing the heterogeneity and companies' innovativeness, excluding the influence of the number of CE units. The correlation yielded a coefficient of 0.303 with a significance of 0.030, which is quite similar to the results of the Spearman correlation analysis. This shows that if the influence of the number of CE units is removed, the correlation between heterogeneity of CE forms and companies' innovativeness stays significant.

C. Statements on the Effect of the Coordination of Multiple CE Units

Given the results of the quantitative analyses, we further sought to gain more insight into the relationships and potential effects between the use of multiple or heterogeneous CE units and the resulting innovativeness through a qualitative analysis of interviews. The analysis of the interviews with managers directly involved with the implementation and coordination of their respective company's CE units yielded a series of insightful statements on this topic.

First, we looked for statements about the general use of multiple CE units. In our numerous interviews with the various CE managers, we have consistently received confirmation that each CE unit has identified, developed, and ultimately deployed several innovative ideas. For example, respondents consistently reported different innovations created by their CE units, such as new (and often digital) products, services, and processes, or even entirely new business fields with novel business models. Thus, the parallel use of multiple CE units also increased the resulting number of innovative ideas; as one manager of a company with multiple CE units pointed out, *"the pool of ideas was very, very large and very broad. We had more of a problem prioritizing which of the many ideas we could actually pursue."* Another CE manager from a different company explained that at one time, *"each business unit had its own"* CE unit, and using the example of a single CE unit, said that it alone *"had evaluated 140 topics and there were five or six*

that stuck." As these statements indicate, companies with CE units can produce several potentially relevant innovations. While no differentiation is made here as to whether this is the result of homogeneous or heterogeneous CE units, we know that both statements come from CE managers from companies using different CE forms.

Second, we searched for statements regarding the use of heterogeneous CE forms. Several respondents provided statements about the positive effect of having different CE units' and further emphasized the benefits of complementary specialization of those units. Complementarity justifies the existence of the different individual units; as one respondent pointed out, *"There are [multiple] innovation units, and all of them have a raison d'être and add meaningful value by complementing each other."* A CE manager from another company explained that the need for having multiple approaches in the first place is to exploit different approaches: *"The reason why there are three units [...] is because they have totally different skills and requirements that these units simply need."* Highlighting the diversity that increases with more heterogeneous CE forms, he went on to explain that the people who work in these different CE units are *"extremely diverse, all of them. With very different personal skills and very different educational backgrounds. But overall, [they are] extremely complete. I think that's also a secret of success."* Beyond that, some of the respondents reported how synergistic effects can result from complementary, heterogeneous forms of multiple CE units: *"It's the organization and the mandate [of the CE units] that are pretty complementary, with the opportunity for synergies."* For example, a CE manager listed the reduction of duplication, and she explained why this is a common problem of large organizations as well as how they addressed this: *"The stupid thing is, in a corporation it's always the case that people are working at different ends and don't even know about each other and are actually working on the same things. [...] So in the beginning, when we were still quite new, there were simply regular sessions where we had an exchange with [the other CE units] [...] in order to avoid duplication of work."*

However, the heterogeneous and complementary (co-) specialization of CE units does not emerge on its own. Rather, it must be developed purposefully, even if this means that all units must be realigned, as one CE manager described: *"It was already clear to many [people within the organization] that [the design we had] was not a good setup. But in the meantime, we've fixed that. [...] We've set it up completely differently."* It seems to be the rule rather than the exception that CE units are rarely strategically aligned from the outset, as one board member confirmed: *"The start [of the CE units] was random [and they] were not strategically aligned. And we're in the middle of a strategy process right now and aim for a strategic alignment, and we have specifically revised these approaches. Now they fit into an overall strategy."* Another respondent underlined how difficult it can be to bring together the different approaches of the CE units and emphasized that this requires adequate coordination: *"You got the feeling that they weren't heading in the same direction. And then they kept saying: 'Yes, we should coordinate. This should somehow fit together. And maybe we should also collaborate more.' [...] We actually wrestled a lot with [the other CE units]. [The question was] how do we bring the different activities together."* Finally, one respondent provided a compelling and synthesized description of why and how she and her colleagues ensure coordination between their CE

units: “We talk to each other a lot. It's a process that's constantly in flux. And that is a good thing. That means we're always open to adjusting things and simply looking: What do we have to change to make it good? So it's just completely clear to us that we're still too young for that. We haven't been around that long, so we have to keep checking: Does the process fit, and does the [interplay between the CE units] fit? And actually, every half a year, we adjust the process a little bit because we realize that we are always overtaking ourselves in many areas. [...] We learn, and then we adapt.”

V. DISCUSSION

The results highlight the increasing relevance of the purposeful, parallel implementation of multiple CE units. Initially it seemed that the number of CE units implemented by established companies has a positive effect on the innovativeness. However, further analyses have shown that the use of multiple CE units actually is only significant regarding innovativeness, if the CE units have heterogeneous CE forms. Thus, it can be concluded that the number of CE units has a positive effect, but only if those CE units simultaneously present a high degree of heterogeneity. This suggests that heterogeneity per se may not be sufficient, but that innovativeness requires coordination between CE units to make them heterogeneous and fulfil complementary roles.

We explain this effect by the following chain of effects (see also TABLE III): First, a higher heterogeneity of CE forms goes hand in hand with more diverse and complementary CE activities. On the one hand, this reduces the likeliness of double work. In addition, the more distributed the activities over the innovation lifecycle, the greater the chance that there will be a suitable CE unit to support the innovation projects at each stage. On the other hand, more heterogeneous activities also involve more diverse and, at the same time, more complementary people with corresponding knowledge. As diverse and complementary knowledge can be integrated and further developed, this can ultimately lead to more, different, and far-reaching innovations.

In conclusion, a purposeful coordinated differentiation or (co-)specialization of CE units and the simultaneous dynamic integration of their activities and the resulting knowledge thus potentially leads to higher innovativeness. Such coordination of organizational resources toward innovation creation has been explained with the Asset Orchestration (AO) framework [37]. AO is a two-step coordination process that first identifies, combines, and interdependently specializes strategic resources, and then dynamically coordinates and integrates these co-specialized resources so that they are always in value-creating alignment [37]. The AO framework therefore explains why heterogeneous (i.e., co-specialized) CE units can lead to higher innovativeness. It also shows that in order to achieve a heterogeneous specialization and a dynamic integration, suitable coordination is needed. Coordination enables CE units to generate complementary knowledge, which they can then collaboratively integrate and develop into innovations. In contrast, heterogeneous CE units would most likely not lead to much higher innovation performance if there is heterogeneity without further value-creating interplay between the CE units. Thus, coordination must further ensure synergistic exchange and collaboration between the heterogeneous CE units to specify the interfaces and interactions as well as to achieve strategic alignment.

TABLE III. COMPARISON OF THE EFFECTS OF MULTIPLE VS. MULTIPLE, HETEROGENEOUS CE UNITS

	Multiple CE Units	Multiple, heterogeneous CE Units
<i>Characteristics</i>		
CE activities	More	More, diverse, (complementary)
People/employees in CE	More	More, diverse, (complementary)
Knowledge	More	More, diverse, (complementary)
Innovations	More	More, diverse, (complementary)
<i>Potential benefits</i>		
Reduction of double work	No	Yes
Learning from each other	Yes	(No)
Developing knowledge on top of each other	No	Yes
End-to-end innovation support	No	Yes
<i>Resulting effects</i>		
Innovation	More	Even more, different, far-reaching

Drawing on the findings and their discussion, this study offers different implications for literature and practice, which will be presented in the following sections.

A. Scientific Implications

By examining the hitherto underexplored field of the parallel and coordinated implementation of multiple CE units, this study allows us to derive scientific implications. First and most general, our analyses confirmed the effectiveness of CE units in pursuing innovations, which is in line with several studies [6–8]. Second, we enhance the discussion by highlighting that while a higher number of parallel CE units can positively affect a company's innovativeness, the correlation is rather low and not consistently significant throughout our analyses. However, we found that companies with more heterogeneous forms of CE units present a positive and significant effect on innovativeness that stays stable across different analyses. We reason that heterogeneously specialized CE units show more diverse activities, people, and knowledge. If purposefully coordinated toward complementarity and co-specialization, the heterogeneous CE units can further develop their knowledge collaboratively, enabling them to create more, different, and far-reaching innovations. While some researchers have hypothesized such effects [13, 16, 38, 39], their validation has been lacking. We add to this by reasoning the effect and providing the corresponding quantitative analysis.

In the same vein, we contribute to the discussion about the overarching and strategic management of CE in the sense of the CE strategy literature [40–42]. Accordingly, companies may achieve higher innovativeness through overarching management of all CE activities within their organization. Some researchers further highlighted the relevance of CE units' coordination [16, 17, 40] as well as the synergies that may be realized by this [13, 39]. Based on this study's results, we suggest that companies profit from a purposeful coordination of their CE units to realize a heterogeneous (and thus potentially more diverse) as well as complementary and co-specialized set.

B. Managerial Implications

For practice, the study offers confirmation that multiple CE units hold the potential to benefit organizations'

performance in terms of creating innovations – if used the right way. Our results show that the mere use of multiple similar CE units does not contribute significantly to a company's overall innovativeness. Companies can learn, for example, that merely replicating a CE form for use in different locations is less advisable in general.

Instead, our results suggest that in order to become more innovative, companies should ensure that their CE units differ in form. We argue that greater heterogeneity of forms leads to more diverse knowledge, which can lead not only to more but also to different and far-reaching innovations. Furthermore, heterogeneity holds the potential for more complementary activities and knowledge, which can complement and build upon each other. Regarding the support from CE units, having complementary forms further holds the potential for ideas to receive appropriate support at all stages of innovation development. Consequently, managers should be aware of the co-specialization and heterogeneity of CE units already during planning. If the CE units are already implemented, they should use purposeful coordination to co-specialize them and promote value-creating interaction between them.

Additionally, the study provides managers with first-hand insights into the management and coordination of other companies. The respondents' statements show that companies have to learn how to combine and coordinate CE units purposefully. This is the result of a process in which many different parties must commit to and implement the necessary adjustments in the approaches of the CE units, which may seem very difficult at times. Thus, no matter how challenging the task may seem, CE managers should be encouraged to regularly promote inter-unit coordination to eventually reap some benefits from multiple co-specialized and harmoniously collaborating CE units.

VI. CONCLUSION

A. Concluding Remarks

This study highlights the increasing relevance of the purposeful, parallel implementation of multiple CE units. It indicates that established companies do not only achieve higher innovativeness when using multiple CE units but that this effect is even stronger when they implement heterogeneous CE forms. Statements from CE practitioners could further confirm those effects.

Of particular interest is that innovation performance improves more when companies use more heterogeneous forms of CE than when they simply increase the number of CE units. Our rationale is that higher diversity and complementarity that potentially result from heterogeneity create a more suitable environment for creating innovation (e.g., more diverse knowledge, less duplication of work, knowledge built on top of each other, ...). From a theoretical point of view, the AO framework with its concept of co-specialization offers an explanation, stating that co-specialized assets, if purposefully coordinated (i.e., dynamic, proactive orchestration), can realize a “value-creating co-alignment” [37] and, eventually, give rise to innovations.

Thus, this examination contributes to the unexplored phenomenon of implementing and coordinating multiple CE units with implications for literature and practice. At the same time, the study highlights the need to further consider a wide variety of aspects of this increasingly relevant phenomenon.

B. Limitations

We are very much aware that our study is subject to limited validity and, thus, limited generalizability due to the data we had available. The data used for the quantitative analyses was far from ideal for a valid study. For example, the sample size was rather small and the variables did not show a linear relationship, some data was ordinally scaled, and the independent variables yielded a rather strong correlation. Through a variety of analyses and tests, we have therefore worked out piece by piece which statements we can make with the greatest possible certainty. Furthermore, the accuracy and reliability of some measures, such as the innovativeness of companies, are debatable. The innovativeness of companies is by nature a multidimensional and very complex parameter, which was created here on the basis of a large number but still subjective assessments by (external) industry experts.

C. Future Research

Finally, we would like to outline interesting directions for future research that resulted from this study. First, building on the limitations, we suggest validating our results by performing the analyses again using more adequate data. Therefore, researchers could collect data from more companies with multiple CE units, for example, by conducting a large-scale survey. Additionally, the data should be enhanced with more (independent) variables that examine the relevant correlations while showing less correlation among each other as well as a more linear relationship with (the dependent variable) companies' innovativeness.

Second, this study investigated the correlations between the parallel use and the heterogeneity (of used CE forms) of multiple CE units and companies' innovativeness. While the qualitative statements further tried to provide some evidence about the causal relationship between these factors, they do not yet provide a satisfactory conclusion. Thus, future studies should investigate these causations and relevant moderators to provide further insights for the targeted implementation and coordination of CE units.

Finally, it may be worth examining how the coordination of multiple CE units may affect innovativeness. Therefore, more coordination-related factors, such as the means and mechanisms of coordination, could be applied (Heinzelmann et al., forthcoming). This would allow testing of whether the effect of heterogeneous CE units on innovation performance is particularly strong in the case of deliberate coordination.

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