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The role of clusters, firm size, and firm relatedness in post-M&A integration: Norwegian high-technology acquisitions

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Abstract

Based on 92 acquisitions in the Norwegian high-technology industry, this study analyzes the degree to which these targets were integrated into the acquiring firm. By connecting post-acquisition integration theory with business cluster research, we suggest that relative firm size, firm relatedness, and target firm's cluster affiliation affect the degree of integration of acquired targets. In addition, the findings indicate that there is a moderating effect of cluster affiliation on the size-integration relationship. We contribute with theoretical advancement, as well as with a new methodological approach and relevant managerial implications that serve as better support in post-acquisition integration decision making. Ordinal logistic regression was used to analyze the Norwegian sample over a period from 2006 to 2015 with a minimum deal value of 10 million Euro.

Keywords

M&A; mergers and acquisitions (M&As); clusters; agglomeration; post-acquisition integration; post-merger integration; strategic management; acquiring firms; corporate acquisitions; organizational change; integration; similarity; complementarity; autonomy; ordinal logistic regression

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Abbreviations

DV – dependent variable

GCE – Global Centres of Expertise

HQ – headquarters

IV – independent variable

M&A – mergers and acquisitions

NCE – Norwegian Centres of Expertise

OLR – ordinal logistic regression

OLS – ordinary least squares

OR – odds ratio

PO – proportional odds

POM – proportional odds model

R&D – research and development

SDC – Securities Data Company

SIC – standard industry classification

SPV – special purpose vehicle

VIF – variance inflation factor

1. Introduction

Over the last two decades we have seen many Norwegian high technology firms being absorbed through acquisitions. A lot of these deals have been driven by valuable resources, similar to the general consensus in academic literature which identifies this as the main motive for mergers and acquisitions (M&A) (Ahuja & Katila, 2001; Chaudhuri & Tabrizi, 1999). Today, technology acquisitions have been found to be the dominant force of acquisition activity both worldwide and in Norway (Deloitte, 2018; Haavind, 2019).

Norway can be seen as a developing technology hub with a high number of full-time personnel in research and development who are exposed to training, promising career opportunities and a well-developed research environment (MarketLine, 2018). Often overlooked for Sweden with its big retail tech players like Skype, Spotify, and Klarna, Norway has a track record in B2B exits to big enterprises such as Microsoft (FAST), Bayer (Algeta), Texas Instruments (Chipcon) and Cisco (Tandberg). What also makes Norwegian companies attractive is the innovative ecosystem and clusters they are operating in. Reve and Sasson (2015) give several reasons for why Norway is successful with its business cluster approach. According to them, knowledge and competence development, and establishment of deliberate cluster policies for the main international industries (e.g. NODE, Blue Maritime) are key success factors.

Sometimes the outcome, however, is that some of the acquired high technology targets cease to exist as a result of a high degree of post-acquisition integration. In other words, after the parent firm integrates sociocultural, marketing, production and system aspects each to some degree, the acquired firm is no longer an autonomous standalone entity (Bauer & Matzler, 2014; Haspeslagh & Jemison, 1991; Puranam, Singh, & Zollo, 2006). For instance, a high degree of integration has been implemented by big players such as German Bayer AG, when it acquired Algeta, where the target was simply “absorbed”, most of its assets and human capital were integrated into the conglomerate, and nothing much apart from some administrative duties were left here in Norway.

This thesis builds on a sample of 92 acquired high-technology firms in Norway and analyzes what happens to them after the acquisitions have taken place. We aim to find whether relative firm size, firm relatedness, and cluster affiliation of the target have any effect on the degree of post-acquisition integration of the

acquired firm. Then we proceed by exploring whether acquired firm cluster affiliation has any moderating effects on these relationships. By examining how cluster affiliation moderates the degree of integration of acquired Norwegian technology firms, we attempt to find whether clusters can serve as mechanisms to retain potential scale-up stories in Norway, and thus valuable talent and knowledge.

Based on all the above-mentioned observations, our research question is as follows: *How do relative firm size, firm relatedness and acquired firm's affiliation to a cluster influence the degree of post-acquisition integration of the acquired firm?*

The very interesting part here will be how the cluster membership of the acquired Norwegian technology firm will contribute to our findings. As the cluster needs firms to operate effectively, the reciprocal relationship is also crucial. Firms equally depend on the cluster because of knowledge spillovers (Van Geenhuizen & Reyes-Gonzalez, 2007) and cooperation benefits (Porter, 1990). Norway has been starting to strengthen its business cluster policy with a national cluster program since the early 2000s. Meanwhile, the country possesses more than 35 different industry clusters on three levels (Arena, NCE, GCE). We therefore find it both compelling and beneficial to examine how clusters affect high-technology M&A outcomes. A better understanding of this relationship can generate novel managerial insights for executives engaged in high-tech M&A as well as for policymakers overseeing national level cluster schemes. Additionally, we establish potential avenues for advancements in both M&A and cluster research theories and make an attempt to connect them.

2. Literature Review

This comprehensive review of literature is divided into four sections. First, the concept of post-acquisition integration is defined and examined in the context of technology acquisitions. The following two sections review the link between structural integration and its two potential predictors - relative firm size and firm relatedness. The last section investigates well-established literature on cluster theory and reviews the two discussed predictors of integration, relative firm size and firm relatedness from the cluster theory perspective. We derive five hypotheses throughout the review.

2.1 Post-acquisition Integration in High-Technology Acquisitions

Obtaining valuable technology and capabilities through M&A has been a strong competitive force among acquirers. In the presence of accelerated technological change, many firms seek to rejuvenate and readjust their capabilities through external growth strategies instead of undergoing the uncertain and time-consuming process of organic growth (Capron & Mitchell, 2009; Dierickx & Cool, 1989; Knott & Posen, 2009; Steensma & Fairbank, 1999). This external growth approach has been especially observed through a dramatic increase of acquisition activity in high-technology sectors such as electronics, telecommunications, biotechnology, information services and software (Sikora, 2000). For instance, a strategy often adopted in these cases is the acquisition of small technology-based targets by large established firms (Granstrand & Sjölander, 1990). One of the main triggers of M&A waves at the end of the twentieth century was in fact technological innovation (Mulherin & Boone, 2000). During the second decade of the twenty first century, technology has become even more decisive in driving acquisition activity. More recently, technology has been considered as a force behind what looks like the seventh acquisition wave, and the size of the deals and the number of transactions are expected to increase (Deloitte, 2018; Ernst & Young, 2015; Kengelbach et al., 2017), making it highly relevant to study high-technology acquisitions.

Although often overlooked by strategists, one of the most critical phases in technology acquisitions is the post-acquisition integration phase (Angwin & Meadows, 2015; Haspeslagh & Jemison, 1991; Stahl & Voigt, 2008). Literature examining the effects of different post-acquisition integration approaches on high-

tech M&A outcomes is relatively divergent. Some scholars argue that a high degree of integration can result in the destruction of the innovative capacity of the acquired firm, which was the main motive of the deal in the first place (Birkinshaw, Bresman, & Håkanson, 2000; Chaudhuri & Tabrizi, 1999; Graebner, 2004; Puranam, Singh, & Zollo, 2003; Ranft & Lord, 2002). In these cases, the suggested integration approach is a higher level of target autonomy. Other empirical evidence suggests that at least some level of integration is necessary for technology M&As to be successful (Bauer & Matzler, 2014; Chatterjee, Lubatkin, Schweiger, & Weber, 1992; King, Dalton, Daily, & Covin, 2004; Singh & Montgomery, 1987; Zollo & Singh, 2004). Discussions arising from this stream of literature predominantly argue for the potential benefits of coordination. Therefore, the phase following the execution of a technology acquisition presents a dilemma to the parent organization.

Studies in the post-acquisition integration literature vary in their definitions and typologies of the concept of integration. For instance, Pablo (1994, p. 806) defines integration as "the making of changes in the functional activity arrangements, organizational structures and systems, and cultures of combining organizations to facilitate their consolidation into a functioning whole". Similarly, Cording, Christmann, and King (2008, p. 744) define integration as "the managerial actions taken to combine two previously separate firms". In their thorough theoretical review, Graebner, Heimeriks, Huy, and Vaara (2017, p. 2) created their own explanation and defined the concept as "the multifaceted, dynamic process through which the acquirer and acquired firm or their components are combined to form a new organization".

While the existing explanations of the concept of integration are relatively congruent, we find more complexity in the classification of distinct post-acquisition integration approaches. As Graebner et al. (2017) point out, most studies identify two distinct dimensions of integration - "target autonomy" and "structural integration". This view, for instance, is employed by Zaheer, Castañer, and Souder (2013), Puranam, Singh, and Chaudhuri (2009) and Paruchuri, Nerkar, and Hambrick (2006). Cording et al. (2008), however, treats integration as a sole construct that can take different levels of depth. Haspeslagh and Jemison (1991), on the other hand, classify integration approaches into three distinct groups: "absorption", "preservation" and "symbiosis", which mean a high degree of integration, target autonomy or a combination of both, respectively.

2.1.1 Structural integration vs. target autonomy

Following the predominant view in post-acquisition integration literature, we treat integration as two-dimensional and examine two ends of its continuum - structural integration and target autonomy. Zaheer et al. (2013, p. 605), define structural integration as "the extent to which the acquirer consolidates the functional activities of the target into its reporting hierarchy". Essentially, structural integration is a formal organizational design intervention that achieves coordination by combining formerly separate organizational units into the same unit after an acquisition (Puranam et al., 2009). In other words, it is the highest level of post-acquisition integration that can be enforced on a target company. This usually results in a new, larger unit. These types of newly created organizational units imply the existence of common work practices and goals, shared authority and common procedures (March & Simon, 1958; Thompson, 1967).

Puranam et al. (2009) also mention collocation of the target and the acquiring firm as an important aspect of structural integration, similarly to Heimeriks, Schijven, and Gates (2012) who emphasize physical consolidation of functions and activities as an important property of the approach. Another feature of a structurally integrated target is that it ceases to exist as a stand-alone business unit (Puranam et al., 2006). As a result, the acquiree is subject to considerable changes on different organizational levels. These changes can occur on sociocultural, marketing, production and system integration levels (Bauer & Matzler, 2014), which makes it debatable whether full integration can be achieved at the same time on every organizational level (Birkinshaw et al., 2000). The desired goal of structural integration can be referred to as the "coordination effect" since the main purpose of it is enhancing coordination between the acquirer and the target (Puranam et al., 2009).

In contrast, the opposite of structural integration is autonomy, sometimes referred to as "structural separation" (Puranam et al., 2009). It is an organizational state that occurs when the activities of the acquired and acquiring firms remain organizationally distinct regardless of common ownership (Datta & Grant, 1990). Zaheer et al. (2013, p. 605) define target autonomy as "the extent to which the acquirer delegates or defers to the expertise of target managers over decision-making within target functional activities". In other words, target autonomy is the

other end of the post-acquisition integration continuum and occurs when the target continues its existence as a separate entity.

Structural integration and target autonomy also differ from a learning viewpoint. Puranam and Srikanth (2007) discuss trade-offs between the exploration of new opportunities and the exploitation of existing certainties based on organizational learning theory (March, 1991). Acquirers can completely absorb their targets' innovation flows and exploit their inventive efforts by integrating complementary assets and processes into the parent organization. From the perspective of the acquired firm, this type of knowledge leverage may be seen as exploitation of the target's knowledge base. On the contrary, acquirers can aim to leverage the capabilities of their targets and enable exploration of new opportunities through ongoing innovation. Hence Puranam and Srikanth (2007) link post-acquisition integration strategies to distinct modes of learning, namely exploitation (knowledge leverage) and exploration (capability leverage).

2.1.2 Target autonomy approach

The decision to integrate a target versus leaving it autonomous bears certain tradeoffs. By structurally integrating an acquired firm, the parent organization must consider the potential disruptions caused in the combined entity after the organizational properties of the target have been altered.

Evidence shows that in certain cases structural integration can permanently damage post-M&A innovation output, and one such case is when target firms have not had product launches prior to the acquisition. Innovation outcomes, however, will improve if acquired targets have previous experience in launching products (Puranam et al., 2006). As for the timing, Puranam et al. (2006) find that integration of the acquired firm has a negative effect on innovation in the short term. Moreover, structurally integrating a target negatively affects patenting activity of acquired inventors whose status changed after the acquisition (Kapoor & Lim, 2007; Paruchuri et al., 2006). Productivity drops were even stronger for inventors who had higher difference in expertise from the acquiring firm's inventors and for those having stronger social embeddedness.

Another factor influencing the choice of an integration approach is the interdependence between the two firms in the acquisition. Acquisitions involving standalone products require less coordination than component technology deals because the interdependence between product teams of the target and the acquirer

is lower in the former (Galbraith, 1974; March & Simon, 1958). In these instances, gains from coordination are insignificant while the loss of autonomy looms serious disruptions, which at the end can diminish the total net gains from structural integration (Puranam et al., 2009). Nevertheless, there is an exception in component technology acquisitions with high interdependence. Even though the expected approach is structural integration, as mentioned above, the need for it dramatically decreases if a certain level of common ground between the two firms exists. Here, common ground is defined as knowledge that is both shared and known to be shared (Clark, 1996). This mutual understanding lets interdependent actors adjust to each other easier without the need of high degree of integration (Becker & Murphy, 1992; Chwe, 2013; Puranam et al., 2009).

Through the lens of agency theory, structural integration can weaken the link between reward and effort, especially in acquisitions of smaller, entrepreneurial targets. This occurs because unit integration increases the number of agents whose conduct influences the performance of units (Paruchuri et al., 2006; Puranam et al., 2006). These high-tech targets employ talented staff with tacit skills and knowledge, who are offered high-powered incentives. After the integration has taken place, these incentives tend to disappear (Zenger, 1994). In fact, there is a possibility of lower productivity and motivation of a target firm's R&D employees due to their disrupted autonomous existence (Puranam et al., 2006). As a result, the innovative capacity of the acquired target is in jeopardy (Ernst & Vitt, 2000). Therefore, a lower degree of integration can be a more favorable approach in the acquisitions of smaller, R&D-intensive entrepreneurial firms.

2.1.3 Structural integration approach

Although structural integration undoubtedly poses risks of value destruction in the post-acquisition phase, in certain cases it can provide powerful coordination benefits that can increase acquisition success.

Angwin and Meadows (2015) refer to Haspeslagh and Jemison (1991) work and outline how strategically interdependent merging firms can produce value. One approach is through *value capture*, where through a one-time transaction value is simply shifted from the target to the acquirer. The other is *value creation*, which requires a long-term approach of capability transfer. This transfer of certain capabilities creates unique value that could not exist if the firms functioned autonomously. Since these capabilities are immobile (Barney, 1991) and difficult

to exchange on the market (Capron, 1999; Dierickx & Cool, 1989), the greatest value can be achieved through close cooperation. From the knowledge-based view of the firm, we would refer to this capability transfer as transfer of tacit knowledge. This knowledge tends to be immobile and deeply ingrained within an organization. Transfer is thus best achieved via application of special coordination mechanisms such as integration of common rules, routines and directives (Grant, 1996). Therefore, a certain degree of post-acquisition integration will be necessary in long-term value creating M&As due to the complexities of capability and knowledge integration.

As mentioned earlier, structural integration of a target is favorable in complementary technology acquisitions due to a high level of interdependence (Puranam et al., 2009). Many authors support this and find that harmonization of systems and resource rationalization may be needed to effectively manage acquisitions of highly interdependent components, often accomplished through a high degree of integration (Bauer & Matzler, 2014; Capron, 1999; Datta, 1991; Haspeslagh & Jemison, 1991; Homburg & Bucerius, 2005; Shrivastava, 1986). This occurs because the more interdependent the companies are, the higher the need for coordination. Therefore, coordination gains exceed the costs from the loss of autonomy (Thompson, 1967).

Formal procedures and systems, however, are not the only elements impacted by a high degree of integration. It also forms the development of informal organizational mechanisms that support knowledge transfer. Such mechanisms include informal communication channels and the formation of common ground and group identity (Camerer & Knez, 1996; Ibarra, 1993; Kogut & Zander, 1996; Krackhardt, 1990; Moran & Ghoshal, 1996). By keeping the acquired unit autonomous, it would become very difficult or even impossible to achieve such a rich level of communication.

To sum up, the previous two sections have outlined arguments that support both ends of the integration continuum. A lower degree of integration can help preserving innovation output and employee motivation and can be especially suitable for acquisitions involving firms with low interdependence. A high degree of integration, on the other hand, is more applicable in complementary technology acquisitions and when the acquirer pursues a value creation acquisition strategy, in which it is crucial to transfer capabilities from the target. It can also facilitate better communication between the firms and improve exploitation capabilities.

2.2 Relative Firm Size and Integration

In this chapter we review the existing body of literature on how one of our hypothesized post-acquisition integration predictors, relative firm size, affects the integration approaches pursued by acquirers.

Prior research on the effects of firm size on post-M&A firm performance remains inconclusive; however, a substantial body of literature agrees that firm size can have an important role in determining acquisition integration and performance (e.g. Cording et al., 2008; Ellis, Reus, Lamont, & Ranft, 2011; Kim & Finkelstein, 2009; Shrivastava, 1986). While some scholars do not find any significant effects of firm size on acquisition performance (Fowler & Schmidt, 1989; Newbould, Stray, & Wilson, 1976), others disagree. Irrespective of its size, any acquisition will naturally bear a certain cost, but size differences can matter when deciding on the type of integration approach in the post-M&A integration phase (Ellis et al., 2011; Haspeslagh & Jemison, 1991; Shrivastava, 1986). More specifically, Shrivastava (1986) argues that larger targets need more integration due to the higher number of functions and units requiring coordination. These targets, however, are also much harder to integrate. Since their subunits are generally more diverse, there is even a bigger need to achieve coordination benefits. Hence, integrating larger targets can result in more diverse and intensive integration problems. This is supported by Alvarez and Barney (2001), who suggest that smaller firms are easier to integrate.

When attempting to capture the size effects on post-acquisition outcomes, it is common to explore both the absolute and relative sizes of acquirers and targets (Haspeslagh & Jemison, 1991); however, relative size measure is used more often. It provides a more contextual understanding of the deal by better capturing the amount of resources that the acquirer would potentially need in order to integrate the target. There are several ways in which studies attempt to capture relative size effects, such as percentage based on total assets (Datta, 1991; Zollo & Reuer, 2010), number of employees (Barkema & Schijven, 2008; Larsson & Lubatkin, 2001) or a market capitalization ratio between the target and the acquirer (King, Slotegraaf, & Kesner, 2008).

Evidence shows that excessively small or excessively large size differences between the target and the acquirer can have negative effects on post-M&A performance (Kusewitt Jr, 1985). In a more recent paper, Cording et al. (2008) point out that a higher size of a target relative to its acquirer can in fact increase the

complexity of post-acquisition integration, harming the acquiring firm's long-term performance. They argue that the difficulty of relatively larger acquisitions can diminish the long-term stock returns and intermediate goal achievement of the acquirer. Similarly, Cloodt, Hagedoorn, and Van Kranenburg (2006) argue that the integration of a relatively large knowledge base demands additional resources for integration activities, thus exposing the post-M&A integration stages to more complexity, reduced speed and higher risk. This complexity may outweigh the potential value creation of integrating a relatively large target to a high degree.

On the contrary, comparatively small acquisitions are easier to integrate (Zollo & Reuer, 2010). In fact, deals with the initial intention to structurally integrate the acquired targets (or as the authors call it, "redesign mergers") usually involve smaller targets (Cartwright & Cooper, 1993). These targets are expected to completely adapt their practices, procedures and culture. Larsson and Finkelstein (1999) challenged this view and hypothesized that greater relative size of target to bidder will result in greater organizational integration. Their hypothesis, however, was not confirmed, thus not providing any ground to oppose the above discussion.

Lastly, Weber (1996) claims that the size of the acquired firm relative to its buyer may have a negative impact on the attitudes, turnover rates and motivation of acquired managers. In a relatively small firm, they might feel trivialized or overlooked by large acquirers. This can occur in cases when the relatively larger parent organization does not make an effort to define clear roles of the newly acquired target and treats it as an incremental addition to the organization. In certain cases, a higher degree of integration could mitigate these negative effects, especially through a focus on the integration of acquired managers. Acquired managers play in fact an important role in the creation of both serendipitous and expected value in technology acquisitions (Graebner, 2004). This value creation is facilitated through a specific set of actions. Graebner (2004) proposes that more value will be created if acquired leaders accelerate coordination across the two companies, if they are given cross-organizational responsibilities, and if the acquired engineers share responsibilities with acquiring firm engineers - all of which are in clear support for a higher degree of integration.

Based on the evidence presented, we predict that in cases when the acquired firm is relatively small compared to its acquirer, post-acquisition integration is likely to be simpler and more beneficial, thus, increasing the likelihood that the

target will be integrated to a higher degree. This leads us to the development of our first hypothesis as follows:

Hypothesis 1a (H1a): *Relative firm size is negatively related to a high degree of integration of the target firm.*

2.3 Firm Relatedness and Integration

Especially the target firm's technological knowledge and the degree of relatedness between acquiring and acquired firm have been identified by the literature as a crucial predictor of post M&A innovation performance (Cassiman, Colombo, Garrone, & Veugelers, 2005; Cloodt et al., 2006). From a learning perspective, the reason being the absorptive capacity - i.e. the more similar the two firms' technological knowledge, the more quickly the acquired firm's knowledge can be assimilated and commercially exploited (Cohen & Levinthal, 1990). In particular, when the operations of the two firms are similar, the acquiring firm can improve operational efficiencies by removing redundancies in the post-acquisition period (Capron, 1999; Pablo, 1994).

Therefore, related acquisitions are suitable to take advantage from a higher degree of integration and unification of operations, and thus lower levels of autonomy can be expected (Datta & Grant, 1990). The authors hypothesize that a greater degree of autonomy will be provided to the acquired firm in unrelated (e.g. private equity firms) than in related acquisitions (e.g. industrial buyers). A high level of interdependence between the acquiring and acquired firms, resulting from acquisition in related product-market domains, increases the required level of control and coordination (Aghasi, Colombo, & Rossi-Lamastra, 2017). A higher degree of integration can generate a compelling coordination effect between acquirer and acquired firms. This is especially valuable in the presence of interdependence between them (Thompson, 1967). On the other hand, unrelated acquisitions are likely to be granted much more autonomy due to the lack of synergies in operations and integration opportunities (Cassiman et al., 2005; Datta & Grant, 1990). Another reason for this could be the low levels of familiarity of the acquiring firm's management over the acquired firm's operations. In such cases, it would make sense to grant more autonomy to the acquired firm (Datta & Grant, 1990).

Similar suggestions have been brought forward by Dundas and Richardson (1982), who say that the unrelated acquired unit should be kept independent because the corporate office (e.g. a private equity firm) "has no technological skills, and operating divisions are focused on specific industries and market segments" (Dundas & Richardson, 1982, p. 294). However, a high level of common ground between the acquiring and acquired firm (e.g. prior alliance) provides acquiring firms with a low-cost coordination mechanism and thus lower transaction costs (Puranam et al., 2009). Therefore, this would weaken the benefits of a higher level of integration and further promote more autonomy for the acquired unit (Aghasi et al., 2017).

Agency theory would predict that an important benefit of a higher degree of integration is that it enhances cooperation between the acquired and acquiring organization by aligning interests toward the goals of the integrated unit (Eisenhardt, 1989). The acquirer, due to its relatedness, is more able to curb opportunism because it can assess the acquired unit more readily. This would be the case even though the risk of free riding by the employees of the acquired firm would be stronger (Puranam et al., 2009). Therefore, managers weigh task interdependence (i.e. firm relatedness) significantly in their integration decisions, as they view post acquisition integration as the means by which to achieve coordination and control between acquirer and target firms (Pablo, 1994).

Finally, the literature has sought to use a transaction cost perspective (Williamson, 1989) to understand more profoundly the forms and effectiveness of interorganizational strategies such as acquisitions. However, TCE can also predict what kind of organizational structure will be most appropriate after related acquisitions. Especially after acquiring high-tech firms, asset specificity may be moderate to low due to relatedness between the parties. The frequency of exchange between the parties after acquisition, however, may increase sharply because of innovation desire with the newly acquired firm. In such cases, it may be wise to integrate the acquired unit in order to lower transaction costs as well as increase the ease of doing business with the acquired target (Williamson, 1989). Therefore, we assume the following in the second hypothesis, as follows:

Hypothesis 2a (H2a): *Acquiring firm relatedness is positively related to a high degree of integration of the target firm.*

2.4 Cluster Theory

Over the last two decades, global competition between companies and higher customer expectations have tremendously increased. Among other factors, trade liberalization as well as companies' internationalization strategies have pushed the boundaries of global leadership and competitiveness even further. In the meantime, governmental interactions on the macro level try to enhance national and international competitiveness in certain economic pockets (e.g. oil and gas industry in the South of Norway). An abundance of literature reveals that the cluster concept has been shown to be an efficient instrument for strengthening regional and national economies by attracting and supporting the best quality domestic and overseas firms (e.g. Amin & Thrift, 1995; Malecki, 1997; Porter, 2000).

There are several definitions for this concept. The Norwegian Innovation Clusters in Norway defines it as follows:

> A cluster is a geographical concentration of enterprises and related knowledge communities linked by complementarity or a similarity of interests and needs. The enterprises can gain easier access to important production factors and ideas for and impulses to innovation through interaction and cooperation. A cluster emerges over time, on the basis of location advantages and natural development dynamics. (Norwegian Innovation Clusters, 2019, para. 4)

Moreover, Norwegian Innovation Clusters (2019) outline that:

> A cluster is generally defined and delimited on the basis of the participants' affiliation to:
>
> - The same value chain or the same knowledge/technology base
> - A geographical concentration of businesses and related functions
> - A grouping of enterprises and related knowledge communities that have a critical mass that can form the basis

for triggering cooperation and dynamic relations between the participants

- A common understanding of the cluster's importance and vision for further development. (Norwegian Innovation Clusters, 2019, para. 7)

More prestigious in this stream of research is Michael E Porter. According to Porter (1990), national clusters are formed by firms and industries linked through vertical (buyer/supplier) and/or horizontal (common customers, technology, etc.) relationships with the main players located in a single nation/state.

A couple of years later, Porter (1998) expanded this definition by including institutions such as universities that would deliver and research the knowledge necessary to drive innovation within the cluster. Universities help to shape cluster firms and the cluster itself with knowledge creation, higher education and provide policy makers with updated know-how (Lu, Reve, Huang, Jian, & Chen, 2018). For instance, universities increase co-located firms' patents (W.-H. Liu, 2013), support business relations (Bramwell, Nelles, & Wolfe, 2008), rejuvenate technology and facilitate innovation (Viljamaa, 2007), and create local knowledge spillovers (Kantor & Whalley, 2014).

Geographical proximity has been seen as an inevitable condition in order to facilitate the circulation of knowledge and the development of institutions, which in turn may enhance cluster effectiveness. According to Porter's (1998) arguments, regional agglomeration can encourage an enhanced division of labour among firms. Moreover, due to close physical proximity among numerous competing companies within the cluster, innovation is encouraged.

Not all authors, however, restrict the cluster concept to geographical boundaries. In a widely recognized paper on cluster theory Bathelt, Malmberg, and Maskell (2004) suggest that clusters are not restricted to a distinct regional scale. Actors located outside of the cluster region can still take part of it through spaces of shared meaning and identity (e.g. cluster organizations), various institutional arrangements, and shared values and interpretative schemes. Hence, although important, geographical proximity is not a mandatory requirement for a firm to realize benefits from being part of an industrial cluster.

Innovation output can be seen as one of the most important measures for cluster energy, and thus it is crucial for the member firms to support the entrepreneurial and start-up scene in clusters with venture capital, business education and incubators (Rosenfeld, 1997). In well-functioning clusters, firms experience pressure to innovate. Reve and Jakobsen (2001) identify three distinct processes that drive innovation: advanced customer demand for innovative products and solutions; rich and open communication between customers and suppliers; and customers can choose between alternative suppliers (Reve & Jakobsen, 2001, p. 40). In less-functioning clusters, firms will, all else being equal, not be able to benefit from these processes, resulting in lower innovation rates, and hence lower value creation (Reve & Jakobsen, 2001).

At this point it is important to mention that there are many synonyms for what we understand to be a cluster. Giuliani (2005) differentiates between geographical agglomeration *plus* sectoral specialization and geographical agglomeration *only*. In the group of geographical agglomeration plus specialization, we can find synonyms to the Porter's coined word "cluster" such as "technology district" (Storper, 1997), "Local innovation system" (Cassiolato, Lastres, & Maciel, 2003), or "Industrial cluster" (Morosini, 2004). In the group of geographical concentration only, we can see the synonyms "Milieu" (Capello, 1999), or "Productive arrangement" (Cassiolato et al., 2003). We want to point out that while we employ the term "cluster" in this study, we do not restrict ourselves to a sole meaning of it but rather analyze whether the conditions to be considered a cluster are met based on the above-mentioned definitions.

We argue that clusters are composed of private and public enterprises of various sizes, including producers, suppliers, and customers. Furthermore, professional associations (such as IKT Norge), academic and research institutes are essential parts of economic clusters.

Successful examples of cluster approaches can be found in regions focusing predominantly on high technological product outputs (e.g. Silicon Valley, Life Sciences Corridor in Boston area). These examples indicate that if economic activities are distributed and coordinated within a cluster, a stronger (national) competitiveness may result (Karaev, Lenny Koh, & Szamosi, 2007). Moreover, cluster-based economic development has proven highly successful in both smaller and larger West European countries (e.g. Norway). We can conclude that "a cluster

is a system of interconnected firms and institutions whose whole is more than the sum of its parts" (Porter, 2000, p. 21).

2.4.1 Cluster theory in practice with the example of Norway

One of the most prominent researchers in cluster theory in Norway, Torger Reve, together with Amir Sasson, both from BI Norwegian Business School based in Oslo, presented the third national study of industrial clusters in Norway, "A Knowledge-Based Norway" ("Et kunnskapsbasert Norge") (Reve & Sasson, 2012). In this research paper, thirteen Norwegian clusters were studied in close detail. Subsequently, the findings were presented to highly prominent economic and political players in Norway. In Reve's big three research projects about clusters in Norway, he tried to answer the question what makes an industry or an industrial location attractive for knowledge-based firms.

This question is subject to be answered when applying The Emerald Model (Reve & Sasson, 2012), which serves as a framework for analysis of the attractiveness of localities from six dimensions. The model captures a cluster's ability to attract the following six elements: advanced education institutions and departments, highly talented employees, advanced academic specialist and research and development projects, competent and willing investors and owners, the creation and implementation of environmental solutions and a diverse and sizeable group of related firms (Reve & Sasson, 2015).

Overall, Norwegian cluster policies have focused on involving many actors such as the private sector, investors, as well as academia (triple-helix approach) in order to build a sound cluster development program. The government saw its role more tailoring favorable market conditions than leading this process (Reve & Sasson, 2015). Today, Norway experiences wide acceptance for cluster models and the importance of knowledge externalities among policy makers and politicians, and many projects and programs have been started.

Norwegian Innovation Clusters, a government supported cluster program, currently aims to give support to cluster on three levels since 2014 (Norwegian Innovation Clusters, 2019). Arena is a three to five year, Norwegian Centres of Expertise (NCE) a 10-year, and Global Centres of Expertise (GCE) a 10-year program, respectively.

The first level is the so-called Arena program. This program aims at immature clusters that are in an early phase of cluster collaboration. Clusters can be

small or large, and the participants can be in a regional, national or international position. However, there must be a potential for increased innovation and value creation by way of increased collaboration between these parties. Arena offers financial and professional support for implementation of three-year development projects. Currently, the program consists of 19 cluster projects throughout Norway (Arena, 2019).

The second level is NCE. The difference to Arena is that the clusters within NCE have already established systematic collaboration and have potential for growth in national and international markets. The members of the NCE clusters have considerable potential for growth in national and international markets. Within their respective sectors or technology areas, the clusters have a strong national position and the participants normally have clear and strong international ambitions. Currently there are 14 NCE clusters in Norway, representing well-known members such as NCE Aquaculture, NCE Seafood Innovation Cluster or NCE Oslo Cancer Cluster (Norwegian Centres of Expertise, 2019).

Lastly, the best-known clusters of Norway are part of GCE. GCE is characterized by mature clusters with a global position. Typically, these clusters have already established systematic collaboration and have developed dynamic relations with high interaction and a broad strategic action area. The clusters have considerable potential for growth in national and international markets and are part of a strong innovation network. As mentioned before, academic and research programs are crucial here and GCE clusters reveal high-class educational programs that contribute with professional relevance to the cluster (e.g. University of Agder for GCE Node). Norway currently has three strong GCE clusters with companies that can claim top, global positions within their fields. These are GCE Blue Maritime, GCE Ocean Technology, and GCE Node (Global Centres of Expertise, 2019).

To sum up, in the last two sections we have identified that clusters have a crucial role in shaping the competitiveness of Norwegian high-technology firms. Clusters in general can have positive effects on the innovation output of its members, especially due to an increased pressure to innovate. Consequently, firms affiliated to these knowledge-based communities have the potential to gain a competitive advantage over other firms. Moreover, we have recognized that the Norwegian cluster scene in particular is well-established and provides value to companies in Norway. Based on the above discussion, we predict that clusters will

act as "protective elements" of the target firms in the post-acquisition integration phase. In other words, all else being equal, we expect that acquirers are likely to integrate acquired targets to a lower degree (target autonomy approach) if the targets have been embedded in a cluster prior to the acquisition. We therefore predict:

Hypothesis 3 (H3): *Cluster affiliation of the acquired firm is negatively related to a high degree of integration of the target firm.*

2.4.2 Relative firm size and cluster affiliation

The following section builds up on the predictions from Hypotheses 1a and 3, namely, that relatively smaller targets are more likely to be integrated to a higher degree than larger ones, and that targets which belong to a cluster are more likely to be left autonomous. We further build up on the already established argument of how clusters motivate acquirers to keep their acquired targets autonomous, and we argue that belonging to a cluster will have a moderating effect on post-acquisition integration of relatively small targets. Essentially, we expect that when deciding on an integration strategy, the benefits of integrating relatively smaller firms to a high degree will be outweighed by the advantages of keeping them more autonomous when they belong to clusters.

In high-technology sectors external growth is mostly pursued through the acquisitions of small technology-based firms (Granstrand & Sjölander, 1990). In general, we assume that relatively small acquisitions usually tend to involve small, entrepreneurial targets. Due to a cluster's ecosystem and the principle of cooperation and competition within its system, a cluster can be described as a protecting force in terms of knowledge for small firms (Tallman, Jenkins, Henry, & Pinch, 2004). Especially for small, young high-technology firms, theory suggests that agglomeration advantages such as knowledge spillovers and close ties to research and academia are important (Van Geenhuizen & Reyes-Gonzalez, 2007). Maybe even more important are linkages and cooperation. These linkages occur between entrepreneurial firms, corporations, scientists involved with the firms, and universities. Entrepreneurial firms only gain from these linkages as long as they are part of the cluster and use them to maneuver their innovations through policy and legal approval thanks to the help of the cluster (Audretsch, 2001). In other words,

small, technology-based firms are likely to become nested in innovation systems, trying to make a profit through the innovative leveraging of the cluster community (Erkko & Helena, 1998).

Moreover, research indicates that clusters can enhance the survival of start-ups. Due to the affiliation with a cluster, small firms may find a larger number of specialized inputs and suppliers to work with, therefore allowing them to focus on their own work (Pe'er & Keil, 2013). Furthermore, by belonging to a cluster, small start-ups may find it easier to get access to a more skilled pool of labor as well as increase visibility and legitimacy, thus, reducing the liabilities of smallness and newness (Pe'er & Keil, 2013). This suggests that start-ups are able to reap these benefits as long as they are part of the cluster.

Research in Sweden found that locating in an industrial cluster has a significant positive effect on firm survival. These findings are explicitly applicable also for small entrepreneurial firms in particular. The authors suggest that new, small firms in stronger clusters not only have higher survival chances, but also have higher economic performance by belonging to a cluster (Wennberg & Lindqvist, 2010).

Taking all these points together, we argue that clusters mitigate the liability of smallness of acquired firms. We claim that cluster affiliation of relatively smaller target firms reduces the degree to which acquirers integrate them, and that cluster-related benefits will outweigh the advantages of integrating relatively smaller firms to a higher degree. Our prediction is that they are more likely to give the cluster-affiliated targets more autonomy. Therefore, with reference to Hypotheses 1a and 3, we assume that relative firm size will be moderated by target cluster affiliation. Based on this, we predict:

Hypothesis 1b (H1b): *Cluster affiliation moderates a negative impact of relative firm size on the degree of integration, such that if the target belongs to a cluster, the impact is lower.*

2.4.3 Firm relatedness and cluster affiliation

We have seen how cluster membership can have a positive impact on innovation as well as knowledge spillovers for member firms. Clusters provide firms access to a whole range of explicit and tacit knowledge relevant to their common industry sector (Tallman, 2013). Therefore, acquiring a firm that belongs to a cluster can be used as a network-opener and can help to bridge structural holes in a network (Zaheer & Bell, 2005). We argue that if firm relatedness between acquiring and target cluster firm is high, then more autonomy should be granted to the acquired firm because of its benefits of specialized infrastructure, its network of skilled regional workforce and its ties to regional academia. Despite the attractiveness of more integration and the relatedness between the two firms, granting autonomy for the acquired cluster firm might be wise because of informal knowledge flow within the cluster that does not happen anymore if the firm is taken out and integrated into the acquiring firm (Dahl & Pedersen, 2004).

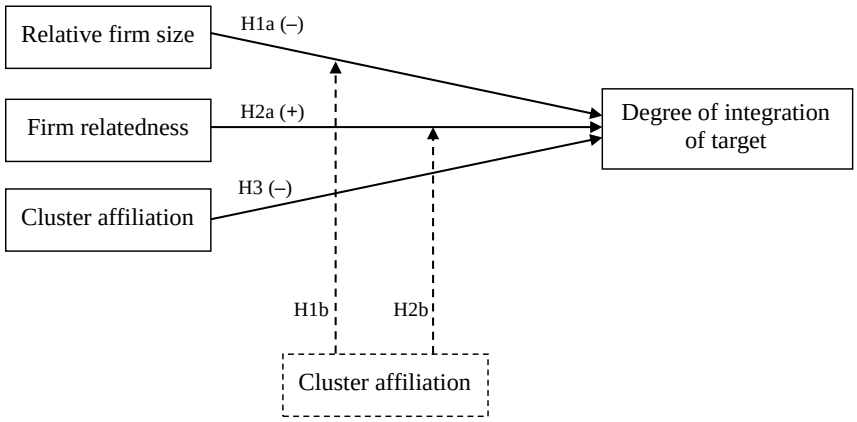
Further, it may also be very likely that the acquiring firm, despite its relatedness, does not have the absorptive capacity (Cohen & Levinthal, 1990) to understand how knowledge is treated within clusters. On the other way around, the target cluster firm may not have the desorptive capacity (Lichtenthaler & Lichtenthaler, 2010) to convey technological knowledge without its cluster affiliation due to the strong relationships and collaboration (e.g. educational institutions) within the ecosystem. In other words, the acquired cluster firm has become dependent on the cluster institutions and without its "roots" it may be hard for the acquired firm to fulfil its purpose to be an innovation tech driver as an integrated unit within the acquiring firm.

To summarize, we hypothesize that the acquirer cannot just simply take out the Norwegian tech firm of its cluster because it can only function properly in its ecosystem. Therefore, a higher degree of integration should be considered with caution and the cluster should moderate the relationship of relatedness on integration. This leads us to the formulation of our last hypothesis, as follows:

Hypothesis 2b (H2b): *Cluster affiliation moderates a positive impact of acquiring firm relatedness on the degree of integration, such that if the target belongs to a cluster, the impact is lower.*

Figure 1 summarizes our arguments graphically. The logic is that relatively smaller firms are more likely to have a higher degree of integration after acquisition (H1a). A higher degree of integration is also more likely if the target and the acquirer are related (H2a). We can see that the affiliation to a cluster of the target firm acts as a moderator for the relationships (H1b & H2b). Cluster affiliation would alter the relationship between relative size/relatedness and the degree of integration because of the clusters' protective and supportive ecosystem that creates incentives for giving autonomy to the acquired Norwegian high-technology target firms. Finally, cluster affiliation in itself should have a negative impact on a high degree of integration (H3).

Figure 1. Theoretical model



2.5 Illustrative Cases for Hypotheses

2.5.1 Case 1: Zoetis acquires Norwegian Pharmaq

In 2015, American headquartered Zoetis Inc. announced an agreement to purchase Pharmaq AS, the Norwegian global leader in vaccines and innovation for health products in aquaculture, for a price of USD$765 million. The Norwegian aquatech cluster firm was bought with Zoetis' intention to give the company a market-leading presence in the fastest growing segment of the animal health industry.

At the time of the acquisition, Pharmaq had 300 employees worldwide. With approximately 9,000 employees worldwide at the beginning of 2015, Zoetis serves veterinarians, livestock producers and people who raise and care for farm and companion animals with sales of its products in 120 countries. Comparing to

Pharmaq's company profile, we can say that this acquisition was related and the SIC codes also confirmed this. Meanwhile, Pharmaq still running autonomously, Zeotis announced in 2015: "To ensure its continued success, the Pharmaq business will run largely as a stand-alone operation within Zoetis and maintain its focus on critical customer needs and R&D milestones."

According to our hypotheses above, Zoetis would be more likely to integrate Pharmaq to a higher degree due to its relatively small firm size (H1a) and also for its relatedness (H2a). However, cluster theory (H3) would predict the opposite. Exactly because of these tremendous "R&D milestones" Pharmaq should continue to play a vital part for the aquatech cluster in Norway. Finally, cluster affiliation could moderate the relatively small firm size (H1b) in a way that the result would lead to a lower degree of integration, and thus more autonomy for Pharmaq.

2.5.2 Case 2: Nokia acquires Norwegian Trolltech for $154 million

In 2008, Finnish Nokia announced that it was paying USD$154 million for Trolltech, a Norwegian software company whose products are used to create applications that work on different operating systems. The company together with its software had been highly integrated into Nokia's operations. After the acquisition, the Trolltech team was considered to play an important role in accelerating the implementation of Nokia's software strategy.

Nokia, back then the world's largest cellphone maker, had said Trolltech's set of software development tools, called Qt, "will enable us to deliver on our strategy of developing applications across our range of devices." In general, around the acquisition time, European software companies had been targeted for acquisition by global cell phone makers intent on adding specialist technologies to gain a competitive edge, especially in the emerging market of wireless internet services.

At the time of acquisition Trolltech employed around 250 people while Nokia was employer to around 125,000 people. Calculating the relative firm size leads us to 0.002, i.e. very small. Furthermore, according to our research, Trolltech was not part of any cluster during the time of acquisition. The acquisition was characterized as being unrelated based on SIC codes, but it is definitely possible to imagine that the businesses were complementary und thus related to some extent.

Therefore, based on our hypotheses, we would expect that Nokia absorbs Trolltech due to its relatively small firm size (H1a). Moreover, the non-existent

cluster affiliation and seemingly semi-related businesses make it possible to believe in a higher degree of integration (H2a & H3). Indeed, Trolltech had been highly integrated into Nokia and this case illustrates our hypotheses successfully. In the following section we explain our methodology and how we operationalized the constructs to test our hypotheses.

3. Methodology

In this master thesis we employ a deductive research approach. In other words, we apply the use of already established theory and earlier research to deduct hypotheses about the relationship between two or more variables (Collis & Hussey, 2013). The hypotheses are analyzed quantitatively with the help of a proportional odds model / ordinal logistic regression analysis (OLR).

We predominantly obtained secondary data with a few exceptions where primary data was needed for clarifications. Two of the variables, degree of integration (dependent variable) and cluster affiliation are expressed in measures that were constructed manually using several different types of secondary data. It is rare or almost impossible to find secondary data sources with readily available information on these two measures; hence, we collected the data manually to achieve the richness of detail necessary to investigate these variables. In order to mitigate validity concerns related to this approach, we have kept a detailed track record of our efforts to document these measures.

Secondary data collection was the most suitable choice for our thesis. We study a relatively large sample of firms over a certain period of time, which would not have been possible through primary data collection due to time and resource constraints. Moreover, secondary data has been found to be higher quality than primary data (Stewart & Kamins, 1993), and reanalyzing it opens up the possibility to find unexpected and novel discoveries (Saunders, Lewis, & Thornhill, 2009). Lastly, using secondary data allows for more public scrutiny of our data because it is relatively easy to check by others (Denscombe, 2007).

3.1 Sample and Data

Our data of Norwegian high-technology acquisitions was obtained from the Securities Data Company (SDC) Platinum M&A database provided by Thomson Reuters. We chose our sample of Norwegian targets to capture the effects of Norwegian business clusters on the degree of post-M&A integration. The sample was restricted to high technology acquisitions for two main reasons. First, we aim to observe what predicts the degree of integration of targets in knowledge-intensive industries. The highest level of knowledge intensity can be observed in high-technology firms due to their product development-related activities (Yang, 2005; Song & Montoya-Weiss, 1998). Second, we attempt to capture how cluster affiliation interacts with high-technology acquisitions because the concept of clusters directly concerns the competitiveness of knowledge-based firms and industries, as explained by Reve and Sasson (2012).

We complement and compare the data obtained from SDC with the M&A database Zephyr provided by Bureau van Dijk and other supporting sources such as Proff Forvalt, Orbis, company annual reports, historical company websites (using an internet archive web page "The Wayback Machine") and publicly available press releases.

From SDC we obtained observations as follows. In the first step, we extracted all completed-confirmed acquisitions within a 10-year period (from January 1, 2006 to December 31, 2015) that had a Norwegian high-technology firm as target. The choice of this time window is driven by two main factors: availability of rich public information on acquisitions and a sufficient post-acquisition time window to assess the degree of integration of targets (i.e. 3-5 years) (Harrison, Hitt, Hoskisson, & Ireland, 1991; Makri, Hitt, & Lane, 2010). This filter resulted in 4,890 hits. Next, we applied a criterion that the Norwegian target firm had to be within the high-technology industry[1], resulting in 932 hits. We only selected deals that had a deal value greater or equal to 10 million Euro. The choice of this deal value was motivated by an increased availability of secondary public data in media and on databases (e.g. Zephyr or Orbis). Moreover, we only included deals in which the ownership changed from either non-existing or minority (i.e. 49.99 percent or less)

[1] SDC Target high-tech industry codes selected: 518, 516, 416, 233, 234, 136, 121, 216, 223, 413, 236, 242, 418, 243, 231, 517, 235, 222, 120, 417, 138, 116, 114, 113, 140, 420, 112, 111, 134, 512, 211, 132, 131, 137, 119, 412, 213, 415, 227, 225, 224, 118, 513, 232, 129, 249, 219, 319, 229, 239, 419, 519, 117, 214, 315, 313, 221, 314, 241, 514, 135, 122, 511, 414, 515, 226, 316, 311, 312, 133, 401, 411, 215, 237, 115, 212.

to a majority ownership (i.e. more than 50.01 percent), which helped us capturing deals where the ultimate owners changed and the effects on integration would be relevant. This left us with 128 deals.

After checking each deal for potential errors, 36 observations were removed due to a lack of information or incorrect information (see Appendix A). After the removal of the observations, our final sample contained 92 deals.

3.2 Measures

3.2.1 Dependent variable

Our dependent variable is the *degree of integration* of the acquired Norwegian high-technology firm. The range of the response variable extends from high autonomy to structural integration into the acquiring organization. Contrary to Puranam et al. (2009) and Paruchuri et al. (2006), we will not choose integration to be a binary variable but instead, we will treat it as an ordinal dependent variable with five possible values from zero to four (i.e. zero for high autonomy, four for structural integration). According to our views, this portrays reality better as acquisitions are not "black and white". Bauer and Matzler (2014) used the same procedure in their study with the help of a seven-point degree scale for integration, and the approach is also supported by Cording et al. (2008) who measure integration depth as the degree to which several functional areas of the target were combined or integrated as a result of the acquisition.

As the 92 eligible acquisitions took place in the past, we developed measures based on secondary data that was available on the internet today and in the past. Several studies in the M&A literature estimate post-M&A performance using three to five years of data after the transaction (Harrison et al., 1991; Makri et al., 2010). We find this time window most appropriate for two reasons. First, the lower limit helps us making sure to capture situations where integration took longer. Second, the upper limit lowers the possibility of capturing the effects of other external influences, such as a new strategic direction of the firm.

The criteria applied in our measurement of the degree of integration are similar to the methods used by Puranam et al. (2009) and Paruchuri et al. (2006). These include using a database (e.g. Proff Forvalt), to examine if the target maintained independent financial reporting and was recorded as an operating entity. This is corroborated with supporting press releases and articles informing on the

proposed organizational form of the target after the acquisition. We found that the intention to integrate a target was almost always conveyed in press releases through statements such as “the activities of the two businesses will be integrated” or “the company operates as a separate entity and brand in the global market”. A limitation to this approach identified by Paruchuri et al. (2006) is a lack of possibility for any gradations to separate the degree of integration. We, therefore, extended this approach by introducing a five-point scale measuring the degree of integration. In certain cases, press releases and financial reporting databases solely do not provide a rich enough understanding of the integration status. Thus, we supplemented this information with marketing (webpage) and collocation data since the literature identifies both as important elements of post-acquisition integration (Bauer & Matzler, 2014; Puranam et al., 2009). Our criteria used to measure the degree of integration are the following:

1. Financially dissolved / not (obtained from Proff Forvalt, if not available, then from Orbis); dissolved = 1, alive = 0
2. Webpage (obtained from internet archive “The Wayback Machine”); does not exist = 1, exists = 0
3. Collocation (obtained from Brønnøysund Register Centre of Norway); acquirer/target moved to one address or dissolved = 1, separate addresses (stayed in original Norwegian address) = 0
4. Publications (obtained from press releases, CEO rationales, internet archive “The Wayback Machine”, Zephyr database, annual reports); supporting integration = 1, supporting autonomy = 0

Each of these criteria had the possible values of 0 or 1 and were subsequently added up to obtain a possible scaled value from 0-4. As mentioned above, we used extensive database and internet search engines strategies to value each of 92 observations according to this 0-4 principle.

When evaluating whether the variable “Publications” receives a 0 or a 1, it is important to note that this measure was mostly based on “forward looking statements” from press releases, as in many cases there was no subsequent press coverage about the deals in the following three to five years. These forward-looking statements include the planned level of integration of the target, the anticipated execution of the proposed acquisition, the time frame in which it is expected to occur, the expected benefits of the deal, and the future financial performance of the acquiring company after the proposed transaction. Therefore, we assess these as

reliable sources to evaluate whether integration or autonomy was favored by the acquiring company.

In addition to the aforementioned procedure using secondary data, in some cases we also gathered primary data to support deals where it was difficult to draw conclusions from publicly available press releases or the information was not present. In these cases we contacted employees of the target companies via LinkedIn or Email to clarify the integration status of the acquired company.

3.2.2 Independent variables

Relative firm size is measured as a ratio between the target and acquirer in terms of number of employees at the effective year of the acquisition. Larsson and Lubatkin (2001) suggest that relative firm size can be estimated as the ratio between the total number of employees of the target and the acquirer. In order to obtain the ratio, the number of target employees are divided by the number of acquirer employees (1).

$$Relative\ firm\ size\ = \frac{Target\ Number\ of\ Employees}{Acquirer\ Number\ of\ Employees} \quad (1)$$

From this equation, we can infer that if the relative firm size is small, the acquirer is relatively bigger than the target. However, if the target is bigger than the acquirer, in terms of employees, we will obtain a result greater than 1 for this equation. We decided to take the *relative* size because of better comparability between both firms. We chose to measure relative firm size in number of employees because this indicator had the best available data dating back to the first deals in 2006. Moreover, the number of employees best captures the resources needed to be integrated in knowledge-intensive high-technology acquisitions, and in this context we find it as a superior measure to, for instance, market capitalization or assets.

These figures were partially obtained from SDC. Many observations were missing the exact employee numbers for the respective years. We complemented the data by searching databases such as Proff Forvalt, Orbis, Bloomberg or other publications on the internet (e.g. articles or annual reports).

Firm relatedness. We define firm relatedness as a dummy variable that equals 1 if the acquiring and the target firms are related and 0 if they are unrelated. Adhering to prior research (Chatterjee et al., 1992; Eckbo, 1983; Ellis et al., 2011;

Fowler & Schmidt, 1989; Fuller, Netter, & Stegemoller, 2002; Scanlon, Trifts, & Pettway, 1989; Walker, 2000), firms are classified as related if the two-digit SIC (Standard Industrial Classification) codes of the acquirer and the target coincide, and 0 if otherwise. The application of SIC codes is one of the most popular approaches to measure relatedness in strategy literature (Robins & Wiersema, 2003). The first digit of the SIC code indicates the economic sector, the second identifies its subsector and so on (Neffke & Henning, 2013). For the purpose of our study, using the first two-digit classification is most appropriate as the high-technology industry is knowledge-intensive and firms can be highly related even if their full four-digit SIC codes do not coincide.

In certain cases, the acquiring company used so called "special purpose vehicles" (SPVs) to execute the acquisition (e.g. German Bayer AG used its wholly owned subsidiary Aviator Acquisition AS to acquire Norwegian Algeta ASA in 2013). Here, the wholly owned subsidiary did not accurately represent the ultimate acquirer in terms of its operations (business description, industry description, SIC code). We edited the original SDC acquisition data and corrected the parent company name, industry, business description and SIC code. Therefore, the actual acquirer in our example was German Bayer AG and not Aviator AS as indicated in the database.

Cluster. Acquired firm's cluster affiliation is coded as a dummy variable (cluster affiliation: yes = 1 or no = 0). As mentioned earlier, this variable will act as a moderator in our model, i.e. cluster affiliation is a variable that alters the strength of the relationship between relative target firm size and degree of integration, and firm relatedness and degree of integration. For each observation the value was determined using a model with two criteria, and if at least one of these criteria was met, cluster affiliation received a value of 1. The model had the following two criteria:

1. Membership in cluster organization
2. Location of HQ in cluster region

In the first step we determined whether the target is a member of a cluster organization. We used NCE, GCE, Arena databases and mapped out all existing clusters and their cluster organizations in Norway. We began to go through the list of targets and their industry and identified whether the targets were members of any relevant cluster organization from these lists based on the target's high-technology industry. If we did not find evidence of membership to any of GCE, NCE or Arena

cluster organizations, we conducted additional research to identify any other relevant cluster organizations and whether the target was a member at the acquisition time. We checked when the cluster organization was established and confirmed the findings by examining their websites on the internet archive page "The Wayback Machine". Then we made sure that the target was listed as a member of the cluster organization within the same year as the acquisition took place. In a few cases there was no information available about the members of specific cluster organizations prior a particular deal. In these cases, if we found evidence that the target of interest was a member of a cluster organization no more than twelve months post-acquisition, we still categorized it as being a member of the cluster prior to the acquisition. We assumed this because business clusters develop over time and are not constructs that emerge instantly (Ketels & Memedovic, 2008); thus, if the target was listed as a member of a relevant cluster organization within twelve months after the deal (assuming it had not undergone complete structural integration), we assumed that it was also a member prior to the deal.

If membership to a cluster organization criterion was met, the Norwegian target was identified as being part of a cluster, i.e. received a value of 1. As identified in the literature, cluster membership is not by any means restricted to a distinct regional scale (Bathelt et al., 2004; Viederyte, 2013).

If no evidence was found of a target belonging to a cluster organization, we proceeded to test the next criteria that would allow to categorize the target as belonging to a cluster - location of HQ in cluster region. If at the time of the deal it was located in a geographical concentration of related businesses that share common knowledge, technology or value chain, and if it was surrounded by relevant educational institutions, we identified the Norwegian target as being a part of a cluster, and assigned it a value of 1. First, we determined whether the HQ of the target were located in any relevant NCE, GCE or Arena clusters. If we could not find the presence of a relevant GCE, NCE or Arena cluster in the company's HQ location, additional research was conducted to identify any other relevant clusters in the location. If none were identified, the target received a value of 0.

Since we needed to check whether firms belonged to a cluster in past dates starting from 2006, we used the webpage "The Wayback Machine" to retrospectively analyze the internet during the time when the respective firm got acquired and obtain information to assess cluster affiliation.

This approach was applied to each of the 92 observations on a case by case basis to carefully evaluate whether the Norwegian targets belonged to a cluster or not. In four cases secondary data was not enough to evaluate whether a company was part of a cluster organization. In these cases, we gathered primary data from the companies through contact forms on websites and e-mails or LinkedIn profiles of former employees. The answers and personalities of the contacted people are kept confidential.

3.2.3 Control variables

Control variables are considered external variables that are not connected to the hypotheses or theories tested. Rather, their purpose is to produce confounding effects within relationships in the model tested (Spector & Brannick, 2011).

We include three control variables in order to strengthen the model. These will be *acquired firm age at acquisition, geographic distance of target and acquirer,* and *financial crisis.*

Acquired firm age at acquisition is measured in years as the difference of age at effective acquisition date and the date of incorporation. In Microsoft Excel, we subtracted the date of incorporation from the effective date of acquisition in order to obtain the age in terms of days. After that we divided the days by 365.25 (accounts for leap years) and round the result to one decimal place (e.g. 19.1 years). We include this variable as a continuous one in our model.

Geographic distance. Geographic distance between the target and the acquirer is measured using spherical geometry. In order to calculate the distance between the firms for each deal, we first collected latitude and longitude coordinates on these firms' locations on Google Maps. We used addresses that the firms had at the time of the acquisition (effective date of the deal). We then applied the following Great Circle distance formula to arrive at the distance calculation, as follows:

$$\text{Geographic Distance} = r \times \text{acros}[\sin(lat_{acq}) \times \sin(lat_{tgt}) + \cos(lat_{acq}) \times \cos(lat_{tgt}) \times \cos(lon_{tgt} - lon_{acq})], \quad (2)$$

where r is the radius of the earth in kilometers (r = 6,371), and the latitude and longitude coordinates for both acquirer and target have been converted into radians by using the RADIANS function in Microsoft Excel. A similar

measurement approach has been adopted in prior work (e.g. Ragozzino & Reuer, 2011).

Financial crisis is measured as a dummy variable and equals 1 if the target was acquired prior to the financial crisis, 0 if else. It is crucial to control deals before and after the financial crisis period, as studies indicate that the financial crisis had a substantial effect on M&A trends worldwide (Rao-Nicholson & Salaber, 2016; Stoddard & Noy, 2015). It is difficult to precisely date the beginning of the global financial crisis. While the crisis period is often defined more comprehensively by including the beginning of 2007 when the market was affected by the U.S. subprime mortgage problems (Erkens, Hung, & Matos, 2012), it was in September 2008 when the issues associated with the financial system escalated. We therefore define the beginning of the financial crisis as any date following September 2008.

3.3 Validity

3.3.1 External validity

The concept of external validity refers to whether our findings can be generalized to different settings. Even though our research setting is very specific to one target country, industry, and a constrained deal value, we believe that this study is applicable to other situations as well. The reason why we are confident is that the theory underlying our research, specifically post acquisition integration theory and cluster theory, have already been confirmed in various settings around the world. Lucas (2003) argues that external validity is less an issue with the exact research design itself but more about the underlying theory, its scope and boundaries, and its applicability to different settings. Therefore, if the theory has already been supported in various tests, the findings will have external validity.

The business cluster theory of Michael E. Porter is well researched in various settings and countries all around the world. Moreover, we do not only see business clusters in theory but also in practice (e.g. Life Sciences Corridor in Boston). Therefore, we believe that the business cluster theory has been well supported in a variety of tests and therefore increases the external validity of our research.

The same applies to the post-acquisition integration theory. Over many years it has been made applicable to and across other settings. A quick search on

Google Scholar shows 2.4 million hits covering different settings and research questions about this theory.

Summarizing our external validity discussion leads us to the conclusion that even if the external validity of our particular research setting is moderate, the theories we used to set up this study helps us increasing the overall external validity. We argue that this strengthens our generalizability to other settings.

3.3.2 Internal validity

Internal validity refers to the confidence that our independent variables are at least partially responsible for the variation that has been identified in the dependent variable. Generally speaking, it is rather difficult to achieve high internal validity in non-experimental research. Two main factors contribute towards a lower internal validity in our research design.

First, due to the fact that we only focus on *Norwegian* acquisition targets, we introduce a sample selection bias. In other words, not every acquisition has the same probability of being selected. In order to increase the internal validity, we should compare our results to a reference group and check if we find the same effects.

Second, due to our limited sample size, we are not able to include more confounding variables that could explain the variance of the degree of integration. Other factors than our variables could have explained why firms become integrated or stay autonomous, such as, for example, the cash flow of the acquiring company. We could not, however, get a hold of this data. Nonetheless, the fact that we included confounding (control) variables such as age, distance and a time variable, increases the internal validity of our model.

To sum up, we included as many variables as possible in the model that were explaining the variance of the dependent variable. Still, due to external constraints the internal validity of our study remains limited. We are moderately confident that our model explains cause effect relationships between our variables.

3.3.3 Construct validity

This category of validity refers to the degree to which a test measures what it claims to be measuring.

Degree of integration (scale of 0-4). We believe that we captured the measurement for the dependent variable as best as possible given that we only had secondary data to work with. This five-point scale uses measures which, according to past literature, are essential when dealing with post-acquisition integration. However, construct validity could have been increased even more if we had prime insights in the different acquisitions (such as company insights after the acquisition or primary data, e.g. interviews).

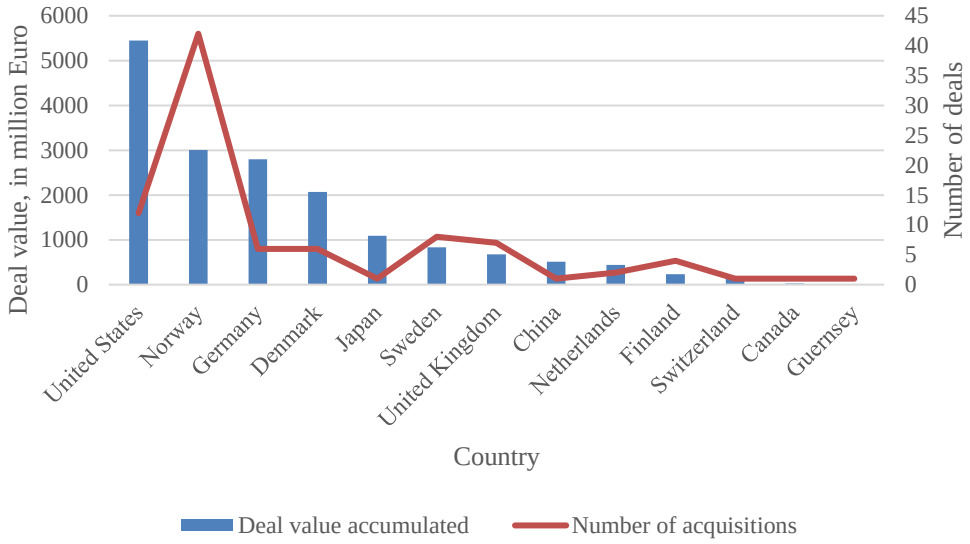
Cluster affiliation (binary variable). The measurement of cluster affiliation could be questioned for firms that were neither in a cluster organization nor where located in a cluster region. For firms that did not fulfil either of these categories, a value of 0 was assigned. Some of these firms could have possibly been in a cluster despite the fact that it was not publicly disclosed on the internet. However, given the data available, it was not possible for us to observe this. Therefore, the construct validity of cluster affiliation could be improved.

All other variables (e.g. geographic distance) are measuring what they intend to measure with accuracy.

3.4 Descriptive Statistics

We start by giving an overview of which countries acquired into Norway and how much they paid for the Norwegian high-technology targets. Figure 2 displays this graphically and reveals the accumulated value as well as the number of deals per country. The x-axis represents the countries of firms that acquired Norwegian targets in the 10-year period from 2006-2015. The y-axis on the left shows the accumulated deal value in million Euro. For instance, German companies acquired Norwegian tech targets for an accumulated value of almost three billion Euro in the period from 2006-2015. The y-axis on the right provides the reader with the absolute number of acquisitions in Norway per country. We can observe that Japan, Canada or Guernsey had only one acquisition in the ten-year period respectively.

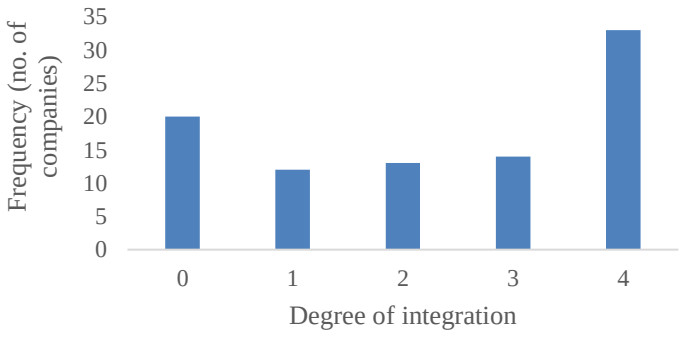
Figure 2. Deal value and number of deals per country



One can identify that twelve companies from the United States (e.g. Microsoft or Zoetis) contributed to accumulated deal value of over 5 billion Euro over ten years. In terms of number of acquisitions, domestic overtakes by Norwegian firms were still the most frequent ones (42 deals) in our data set. Regarding the highest average deal value per acquisition (accumulated deal value divided by number of acquisitions), Japan ranks first with only one acquisition worth one billion Euro (Mitsubishi acquiring Cermaq ASA) in 2014. Interestingly, China was represented with only one deal with a value of 500 million Euro. Finally, we find it worth mentioning that all country deal values accumulated are equal to 17.3 billion Euro (n=92) over ten years.

As for the distribution across categories of the degree of integration (see Figure 3), most deals (33) fall into the category of the highest degree of integration which is “4”. This is followed by the lowest degree of integration, “0” while the categories in-between are distributed similarly.

Figure 3. Histogram of degree of integration



Further, Appendix B shows the correlations and the descriptive statistics for the variables used, respectively. The correlation matrix (see Appendix B**)** displays the correlations among the variables used. In order to obtain the coefficients and p-values, we applied different correlation coefficients due to the different properties of our data. As some variables have nominal or ordinal scale, we had to differentiate between them. Kendall's Tau rank correlation coefficient was used to obtain the correlation of our DV (*Degree of integration*) with the other six variables (column 1). For an adequate correlation measure between two binary variables (e.g. Cluster and Financial crisis), we used the Phi Coefficient (φ) in a 2x2 matrix in R. In fact, the Phi Coefficient is equivalent to the Pearson's standard product moment coefficient in these 2x2 cases where both variables are dichotomous (take the value of either 0 or 1) (Howell, 2009). Therefore, all pairwise correlations of binary variables are calculated using the Pearson correlation coefficient and its respective p-value. We double checked Phi of these matrices and the correlation is the same when applying Pearson.

Further, we also encountered correlations with one variable being dichotomous and the other being continuous (e.g. Cluster and Target age). A close examination on the internet refers to the point-biserial correlation coefficient in these situations. Again, literature treats these correlations as a sub-category of the Pearson correlation coefficient. "The answer is very simple - any statistical package I know of will calculate the point-biserial correlation, because it is simply Pearson's *r* applied to a special kind of data." (Howell, 2009, p. 295). For the remaining pairs of correlation (both variables continuous), Pearson's *r* was used as well.

The correlation between the DV and relative firm size is significant at $p < 0.05$ and goes also into the hypothesized direction (-0.19). In other words, the degree of integration is significantly negatively correlated with relative firm size. The DV is also significantly negatively correlated with cluster affiliation at $p < 0.1$ (-0.18). The expected effect is also visible for the degree of integration and firm relatedness. The correlation is significant at $p < 0.10$ and it has the assumed sign in front of the coefficient (0.18), meaning that if the firms are related, the higher the degree integration. However, we interpret these correlations with caution as they are not the same as dependency, they only *measure* dependency. Further, correlation does not imply causation and we were especially careful when interpreting correlations between discrete variables.

3.5 Multicollinearity

At this point, it appears improbable that our model would be affected by multicollinearity problems. Firstly, we plotted all variables with each other graphically to see the bivariate trends. We did not see patterns that would repeat over and over again. The correlation table (see Appendix B) also does not reveal any high correlations among the variables. Next, we computed the Eigenvalues of the covariates in R. The Eigenvalues of all covariates ranged from 0.51 to 1.54, which is a very reasonable range. We also calculated the ratio of max to min Eigenvalues (Kappa), which yielded 3.01 (well below the rule of thumb of 100). Finally, we ran an OLS model (DV = degree of integration) with all variables included and checked the Variance Inflation Factor (VIF) for each variable. A VIF of 1 signals that there is no variance inflation and would thus convey no problems with multicollinearity. Our highest value for the VIFs was 1.12 (Geographic distance). The rule of thumb here is that if we had detected a VIF greater than 4, we would have started considering multicollinearity issues. Our mean VIF was equal to 1.07. Therefore, we can say with much certainty that our variables are not subject to multicollinearity.

3.6 Statistical Model

We use the statistical software SPSS to carry out a proportional odds model (POM) to predict our *ordinal* dependent variable given one or more independent variables. Ordinal logistic regression will enable us to determine which of our independent variables (if any) have a statistically significant effect on our dependent variable. For categorical independent variables (e.g. cluster), we can interpret the odds that one "group" (e.g. 1 = belonging to a cluster) has a higher or lower score on our dependent variable. For continuous independent variables we are able to interpret how a single unit increase or decrease in that variable is associated with the odds of our dependent variable having a higher or lower value (X. Liu, 2009).

We can also determine how well our ordinal regression model predicts the dependent variable based on the model fitting information, goodness-of-fit and pseudo r-squared test (Cox and Snell) we obtain from the SPSS output.

However, for the ordinal regression model to have a high internal validity, several assumptions about our data must be met. These are:

1. The dependent variable is measured on an ordinal level.

2. One or more of the independent variables are either continuous, categorical or ordinal.
3. No multicollinearity - i.e. when two or more independent variables are highly correlated with each other.
4. Proportional Odds (test of parallel lines in SPSS) - i.e. that each independent variable has an identical effect at each cumulative split of the ordinal dependent variable.

Especially the fourth assumption is key to the valid application of the model (Brant, 1990). The ordinal logistic regression model is expressed as the following equation in SPSS:

$$\ln(Y_j') = \text{logit}[\pi(x)] = \ln\left(\frac{\pi_j(x)}{1-\pi_j(x)}\right) \quad (3)$$

Logit here means natural log (ln) of the odds. Moreover,

$\pi_j(\underline{x}) = \pi(Y \leq j|x_1, x_2, \ldots x_p)$. This term expresses the probability of being at or below (Y<= j) category j, given a set of predictors (X. Liu, 2009). If we insert this term in the equation above, we will obtain:

$$\text{logit}\left[\pi\left(Y \leq j|x_1, x_2, \ldots x_p\right)\right] = \ln\left(\frac{\pi\left(Y \leq j\middle|x_1, x_2, \ldots x_p\right)}{\pi\left(Y > j\middle|x_1, x_2, \ldots x_p\right)}\right) =$$

$$\alpha_j + \left(-\beta_1 X_1 - \beta_2 X_2 - \ldots - \beta_p X_p\right) \quad (4)$$

$1 - \pi_j(\underline{x}) = \pi\left(Y > j\middle|x_1, x_2, \ldots x_p\right)$, just turns the inequality sign around to obtain the probability of being above category j. Therefore, the fraction gives us the ratio of being at or below category j in relation to being above category j, where αj's are the thresholds, and β_1, β_2 ...β_p are logit coefficients; j = 1, 2...J-1 (X. Liu, 2009).

As already seen in the equations, the PO model is used to estimate the odds of being at or below a particular level of the dependent variable. For example, we will have 5 levels of ordinal outcomes (0-4, integer values), the model makes J-1 i.e. 4 predictions, each estimating the cumulative probabilities at or below the j^{th} level of the outcome variable (X. Liu, 2009).

4. Findings

Table 1 reports the PO model results, used to investigate the hypotheses. Notably, the base model is displayed in the first column of the table. The other two columns contain models with moderation effects. All three models fulfill the previously addressed assumptions and especially the assumption of proportional odds (test of parallel lines), which is crucial to the validity of the proportional odds model. According to the literature, it would be misleading and even invalid to use this model if the assumption of proportional odds was not met (e.g. X. Liu & Koirala, 2012).

As we can see at the bottom of Table 1, the proportional odds assumption test (test of parallel lines) is non-significant, and thus not violated (Brant, 1990). If we were to reject the null hypothesis based on the significance of the Chi-Square statistic, we would conclude that ordered logit coefficients are not equal across the levels of the outcome, and we would fit a less restrictive model (e.g. multinomial logit model). If we fail to reject the null hypothesis, we conclude that the assumption holds. The Brant test of parallel regression assumption yields $\chi 18 = 13.469$ ($p = 0.763$) for the base model, indicating that the proportional odds assumption was upheld. The same applies for the other two models although the second model was very close to a significance level of five percent ($p = 0.054$), but the PO assumption was still upheld. This suggests that the effects of our explanatory variables were constant across separate binary models (X. Liu, 2009).

Table 1. Results of proportional odds model using SPSS

	(I)		(II)		(III)	
Variables	Estimate	OR	Estimate	OR	Estimate	OR
Intercepts						
Integration = 0	-2.170***		-2.317***		-2.215***	
	(.561)		(.584)		(.600)	
Integration = 1	-1.392***		-1.511***		-1.434**	
	(.532)		(.555)		(.571)	
Integration = 2	-.685		-.787		-.726	
	(.518)		(.539)		(.556)	
Integration = 3	.034		-.053		-.008	
	(.514)		(.531)		(.552)	
Predictors						
Relative firm size	-.661**	.516	-1.451**	.234	-.667**	.513
	(.307)		(.597)		(.307)	
Firm relatedness	.705*	2.024	.635	1.887	.598	1.818
	(.399)		(.405)		(.601)	
Cluster	-.718*	.488	-.642	.526	-.816	.442
	(.400)		(.412)		(.568)	
Age - target	-.034**	.967	-.040**	.961	-.034**	.967
	(.017)		(.018)		(.017)	
Geographic distance	-.179	.836	-.186	.830	-.180	.835
	(.197)		(.199)		(.198)	
Financial crisis	-.317	.728	-.405	.667	-.297	.743
	(.422)		(.428)		(.426)	
Relative firm size * Cluster			1.217*	3.377		
			(.688)			
Firm relatedness * Cluster					.194	1.214
					(.805)	
Observations	92		92		92	
Model fitting	$\chi2 = 19.447$***		$\chi2 = 24.075$***		$\chi2 = 19.832$***	
Pseudo R^2 (Cox and Snell)	.193		.230		.194	
PO assumption score test	$\chi2 = 13.469$		$\chi2 = 32.316$*		$\chi2 = 12.706$	
	(p = .763)		(p = .054)		(p = .919)	

Note. OR, PO is used to represent odds ratio and proportional odds, respectively. Standard errors are displayed in brackets under estimates.
* indicates $p < .10$. ** indicates $p < .05$. *** indicates $p < .01$.

4.1 Model 1 – Base Model (I)

The log likelihood ratio Chi-Square test with 6 degrees of freedom, LR $\chi 2(6) = 19.774$, $p = 0.003$, indicated that our logit regression coefficients of the six predictor variables were statistically different from 0. Therefore, the model with six predictors provided a better fit than the null model with no independent variables. The Cox and Snell Pseudo R-squared equaled 0.193 suggested that the relationship between the response variable, degree of integration, and the predictors was moderate.

We can further report that each of the models shows the aforementioned thresholds/intercepts (a_j's) as well as the logit coefficients/predictors (β_1, β_2, …,β_6) and the odds ratios (ORs). For the intercepts, SPSS sets the highest category always as the reference category. In this case, degree of integration = 4 is set as the reference category. The ORs can be better interpreted and are calculated as the exponentiated coefficients. In the base model, for example, the estimated logit regression coefficient for relative firm size in the base model, $\beta = -0.661$, $p = 0.031$, indicated that relative firm size had a significant effect on the degree of integration. Hypothesis 1a stated that relative target firm size is negatively related to degree of integration, such that the smaller the relative firm size (smaller target relative to the acquirer), the higher the degree of integration.

Substituting the value of the coefficient into the formula (4), logit $[\pi(Y \leq j \mid \text{rel. firm size})] = \alpha_j - (-0.661)^*$ (rel. firm size) $= a_j + 0.661^*$(rel. firm size). OR = $e^{(0.661)} = 1.94$, indicated that the odds of being at or below a particular degree of integration relative to beyond that level increased by a factor of 1.94 with one unit increase in the relative firm size. In other words, a higher relative firm size (bigger target) was related to the likelihood of being in a lower degree of post-acquisition integration (higher autonomy). In order to estimate the odds of being beyond a category of the degree of integration, which is calculated as the complement probability of being at or below a category, we exponentiate -0.661. This results in OR = 0.52, indicating that the odds of being beyond a certain degree of integration level decreased by a factor of 0.52 with one unit increase in relative firm size.

Therefore, we can conclude that a smaller relative firm size, i.e. the smaller the target relative to the acquirer, is related to a higher likelihood of having a higher degree of integration, thus supporting Hypothesis 1a at a significance level of five percent ($\beta = -0.661$, $p < 0.05$).

Hypothesis 2a stated that we would expect a higher degree of integration if the two firms are related.

The estimated logit regression coefficient for relatedness in the base model, $\beta = 0.705$. Substituting this information into the original logit formula results in logit $[\pi(Y \leq j \mid \text{relatedness})] = \alpha j - (0.705)*(\text{relatedness}) = \alpha j - (0.705)*(\text{relatedness})$. By exponentiating, OR = $e^{(-0.705)} = 0.49$, indicating that related firms are 0.49 times the odds for unrelated firms of being at or *below* at a particular integration level. In other words, the odds for related firms falling into an equal or *bigger* integration level (more integration) are $e^{(0.705)} = 2.02$ times higher than for unrelated firms. Therefore, we can conclude that Hypothesis 2a is also supported at $p < 0.10$ ($\beta = -0.705$, $p = 0.077$).

Hypothesis 3 stated that cluster affiliation of the acquired firm is negatively related to a high degree of integration of the target firm. The estimated logit coefficient for cluster affiliation is $\beta = -0.718$. Substituting this into the logit formula (4) for the proportional odds model results in logit $[\pi(Y \leq j \mid \text{cluster})] = \alpha_j - (-0.718)*(\text{cluster}) = \alpha_j + (0.718)*(\text{cluster})$. By exponentiating, OR = $e^{(0.718)} = 2.05$, indicating that cluster firms are 2.05 times the odds for non-cluster firms of being at or *below* at a particular integration level. In other words, the odds for a cluster firm falling into an equal or *higher* integration level (more integration) is $e^{(-0.718)} = 0.49$ times lower than for a non-cluster firm. Therefore, we can report that Hypothesis 3 is supported ($\beta = -0.718$, $p < 0.10$).

Interestingly, the logit regression coefficient for target firm age indicated that age had a significant effect on the degree of integration ($\beta = -0.034$, $p < 0.05$). Substituting the value of the coefficient into the formula yields logit $[\pi(Y \leq j \mid \text{target age})] = \alpha_j - (-0.034)*(\text{target age}) = a_j + 0.034*(\text{target age})$. OR = $e^{(0.034)} = 1.03$, indicated that the odds of being at or below a particular degree of integration relative to beyond that level increased by a factor of 1.03 with one unit increase in the relative firm size. In other words, a higher target age was significantly related to the likelihood of being in a lower degree of post-acquisition integration.

Finally, the impact of the financial crisis as well as the geographic distance between target and acquirer did not show any significant relation to the degree of post-acquisition integration (see Table 1).

4.2 Model 2 – Moderation (II)

Next, the first moderation PO model with all six predictor variables and one interaction term (Cluster * Relative firm size) was fitted in Model 2. The log likelihood ratio Chi-Square test, LR $\chi 2(7) = 24.075$, $p = 0.001$, indicated that the model with the interaction term provided a statistically significant better fit than the null model with no independent variables. The Cox and Snell Pseudo R-squared for the second model equaled 0.230 and was larger than that of the base model but was still moderate.

The interaction term indicates the slope of the assumed relationship between relative firm size and degree of integration varies significantly between cluster and non-cluster firms. We can observe that the interaction term is significant at $p < 0.10$ and has the opposite sign of the relative firm size variable. When calculating the predicted logits for cluster firms and a given relative firm size, we obtain:

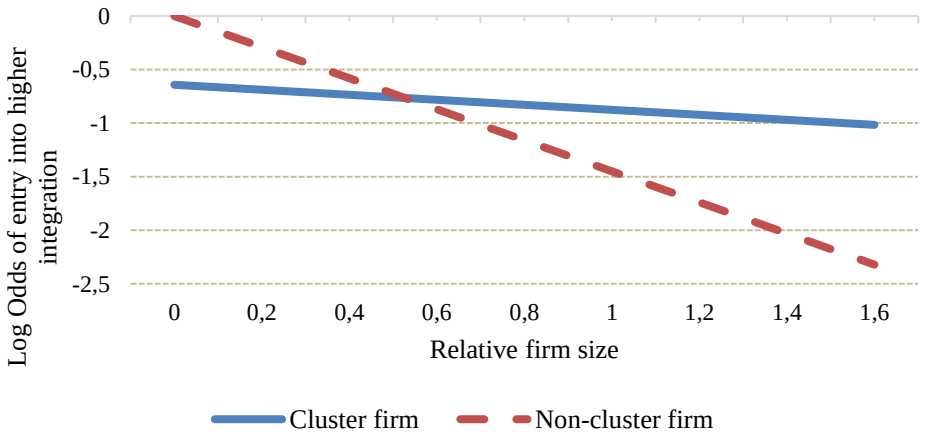
(-0.642 - 1.451*(rel. size) + 1.217*(rel. size)) = -0.642 - 0.234*(rel. size).

Based on Model 2, we obtain the following predicted logits for non-cluster firms:

(-0.642*0 -1.451*(rel. size) + 1.217*(rel.size)*0) = -1.451*(rel.size)

When setting the two equations equal, we find that up until a relative firm size of 0.528, a cluster firm will be more likely to be in a lower integration (more autonomous) than a non-cluster firm. For any values higher than 0.528, a non-cluster firm will be more likely to fall in a lower integration category (more autonomous) than a cluster firm. Figure 4 depicts this graphically.

Figure 4. Predicted logits for interaction term



The x-axis displays the relative firm size and the y-axis displays the log odds to enter a higher degree of integration threshold. As mentioned in the formulas, both cluster and non-cluster firms are less likely to be in a higher degree of integration but cluster firms (blue graph) are even more likely to be in a lower degree of integration than non-cluster (red graph) firms up until the relative firm size value of 0.528 (point of intersection).

Therefore, we can say that the relationship between relative firm size and the degree of integration varies significantly ($p < 0.1$) between cluster and non-cluster firms. We can see that cluster firms are more likely to be more autonomous than non-cluster firms until a relative firm size of 0.528. Therefore, smaller firms that are in clusters will have a lower integration level than smaller firms that are not in clusters. Therefore, Hypothesis 1b is supported at $p < 0.1$.

4.3 Model 3 – Moderation (III)

Lastly, PO Model 3 with all six predictor variables and one interaction term (Cluster * Firm relatedness) was fitted in column 3. The log likelihood ratio Chi-Square test, LR $\chi2(7) = 19.832$, $p = 0.006$, indicated that also Model 3 provided a statistically significant better fit than the null model with no independent variables. The Cox and Snell Pseudo R-squared for the third and last model equaled 0.194 and was slightly better than that of the base model but was still moderate.

In this model, we tested Hypothesis 2b, which claims that the relationship between relatedness and the degree of integration is moderated by cluster affiliation. As we can see in column 3, the moderator variable is insignificant ($\beta = 0.194$, $p = 0.810$) and it seems not to change neither the direction nor the magnitude of relatedness on the degree of integration. Furthermore, cluster affiliation and relatedness also turn insignificant during the presence of the interaction term.

Therefore, we conclude that cluster affiliation does not moderate the relationship between firm relatedness and degree of post-acquisition integration, and thus Hypothesis 2b is rejected.

5. Discussion

This thesis investigates the extent to which Norwegian target firm characteristics such as relative firm size, firm relatedness and cluster affiliation impact the degree of integration after an acquisition. By connecting the post-acquisition integration theory and business cluster research, we aim to shed light on how the integration-autonomy dilemma differs when the target firms are nested in knowledge-intensive ecosystems through industrial clusters. Our intention was to generate new insights into this relationship through the inclusion of cluster affiliation as a moderating variable.

The adoption of cluster affiliation as a predictor to explain the choice of a post-acquisition integration approach represents a departure from most previous work examining both clusters and post-acquisition integration. By doing so, we extend research on cluster theory and show that clusters can play a role in determining what happens to Norwegian high-technology targets after they have been acquired. Moreover, we examine a quantifiable sample through the exploration of secondary data. Investigating a larger sample instead of in-depth cases is an attempt to produce more generalizable findings in the field.

5.1 Effects of Relative Size and Firm Relatedness

Our first hypothesis predicted that relative firm size and the degree of post-acquisition integration were negatively associated. After empirically testing this relationship we find strong support for our hypothesis. Our results clearly highlight the difference between integration of relatively smaller versus larger firms, and we find that relatively smaller targets are more likely to be integrated to a higher degree. Congruent with literature, there is less complexity in the integration process of these smaller firms since the acquirer needs to employ less resources and faces fewer problems and risks (Cloodt et al., 2006; Cording et al., 2008; Larsson & Finkelstein, 1999; Zollo & Reuer, 2010). The literature, however, is inconclusive and relative firm size remains as an underexplored predictor of post-acquisition outcomes (Ellis et al., 2011). We therefore believe that our findings contribute towards filling this gap.

The observed relationship, however, can be questioned and may have other potential explanations from the ecological theory perspective of the firm. Bruderl and Schussler (1990) argue that the more employees a firm has, the longer it will

survive. When building up on theories such as the "liability of newness" and "liability of smallness", which predict higher risks of failure for young and small firms compared to old and big ones (Stinchcombe & March, 1965), Bruderl and Schussler (1990) introduce the "liability of adolescence". They claim that individual firms face an adolescence, during which mortality is very low. After this phase, death risk jumps to a high level because of the depletion of initial resources (e.g. number of employees). The length of this adolescence varies with the amount of initial resources a firm has, and death risk is expected to be lower for organizations with more resources. If we assume this to be the case, small tech firms which are often in the role of a relatively small target should also be subject to this scenario. Consequently, acquirers might pursue a structural integration approach instead of leaving the targets autonomous in order to preserve them. Hence, in some instances an alternative explanation to why relatively smaller targets are subject to a higher degree of post-acquisition integration could be connected to higher mortality risks of these firms.

Lastly, referring to our first hypothesis, the relationship we predicted was that relatively smaller firms are likely to be more integrated, which also implies that relatively larger targets are likely to be left autonomous. The latter implication, however, could be challenged from the viewpoint of the ecological perspective, and thus calls for attention in future studies. According to the ecological perspective, growth is followed by structural change. In other words, organizations cannot grow indefinitely and remain in their original forms (Hannan & Freeman, 1977), a view which can be also applied on growth through M&A. Therefore, it might be intriguing to test the integration approaches and outcomes of relatively large targets and observe whether our implication that they are likely to be left autonomous holds or not. The ecological perspective would predict that by getting larger, a firm is bound to undergo structural change at some point, which might often imply a high degree of integration after growing through M&A. Interesting predictors to examine in this case would be pre-acquisition growth of the acquirer or acquirer's acquisition experience, for instance.

We also find ground for our second hypothesis, which claims that firm relatedness and degree of post-acquisition integration are positively associated. This suggests that the more similar the firms are in terms of their market and products, the more integrated will the targets be to unlock potential synergies that will lead to cost reductions or efficiency gains. Phrased differently, unrelated firms

will be left more autonomous due to the acquiring firm's lack of familiarity about the acquired firm. Our finding is very much in line with the relatedness literature that investigates post acquisition integration (e.g. Cassiman et al., 2005; Datta & Grant, 1990).

However, many authors interested in the firm relatedness literature stream decompose firm relatedness into similarity and complementarity of products and markets (Bauer & Matzler, 2014; Kim & Finkelstein, 2009; Zaheer et al., 2013). On this more granular level, decisions about the degree of integration can be very different. What we refer to when saying relatedness is *similarity*. This view of similarity, however, may have entirely different implications for integration. Depending on whether the products and technologies are standalone (Galbraith, 1974; March & Simon, 1958) or complementary (Makri et al., 2010), various outcomes for integration/autonomy decisions can be justified. For example, closely related to our argument, Lane and Lubatkin (1998) assert that when firms acquire targets with similar technologies (similar knowledge), it should have a high relative absorptive capacity that eventually facilitates integration. On the other hand, the presence of knowledge complementarities would, especially in high-technology acquisitions when technology complementarities are combined, foster integration (Makri et al., 2010). Both streams would come to the conclusion to have a higher degree of integration for the target firm, but with very different initial assumptions about firm relatedness. Imagine a pharmaceutical company acquires a robotics company. On paper, these firms would appear seemingly unrelated, which would also be suggested by SIC codes. However, even though they are not similar, they might be highly complementary, if, for example, the pharmaceutical acquirer buys the robotics firm with the goal to modernize its medical device systems. In reality, this type of a case could be recognized as a related acquisition. Due to the existence of such examples, the differentiation between similarity and complementarity is inevitable.

For the purposes of this study though, we generalized firm relatedness as similarity with the use of SIC codes because we could not obtain specific data about the knowledge similarity or complementarity due to a lack of available information. Overall, our finding coincides with the literature. However, considering this on a more granular level, firm relatedness should contain a more thorough analysis of similarity and complementarity because similarity on its own is not the only proxy to assess an acquisition's potential to create value (Kim & Finkelstein, 2009).

5.2 Cluster Effects on Post-acquisition Integration

The second part of this discussion is related to the interplay of post-acquisition integration and business cluster theory. Hypothesis 3 states that cluster affiliation will negatively impact the degree of post-acquisition integration. Like the previous hypotheses, our model was able to confirm this hypothesis. This result suggests that a target firm's association to a business cluster makes it more likely to have a lower degree of integration, or in other words, more autonomy. That being said, the connection to a cluster acts as a barrier that prevents firms to become structurally integrated or even dissolved because of the clusters' protective and supportive ecosystem.

The literature offers potential explanations for our observed phenomena. One of these is social network theory in industrial clusters. Industrial cluster firms differ from other firms in that the clusters they are affiliated to reflect not just economic responses and motivations to the pattern of available opportunities, but also an unusual level of embeddedness and social integration (Gordon & McCann, 2000). Moreover, interpersonal trust and informality of the relationships among cluster firms can be seen as a major potential strength as opposed to pure market contracting (The Explorer, 2019; Williamson, 1989). Therefore, acquiring firms may observe that the target firm is nested in a social network system, thus protecting the target to some extent from a high degree of integration or even dissolvement.

Further, our findings can be also explained based on the innovation and education linkages that cluster firms possess within the respective cluster. Universities can help these firms and the cluster itself with knowledge creation and provide students with higher education (Lu et al., 2018). Universities are capable of increasing co-located firms' patents (W.-H. Liu, 2013), and support business relations (Bramwell et al., 2008). These arguments would support why acquiring firms do not plan with a high degree of integration for those targets which are affiliated to clusters.

Finally, many clusters in Norway, and thus also the firms within them, benefit from cluster acceleration programs of the Norwegian government (Arena, NCE and GCE). A high degree of integration or dissolvement into the acquiring firm would be counterproductive in reaping these benefits.

Nonetheless, there are also arguments why our findings may be at odds with current literature. If the acquiring firm wants to realize the cluster benefits for itself

and attempts to enter the cluster through the acquisition, then a high degree of integration of the target may be justified because the acquisition may provide instant access to network relations and labor (Lorenzen & Mahnke, 2002). Furthermore, acquired managers could facilitate an easy entry into the cluster for the new parent firm (Graebner, 2004).

To sum up, various perspectives in the literature would support our hypothesis. We assume that the acquiring firm observes the properties and benefits that the target cluster firm possesses. According to social network theory, the acquiring firm does not want to create a structural hole (i.e. disconnections between firm's partners) (Ahuja, 2000) for the target by highly integrating it. We thus claim that the continuing link to the cluster is very valuable for both the target and the acquirer.

The cluster arguments presented here can be also applied to Hypothesis 1b, which claims that cluster affiliation moderates the negative impact of relative firm size on the degree of post-acquisition integration, such that if a firm belongs to a cluster, then the impact is lower. In fact, what we can draw from this result is that cluster firms are more likely to be more autonomous than non-cluster firms up until a relative target firm size of 0.528 (approximately half as big as the acquirer in terms of employees). In Hypothesis 1a without the cluster interaction term, we had assumed that relatively small firms are more likely to be integrated to a higher degree. However, this result here shows that it is the opposite way when the relatively small target firms belong to a cluster. This finding intrigues us as it would also support the social network theory argument mentioned before.

Further, cluster membership outweighs the benefits of integrating small firms because of their innovation advantage in early stage industries where skilled labor plays a huge role (Acs & Audretsch, 1987). The network that the target firm enjoys in the cluster provides it with valuable resources, particularly when the firm is small and resource constrained (Baum, Calabrese, & Silverman, 2000). This network is characterized by relationships and resources resembling properties of an already well-established firm. Therefore, through connecting arguments in the literature, we assume that the acquiring firm observes that (a) the small target does not actually possess liabilities of newness/smallness (Freeman, Carroll, & Hannan, 1983) due to the network, and (b) it requires the network link to the cluster in order to continue to be innovative (Ferrary & Granovetter, 2009).

However, there are also circumstances in which an acquiring firm could benefit from removing a target from its cluster. For example, with increasing size of the cluster, congestion costs can arise that lead to diseconomies of agglomeration (Prevezer, 1997), which is the opposite of the desired cluster synergies. Furthermore, and maybe even more detrimental to small firms could be the increased competition and higher prices for skilled labor, land and utilities (Folta, Cooper, & Baik, 2006). In this instance structural integration might outweigh cluster affiliation benefits and justify an approach whereby the target ceases to be a part of the cluster.

Finally, we find that the preservation of a target's culture might be yet another factor outweighing the structural integration benefits of relatively smaller targets, thus strengthening the support we found for Hypothesis 1b. Displacing an acquired firm's organizational culture can be detrimental in a successful integration of relatively smaller targets (Cartwright & Cooper, 1993), serving as one of the reasons why acquirers are likely to structurally integrate them. However, in situations when small targets are embedded in clusters, the benefits of keeping them intact and autonomous might outweigh the potential integration gains. We already mentioned that firms belonging to clusters differ from non-cluster organizations in that they are embedded and socially integrated (Gordon & McCann, 2000), and that they reap larger benefits from trust and informal relationships (Williamson, 1989). In order for these firms to actually gain a competitive advantage from being in clusters, they need to be actively connected through inter-firm information flows and informal gossip. This allows them to participate in a complex multilayered communication ecology of the cluster known as the "local buzz" (Bathelt et al., 2004). If the organizational culture of the target suddenly has to undergo drastic changes, the chances are that it would not be able to remain as embedded in the cluster, thus reducing or even eliminating the benefits it initially gained from being affiliated to the cluster ecosystem. In a recent publication, Torger Reve supports the argument that culture plays a decisive role within clusters, and that cluster companies must cooperate and develop mutual trust (The Explorer, 2019).

Therefore, despite the relative ease of integrating smaller targets, there are network and cluster effects that outweigh the integration of the target firm and favor a more autonomous, standalone approach.

Finally, contrary to our prediction, cluster affiliation did not have any moderation effect on the relationship between relatedness and degree of integration.

We have already established that firm relatedness (similarity) is positively related to integration. However, the impact of firm relatedness on the degree of integration does not depend on cluster affiliation. It seems that the cluster element is irrelevant here. We would have assumed that the related target firm faces challenges without its ecosystem. Furthermore, due to the fact that we only considered similarity as firm relatedness, we neglected the complementarity between the firms that could have had a significant impact. If this study could take into account the assertion of (Makri et al., 2010) suggesting that high-tech acquirers should carefully evaluate both similarity and complementary of their targets, then findings on cluster affiliation may have moderated the relationship of relatedness on integration.

However, as no previous paper has analyzed this effect (to the best of our knowledge), we can only speculate why the interaction term was non-significant in our study.

6. Implications & Conclusion

6.1 Theoretical, Managerial & Methodological Implications

6.1.1 Theoretical implications

We start the theoretical implications by following a call from Graebner et al. (2017) who asked in their future research section for more guidance regarding the *processes* through which the antecedents and consequences of post-acquisition events unfold.

Notably, we advance the literature by taking the first step towards connecting business cluster theory with post-acquisition integration theory. First and foremost, we elaborate on the interplay of these theories and confirm what we expected. Subsequently, we test something new, namely the impact of cluster affiliation on the post-acquisition degree of integration and find supportive evidence for our predictions. Finally, we tested whether a firm's affiliation to a cluster has a moderating effect on the predictors of the target's degree of integration. In addition, we contribute towards inconclusive research that relative firm size influences post-acquisition events. More specifically and to the best of our knowledge, no previous study has examined whether relative size will determine post-acquisition integration outcomes.

We can also confirm that firm relatedness is in fact an antecedent of post-acquisition integration. Our study complies with the findings of (Datta & Grant, 1990) that higher firm relatedness is associated with a higher degree of integration in a different setting. Moreover, we observe that research extends the relatedness discussion by examining complementarity versus similarity. As our thesis is the first one to look at relatedness combined with clusters and the impact on integration, future literature could build on our work and try combining the more granular view of relatedness (in terms of similarity versus complementarity) and study how these interact with clusters.

Finally, our paper makes theoretical contributions to cluster theory. We push business cluster theory forward by finding that cluster affiliation of targets affects acquirers' decisions regarding the degree to post-acquisition integration of the acquired firms. This has the potential to draw more attention to research what role clusters play in both post-acquisition integration processes as well post-acquisition performance.

6.1.2 Managerial implications

We structure managerial implications into three subcategories, namely buy-side, sell-side and implications for policy makers.

By acknowledging our findings, the buy-side (acquiring managers) might pay more attention towards evaluating the high-technology target's belongingness to business clusters before making executive decisions regarding the integration versus autonomy dilemma. For instance, in a situation where a relatively smaller firm is the target and the optimal integration approach has been deemed to be a high degree of integration because of the ease of integrating smaller targets, managers might consider re-evaluating the integration strategy in cases where the target belongs to a knowledge-intensive business cluster. They might, for instance, decide to maintain a certain level of target autonomy to preserve its organizational culture in order to continue gaining benefits offered by the cluster.

The sell-side (acquired managers), on the other hand, are able to utilize our findings just the opposite way. In negotiations after the acquisition has taken place, the acquired executives can try to increase their bargaining power over autonomy by indicating that they belong to a wider network (cluster). In certain cases, especially for smaller, more entrepreneurial firms, they could use our findings to strengthen their arguments if they want to establish a lower degree of integration.

As expected, these targets will, on average, face a lower degree of integration and managers can rely on this finding to be more comfortable in strategizing the post-acquisition integration process.

Lastly, policy makers can also draw conclusions from our study. Our findings support the assumption that business clusters in Norway have the potential to act as protection mechanisms for national high-tech firms. Having said that, even after undergoing an acquisition, a firm is less likely to be highly integrated or even dissolved (which is often the result of structural integration) if it was part of a cluster. Hence, this finding might draw policy-makers attention towards improving the ecosystem for sustainable cluster development and ensuring that the value of clusters is appropriated accordingly. This could be intriguing for government entities in Norway and potentially abroad and could motivate them to inject more funds in the R&D of clusters. Moreover, it could attract a higher inflow of venture capital and foreign direct investment into Norwegian clusters.

6.1.3 Methodological implications

Our research differentiates methodologically from other papers. For example, instead of measuring integration versus autonomy as a binary dependent variable (e.g. Puranam et al., 2009) we advance our dependent variable to an ordinal measured construct. In order to obtain the degree of integration data, we had to use secondary data and operationalize the concept of integration. This process required a very close and detailed examination and a great deal of manual work was needed. We believe that this approach can add to the literature if primary data is not available to investigate the degree of integration.

Secondly, we also took a very detailed look at how to measure cluster affiliation with secondary data. Many papers that we have seen (e.g. Gilbert, McDougall, & Audretsch, 2008; Keeble & Nachum, 2002) capture cluster affiliation with a location measure alone. However, based on literature which does not restrict clusters to location solely, our research also accounts for membership to cluster organizations to verify if a firm belonged to a cluster in its past. Therefore, we believe that we also contributed to literature with a different, more representative approach of measuring cluster affiliation when only secondary data is available.

Lastly, while some publications (Angrist & Pischke, 2008) consider OLS to be appropriate even in cases where the response variable is ordinal scaled (limited

dependent variable), we find evidence that using ordinal logistic regression is a more restrictive model which is not too common in managerial literature and significantly increases the validity of our findings. After setting up an OLS regression and comparing it with our results here, we trust the finding from the ordinal logistic regression more.

6.2 Limitations

Similarly to other non-experimental studies that rely on historical data, we must consider alternative explanations to our obtained results. Our study makes significant contributions from methodological, theoretical and managerial perspectives; however, it bears certain limitations.

Secondary data. This study almost exclusively depends on secondary data, and, although it tends to be higher-quality than primary data (Stewart & Kamins, 1993), we must carefully evaluate the initial purpose of reports, press releases and news articles. Saunders et al. (2009) refer to Reichman (1962) and caution that these types of secondary sources sometimes might emphasize the most important facts and opinions from their viewpoints, which have been influenced by the authors' culture and predispositions. To minimize these potential inconsistencies, we carefully analyzed each source and cross-checked the obtained information with other sources before making generalizations.

Sample size and frame. Although 92 observations have been regarded as enough for this study, it would have been favorable to obtain a larger sample to increase the probability of finding more significant relationships. A similar study by Zaheer et al. (2013) points out a comparable limitation with a very similar sample size. Second, our sampling frame and the context of our study should be taken into account. As mentioned for external validity, our research is limited to a specific country, Norway, which can potentially inhibit the generalizability of the results.

Degree of integration. We had limited resources to obtain primary data on each deal and were limited to rely on secondary data obtained from databases such as SDC, Proff Forvalt, Orbis and Zephyr and on publicly available information such as press releases. Moreover, several targets and acquirers have already been dissolved. We acknowledge, however, that our study could have been corroborated and complemented by using supportive primary data in the form of semi-structured interviews, questionnaires or surveys targeted at key people in the acquiring or

target firms. Without thoroughly examining integration in a more detailed view of how it develops over time in social, procedural, physical and cultural contexts, we are limited in our understanding of the degree of integration of the target firms.

Firm relatedness. To measure firm relatedness, the most precise and widely used proxy available to us was SIC codes; however, literature identifies significant limitations to this approach. Although it may capture market and product relatedness, the approach often fails to encompass resource relatedness (Lien & Klein, 2009). SIC codes might sometimes convey a complete lack of relatedness while in practice the two firms have a lot in common and the deal has a high degree of complementarity. Therefore, it is necessary to capture other interdependencies, such as the descriptions of products or services, measures of human resource profiles, patent similarities, commodity flows or input ratios (Lien & Klein, 2009).

Cluster affiliation. In some cases, particularly those dating longer in the past, it was more complicated to find evidence for cluster affiliation of the target firms. The concept of clusters in Norway started becoming more recognized only around 2010s, when most GCE, NCE and Arena programs were launched, and the clusters became publicly mapped out. Hence, identifying cluster affiliation for deals distant in the past required more extensive archival data search. We must subject our findings to the possibility that some facts on the actual situation might have not been adequately represented on the archived internet pages, thus lowering the construct validity of this item.

Time period. The choice of the ten-year time period from 2006 to 2015 places constraints on the study. Our study contains the period of the 2008 financial crisis, which we attempt to capture in our model using the financial crisis control binary variable, which differentiates between acquisitions ex ante and ex post the crisis. According to Kotz (2009), however, it is difficult to precisely capture the beginning of the global financial crisis. We assume that the crisis period began in September 2008; however, we acknowledge that other interpretations might assume that it began in early 2007 when several subprime mortgage lenders went bust. In general, we also have to take into account that the use of another time period might have generated other results.

6.3 Directions for Future Research

Our study also provides a number of directions for future research. First and foremost, future studies could build on this paper and explore different predictors such as the acquisition experience of the acquirer. By that it could be particularly interesting to see how acquisition experience of the acquirer prior to the deal impacts the decision to integrate the target to a certain degree, and whether this moderates the impact of relative firm size on the degree of integration.

Secondly, future research may also take into account the dimension of the acquirer's cluster affiliation. In deals where the acquirer possesses a cluster network for itself, decisions regarding the level of post-acquisition integration might change as well.

Thirdly, future research could build on our work and try implementing a more granular view of firm relatedness, which would be decomposed into similarity and complementarity, and could study how these dimensions interact with clusters and its final effect on the degree of integration.

Finally, more theory building papers are needed in order to understand the mechanisms of cluster affiliation in an acquisition environment. Currently we know very little about how much decision makers take cluster features into consideration when bidding potential targets. Furthermore, if clusters are taken into account, when does this happen and how is this evaluated in the due diligence? The answer to all these proposals will yield more accurate insights in the interplay of cluster and post-acquisition integration theory.

6.4 Conclusion

This study revolved around the acquired Norwegian high-technology firms and analyzed what happened to them after the acquisitions had taken place. The objective of the study has been to identify how certain predictors, such as relative firm size, firm relatedness, and target firm's affiliation to a cluster affect post-acquisition integration of acquired targets. Thereby we have aimed to connect two broad literature streams, namely business cluster theory and post-acquisition integration theory.

We found that these predictors had a significant effect on the degree of integration of the acquired firm. Furthermore, the results support our hypothesis that cluster affiliation moderates the impact of relative firm size on the degree of post-acquisition integration in the sense that relatively small firms affiliated to

clusters are more likely to be left autonomous after an acquisition than non-cluster firms of the same relative size.

Not only are the findings in line with what we hypothesized based on the available literature, but our cluster related discoveries are also of exploratory nature and contribute to the business cluster research in particular. In addition to these theoretical advancements, we contribute with a new methodological approach and relevant managerial implications that serve as better support in post-acquisition integration decision making.

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Appendices

Appendix A – Removed Observations Table

Table 2. Removed observations with respective justifications

No. of removed deals	Justification
14	Acquiring companies already had a majority stake in the target and acquired remaining stakes, or acquired a only minority stake, which do not classify as acquisitions.
6	Target firms were subsequently acquired again by new owners within 5 years, leaving an insufficient post-acquisition time period to assess whether structural integration had taken place or not. We present arguments for the 3-5-year post-acquisition time period under the dependent variable section.
6	Lack of information about deal and employee numbers.
5	Asset purchase agreements (divestments of business units) and not actual acquisitions of a Norwegian company.
2	Restructuring processes in Norwegian conglomerates.
2	Targets were spun-off from and undertook an IPO (100 percent acquisition announcement from shareholders at the exchange).
1	Effective date of the deal was outside of the time horizon of this study.
36	TOTAL

Appendix B – Correlation Matrix & Descriptive Statistics

Table 3. Means, standard deviations and correlations

Variable	*M*	*SD*	1	2	3	4	5	6
1. Degree of integration	2.30	1.59						
2. Relative firm size	2.50	8.16	-.19**					
3. Relatedness	0.50	0.50	.18*	-.01				
4. Cluster	0.54	0.50	-.18*	-.06	-.17*			
5. Age - target	15.92	11.85	-.15**	.07	.07	-.04		
6. Geographic distance	1426.12	2433.08	-.12	-.10	-.13	.10	.02	
7. Financial crisis	0.36	0.48	.01	-.18*	-.07	.00	-.17	-.19*

Note. *M* and *SD* are used to represent mean and standard deviation, respectively.
* indicates $p < .10$. ** indicates $p < .05$. *** indicates $p < .01$.

Table 4. Descriptive statistics

Variable	n	Mean	SD	Min	Max	Description
Degree of integration	92	2.30	1.59	0	4	Ordinal 4-point scale with the possibility of 5 different values, coded as 4 = complete structural integration, 0 = high autonomy of the target firm
Relative firm size	92	2.50	8.16	0	55.9	Standardized; relative size measured as a ratio between the target and acquirer (employees)
Firm relatedness	92	0.50	0.50	0	1	Binary variable; if target was unrelated = 0, if related = 1 (based on 2-digit SIC codes)
Cluster	92	0.54	0.50	0	1	Binary variable; belonging to a cluster (yes) = 1, not belonging to a cluster (no) = 0
Age - target	92	15.92	11.85	0.6	74.50	Target age (years) measured as the difference of age at effective acquisition date and the date of incorporation
Geographic distance	92	1426.12	2433.08	0	8408.76	Standardized; distance (km) calculated using Great Circle distance formula
Financial crisis	92	0.36	0.48	0	1	Binary variable; if target was acquired prior to the financial crisis = 1, if else = 0

Appendix C – Preliminary Thesis Report

BI Norwegian Business School - campus Oslo

GRA 19702

Master Thesis

Preliminary thesis report

Preliminary Master Thesis Report: Post-acquisition Structural Integration and Cluster Affiliation of Norwegian High-Technology Firms

Navn:	Jens Helmes, Rolands Englands

Start:	20.08.2018 09.00
Finish:	15.02.2019 12.00

Preliminary Master Thesis Report

Post-acquisition Structural Integration and Cluster Affiliation of Norwegian High-Technology Firms

Campus:

BI Oslo

Supervisor name:

Torger Reve

Programme:

Master of Science in Business, major in Strategy

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Summary

This preliminary thesis report revolves around our study of Norwegian high-technology acquisition targets and to what extent these targets are structurally integrated into the acquiring firm. This study examined both national and international acquisitions in Norway. We apply a quantitative approach and attempt to find significant relationships between acquired firm age, acquiring firm relatedness, cluster affiliation of the acquired firm and the dependent variable, the *degree of structural integration* of the acquired Norwegian high-technology firm. We draw on a sample of 151 acquisitions in Norway over a 10-year period (from 2006 to 2015) with a minimum deal value of 10 million Euro.

1. Introduction

Over the last seven to ten years we have seen many Norwegian high technology firms being absorbed through acquisitions. A lot of these deals have been driven by valuable resources, similar to the general consensus in academic literature which identifies this as the main motive for mergers and acquisitions (M&A) (Ahuja & Katila, 2001; Chaudhuri & Tabrizi, 1999). Today technology acquisitions have been found to be the dominant force of acquisition activity both worldwide and in Norway (Deloitte, 2018; Haavind, 2019).

Norway can be seen as a developing technology hub with a high number of full-time personnel in research and development who are exposed to training, promising career opportunities and a well-developed research environment (MarketLine, 2018). Often overlooked for Sweden with its big retail tech plays like Skype, Spotify, and Klarna, Norway has a track record in B2B exits to big enterprises like Microsoft (FAST), Cisco (Tandberg), Texas Instruments (Chipcon) and Algeta (Bayer). What also makes Norwegian companies attractive is the innovative ecosystem and clusters they are operating in. Reve and Sasson (2015) give several reasons for why Norway is successful with its business cluster approach. According to them, knowledge and competence development, and establishment of deliberate cluster policies for the main international industries (e.g. NODE, Blue Maritime) are key success factors.

Sometimes the outcome, however, is that some of the acquired high technology targets cease to exist in Norway as a result of post-acquisition structural integration. In other words, after the parent firm integrates sociocultural, marketing, production and system aspects each to some degree, the acquired firm is no longer an autonomous standalone entity (Bauer & Matzler, 2014; Haspeslagh & Jemison, 1991; Puranam, Singh, & Zollo, 2006). For instance, structural integration has been implemented by big players such as German Bayer AG, when it acquired Algeta, where the target was simply “absorbed”, most of its assets and human capital were integrated into the conglomerate, and nothing much apart from some administrative duties were left here in Norway.

At this point, this thesis builds on the acquired tech firms in Norway and analyzes what happens to them after the acquisitions have taken place. We aim to find whether acquired firm age and acquiring firm relatedness have any effects on the degree of structural integration of the acquired firm, and we then explore whether acquired firm cluster affiliation has any moderating effects on these

linkages. By examining how cluster affiliation moderates the degree of structural integration of acquired Norwegian technology firms, we attempt to find whether clusters can serve as mechanisms to "retain" potential scale-up stories in Norway and, thus, valuable talent and knowledge.

Based on all the above mentioned observations, our research question is as follows: *How do acquired firm age, acquirer's relatedness and acquired firm's affiliation to a cluster influence the degree of post-acquisition structural integration of the acquired firm?*

The very interesting part here will be how the cluster membership of the acquired Norwegian technology firm will moderate our estimates. As the cluster needs firms to operate, the reciprocal relationship is also crucial. Firms equally depend on the cluster because of knowledge spillovers (Van Geenhuizen & Reyes-Gonzalez, 2007) and cooperation benefits (Porter, 1990). Norway has been starting to strengthen its business cluster policy with a national cluster program since the early 2000s. Meanwhile, the country possesses more than 35 different industry clusters on three levels (Arena, NCE, GCE).

2. Literature Review

Companies may choose to pursue growth through mechanisms such as organic growth, joint ventures, alliances or M&A. The latter has been a crucial source of corporate development and firm growth, and it has been important in strategic management practice for more than a century (Cartwright & Schoenberg, 2006). The main motivation that drives acquisitions has been found to be valuable resources, including target firm's technology and capabilities (Ahuja & Katila, 2001; Chaudhuri & Tabrizi, 1999), and over time this motive has increased in importance (Bower, 2001). Other motives for M&A can include vertical or horizontal integration, geographical expansion, resource sharing, market power gains, diversification and efficiency gains (Golbe & White, 1993).

Obtaining valuable technology and capabilities through M&A has been a strong competitive force between acquirers. In the presence of accelerated technological change, many firms seek to rejuvenate and readjust their capabilities through external growth strategies instead of undergoing the uncertain and time-consuming process of accumulating them internally (Capron & Mitchell, 2009; Dierickx & Cool, 1989; Knott & Posen, 2009; Steensma & Fairbank, 1999). This external growth approach has been especially observed through a dramatic

increase of acquisition activity in high-technology sectors such as electronics, telecommunications, biotechnology, information services and software (Sikora, 2000). For instance, a strategy often adopted in these cases is the acquisition of small technology-based targets by large established firms (Granstrand & Sjölander, 1990). Mulherin and Boone (2000) support this by pointing out that one of the main triggers of M&A waves at the end of the twentieth century was technological innovation. During the second decade of the twenty first century, technology had become even more decisive in driving acquisition activity. Industry reports have considered technology as a force behind what looks like the seventh acquisition wave, and it is expected that the size of the deals and the number of transactions will increase, making it more relevant than ever to study high-tech acquisitions (Deloitte, 2018; Ernst & Young, 2015; Kengelbach et al., 2017).

One of the most critical phases influencing the success of technology acquisitions is the post-acquisition integration phase (Haspeslagh & Jemison, 1991; Stahl & Voigt, 2008), which we further examine in detail to propose four hypotheses that are tested later on. Our first sub-section reviews the concept of structural integration in the context of technology acquisitions, followed by two subsections each examining how the degree of structural integration of the acquired firm is potentially linked to acquired firm age and the acquiring firm relatedness. In the last subsection we take a different perspective on structural integration by looking at the age and relatedness factors through a theoretical lens of cluster theory (Porter, 1990; Reve & Sasson, 2012).

2.1. Structural Integration in Technology Acquisitions

Research on predictors and consequences of post-acquisition structural integration is relatively divergent. Some scholars find that a high degree of integration in technology acquisitions can result in destruction of the innovative capacity that served as the main motive of the deal in the first place (Birkinshaw, Bresman, & Håkanson, 2000; Chaudhuri & Tabrizi, 1999; Graebner, 2004; Puranam, Singh, & Zollo, 2003; Ranft & Lord, 2002). Other empirical evidence argues that at least some level of integration is necessary for technology M&A success (Bauer & Matzler, 2014; Chatterjee, Lubatkin, Schweiger, & Weber, 1992; King, Dalton, Daily, & Covin, 2004; Singh & Montgomery, 1987; Zollo & Singh, 2004).

The phase following technology acquisitions presents a dilemma to the parent organization. Sometimes acquired firms are better off structurally integrated in order for the acquiring firm to successfully commercialize the obtained technology in a coordinated manner. In other cases, the acquirers need to maintain a certain degree of autonomy within the acquired firm to prevent the disruption of its innovative capacity (Haspeslagh & Jemison, 1991; Puranam, 2001; Puranam, Singh, & Chaudhuri, 2009; Ranft & Lord, 2002).

We define structural integration as a formal organizational design intervention that achieves coordination by combining formerly separate organizational units into the same unit after an acquisition has taken place (Haspeslagh & Jemison, 1991; Paruchuri, Nerkar, & Hambrick, 2006; Puranam et al., 2009; Puranam et al., 2006; Puranam & Srikanth, 2007). These types of newly created organizational units imply the existence of common work practices and goals, shared authority and common procedures (March & Simon, 1958; Thompson, 1967). In addition, Puranam et al. (2009) mention collocation of the target and the acquiring firm as an important aspect of structural integration, which we also adapt as an essential property when referring to structural integration. Therefore, a high degree of integration would result in a high degree of change in the acquired firm on different organizational levels. In other words, changes would occur on sociocultural, marketing, production and system integration levels (Bauer & Matzler, 2014), making it debatable whether full integration can be achieved at the same time on every organizational level (Birkinshaw et al., 2000). The desired implication of structural integration can be referred to as the "coordination effect" since the main purpose of it is enhancing coordination between the acquirer and the target (Puranam et al., 2009).

In contrast, the opposite of structural integration is autonomy, which can also be defined as "structural separation" (Puranam et al., 2009). It is an organizational state that occurs when distinct activities of the acquired and acquiring firms remain organizationally distinct regardless of common ownership (Datta & Grant, 1990).

Further, we identify the main findings that support and challenge post-acquisition structural integration as an organizational design intervention.

2.1.1. Disadvantages of structural integration in technology acquisitions

Puranam et al. (2006) predict that structural integration will have a negative impact on innovation outcomes in technology acquisitions of firms that have not launched products before the acquisition took place. On the contrary, it will be more favorable for acquired firms that have previous experience in launching products. As for the timing, they find that structural integration of the acquired firm will have a negative effect on innovation outcomes in the short run; however, subsequent innovation outcomes increase the potential positive effects. A later study by Puranam et al. (2009) examines acquisitions of component technology and concludes that in these cases acquired firms are more likely to be structurally integrated. The probability of structural integration, however, dramatically decreases when a certain level of common ground between the two firms exists. Here, common ground is defined as knowledge that is both shared and known to be shared (Carston, 1999).

For deals where standalone products are acquired, the interdependence between the product teams of the acquired and acquiring firm is lower than in component technology acquisitions, indicating that there is less coordination needed (Galbraith, 1974; March & Simon, 1958). Building on these arguments, Puranam et al. (2009) argue that in this case there is a limited value of the coordination effects because there are insignificant gains from coordinating interdependence as well as a potential for disruption caused by a loss of autonomy, minimizing the total net gains from structural integration.

Through the lens of agency theory Paruchuri et al. (2006) and Puranam et al. (2006) argue that structural integration can weaken the linkage between reward and effort because unit integration increases the number of agents whose conduct influences the performance of units. Moreover, Puranam et al. (2006) discuss a possibility of lowered productivity and motivation of R&D employees in the target firm as a result of integration due to acquired firm's disrupted autonomous existence. In these cases, talented staff with tacit skills and knowledge, which is typical for technology firms, are often attracted by smaller companies that offer high-powered incentives, and these incentives disappear after the integration has taken place (Zenger, 1994). Ernst and Vitt (2000) also discuss how structural integration is likely to demotivate such employees, critically undermining the innovative capacity of the target firm. Baker (2002) adds up by drawing upon agency theory and implying that grouping together formerly distinct

organizational units can increase free-riding in the newly created unit and preclude the usage of sharper incentives. Other potential personnel complications arising from the removal of target firm's autonomy include the departure of key acquired executives due to them feeling less important (Hambrick & Cannella Jr, 1993), misconceptions of the local marketing or operating environment arising from cultural differences (Weber, Shenkar, & Raveh, 1996) and inefficiencies emerging from the disruption of routines (Paruchuri et al., 2006).

Puranam and Srikanth (2007) also link structural integration to certain forms of exploration (capability leverage) and exploitation (knowledge leverage). This can be illustrated as the degree to which ongoing innovation is pursued vs. the degree to which the existing knowledge is used. The authors find that structural integration has a negative effect on the acquiring firm's abilities to leverage the innovative capabilities of acquired firms, which impairs exploration.

2.1.1. Advantages of structural integration in technology acquisitions

Although structural integration undoubtedly poses disruptive effects in the post-acquisition phase, it can facilitate mutually predictable actions because all parties involved follow the same procedures, share a common goal and answer to the same superiors (Puranam et al., 2009). This mutual predictability can occur due to the realized coordination effects (Galbraith, 1977; March & Simon, 1958). In a research of seven detailed case studies of tech acquisitions Ranft and Lord (2002) propose that rich, unstructured communication through frequent face-to-face interactions helps avoiding the disruptive consequences of cultural and administrative integration while still leveraging the coordination benefits.

As mentioned in the previous subchapter, structural integration will be favored when a firm acquires complementary technology (Puranam et al., 2009). This occurs because coordination benefits rise together with a higher level of interdependence and, thus, coordination gains will exceed the costs from the loss of autonomy (Thompson, 1967). Here, the acquired firm's technology becomes a part of a bigger system, resulting in a property described as "system dependence" (Winter, 1987). Seeking higher coordination is then favorable due to the considerable readjustments that must be made to other parts of the "system" in both the acquired and acquiring firm.

Acquisitions featuring component technologies are thus likely to be characterized by high levels of interdependence between acquiring and target

firms. Many authors support this and find that harmonization of systems and resource rationalization is may be needed to effectively manage acquisitions of highly interdependent components, often accomplished through structural integration (Capron, 1999; Datta, 1991; Haspeslagh & Jemison, 1991; Homburg & Bucerius, 2005; Shrivastava, 1986).

Formal procedures and systems, however, are not the sole elements impacted by structural integration. This approach also forms the development of informal organizational mechanisms that support knowledge transfer. Such mechanisms include informal communication channels, the formation of common ground and group identity (Camerer & Knez, 1996; Ibarra, 1993; Kogut & Zander, 1996; Krackhardt, 1990; Moran & Ghoshal, 1996).

While the previous subchapter points out the findings of Puranam and Srikanth (2007) that structural integration negatively affects the acquired firm's capabilities, a different conclusion they make supports integration strategy. The authors claim that structural integration will positively affect acquirer's success at leveraging the target's existing knowledge base through facilitating exploitation of capabilities. In achieving this, however, acquisition experience is shown to be a critical success factor.

2.2. Acquired Firm Age and Structural Integration

In paving the way for the ecological theory of the firm Stinchcombe (1965) introduced the "liability of newness" construct. Stinchcombe (1965) explains that this liability is revealed by the fact that new roles have to be established and learnt. Moreover one has to deal with new organizations and new organizational types. Similarly, (Darwin, 1859), described the "struggle for survival" on human level and researchers have then applied Darwin's theory of limited resources to organizational behavior. Since then, the literature (Bruderl & Schussler, 1990; Freeman, Carroll, & Hannan, 1983) assumes higher risks of failure for young organizations compared to old ones. Stinchcombe argued that liability of newness exists because of four main reasons. First and foremost, new organizations require to create new roles and tasks that have to be learned. Second, as organizations are young and relatively inexperienced, new roles might have to be invented, which could interfere with capital or creativity restriction. Third, social interactions in a new organization resemble those between strangers, and a common normative basis or informal information structure may be lacking.

Finally, stable links to customers or suppliers are not yet established when an organization begins its operation (Stinchcombe, 1965).

Bruderl and Schussler (1990) build on the liability of newness but take a step forward and find that in reality a liability of adolescence may be more appropriate to assume. They claim that individual firms face an adolescence, during which mortality is very low. After this phase, the death risk jumps to a high level because of depletion of initial resources. The length of this adolescence varies with the amount of initial resources of a firm. If we assume this to be the case, young tech firms should experience the same scenario.

Moreover, Delmar and Shane (2006) argue that founding teams of new firms (start-ups) with prior experience are less likely to fail than firms with no prior start-up experience. The authors assume that this is the case based on previous experiences of hiring employees, finding capital, and establishing links with customers and suppliers. Moreover, experience increases the network and tacit knowledge about the process to lead a new firm. Their research on start-up experience remedies the liability of newness and smallness to some extent.

The same argument applies when a new firm is acquired by a company that has already experience in the market - i.e. it benefits from resources, knowledge transfer, and network expansion. It is comparable here because a firm which is likely to fail would still be likely to fail shortly after an acquisition. The acquisition itself would not change much of that. But when acquiring younger targets and considering their liabilities, it can be assumed that acquirers would prefer structural integration over autonomy. Based on the previous discussion about structural integration, the coordination benefits could prevent the effects of the discussed liabilities of young firms. Therefore, we argue that as a new firm lacks these properties when it starts to operate, an acquiring firm is more likely to integrate the young venture because of liabilities of newness as well as liabilities of adolescence.

Whereas large firms do possess advantages in generating incremental innovations, small (technology) firms are more successful in introducing breakthrough innovations (Baumol, 2002). The development and growth of young technology-based firms is particularly dependent upon innovatively combining their own firm-specific knowledge with that of external partners because young firms are resource constrained (McDougall, Shane, & Oviatt, 1994). Moreover, young technology firms depend upon partners to rejuvenate their knowledge

(Autio, Sapienza, & Almeida, 2000). Due to their learning advantages of newness (i.e. when technology firms are young, they are better able to assimilate knowledge), they can make use of their fast learning ability in order to survive and grow (Autio et al., 2000). Due to this reason, acquirers will integrate young firms, because they will learn faster and the transfer of tacit knowledge that resides in individuals is necessary (Graebner, Eisenhardt, & Roundy, 2010). Therefore, we would assume that younger firms are more likely to be structurally integrated than older firms. These arguments lead us to the development of our first hypothesis, as follows.

Hypothesis 1A: *Acquired firm age will be negatively related to structural integration of the acquired firm.*

2.3. Acquiring Firm Relatedness and Structural integration

Especially the target firm's technological knowledge and the degree of relatedness between acquiring and acquired firm have been identified by the literature as a crucial predictor of post M&A innovation performance (Cassiman, Colombo, Garrone, & Veugelers, 2005; Cloodt, Hagedoorn, & Van Kranenburg, 2006). From a learning perspective, the reason being the absorptive capacity - i.e. the more similar the two firms' technological knowledge, the more quickly the acquired firm's knowledge can be assimilated and commercially exploited (Cohen & Levinthal, 1990). In particular, when the operations of the two firms are similar, the acquiring firm can improve operational efficiencies by removing redundancies in the post-acquisition period (Capron, 1999; Pablo, 1994).

Therefore, related acquisitions are suitable to take advantage from post-acquisition structural integration and unification of operations and thus, lower levels of autonomy can be expected (Datta & Grant, 1990). The authors hypothesize that a greater degree of autonomy will be provided to the acquired firm in unrelated (e.g. private equity firms) than in related acquisitions (e.g. industrial buyers). A high level of interdependence between the acquiring and acquired firms, resulting from acquisition in related product-market domains, increases the required level of control and coordination (Aghasi, Colombo, & Rossi-Lamastra, 2017). Structural integration can generate a compelling coordination effect between acquirer and acquired firms. This is especially valuable in the presence of interdependence between them (Thompson, 1967). On the other hand, unrelated acquisitions are likely to be granted much more

autonomy due to the lack of synergies in operations and integration opportunities (Cassiman et al., 2005; Datta & Grant, 1990). Another reason for this could be the low levels of familiarity of the acquiring firm's management over the acquired firm's operations. In such cases, it would make sense to grant more autonomy to the acquired firm (Datta & Grant, 1990).

Similar suggestions have been brought forward by Dundas and Richardson (1982), who say that the unrelated acquired unit should be kept independent because the corporate office (e.g. a PE firm) "has no technological skills, and operating divisions are focused on specific industries and market segments" (Dundas & Richardson, 1982, p. 294). However, as mentioned before, a high level of common ground between the acquiring and acquired firms (e.g. prior alliances) provides acquiring firms with a low-cost coordination mechanism and thus lower transaction costs (Puranam et al., 2009). Therefore, this would weaken the benefits of a higher level of integration and further promote more autonomy for the acquired unit (Aghasi et al., 2017).

Agency theory would predict that an important benefit of structural integration is that it enhances cooperation between the acquired and acquiring organization by aligning interests toward the goals of the integrated unit (Eisenhardt, 1989). The acquiring unit, due to its relatedness, is also more able to curb opportunism because it is able to observe more easily what the acquired unit is doing. This would be the case even though the risk of free riding by the employees of the acquired firm would be stronger (Puranam et al., 2009). Pablo (1994) finds that managers weigh task interdependence (i.e. firm relatedness) significantly in their integration decisions, as they view post acquisition integration as the means by which to achieve coordination and control between acquirer and target firms.

Finally, the literature has sought to use a transaction cost perspective (Williamson, 1989) to understand more profoundly the forms and effectiveness of interorganizational strategies such as acquisitions. However, TCE can also predict what kind of organizational structural will be most appropriate after related acquisitions. Especially after acquiring high-tech firms, asset specificity may be moderate to low due to relatedness between the parties. The frequency of exchange between the parties after acquisition, however, may increase sharply because of innovation desire with the newly acquired firm. In such cases, it may be wise to structurally integrate the acquired unit in order to lower transaction

costs as well as increase the ease of doing business with the acquired target (Williamson, 1989). Therefore, we assume the following in the second hypothesis, as follows.

H2a: *Acquiring firm relatedness will be positively related to structural integration of acquired firm.*

2.4. Cluster Theory

Over the last two decades, global competition between companies and higher customer expectations have tremendously increased. Among other factors, trade liberalization as well as companies' internationalization strategies have pushed the boundaries of global leadership and competitiveness even further. In the meantime, governmental interactions on the macro level try to enhance national and international competitiveness in certain economic pockets (e.g. oil and gas industry in the South of Norway). An abundance of literature reveals that the cluster concept has been shown to be an efficient instrument for strengthening regional and national economies.

Having said this, we want to clearly elaborate on what a cluster actually is. There are several definitions for this concept. The Norwegian Innovation Clusters in Norway defines it as follows:

"*A cluster is a geographical concentration of enterprises and related knowledge communities linked by complementarity or a similarity of interests and needs. The enterprises can gain easier access to important production factors and ideas for and impulses to innovation through interaction and cooperation. A cluster emerges over time, on the basis of location advantages and natural development dynamics.*"

Moreover, *"A cluster is generally defined and delimited on the basis of the participants' affiliation to:*

- *The same value chain or the same knowledge/technology base*
- *A geographical concentration of businesses and related functions*
- *A grouping of enterprises and related knowledge communities that have a critical mass that can form the basis for triggering cooperation and dynamic relations between the participants*
- *A common understanding of the cluster's importance and vision for further development."* (Norwegian Innovation Clusters, 2019)

More prestigious in this stream of research is Michael E Porter. According to (Porter, 1990), national clusters are formed by firms and industries linked through vertical (buyer/supplier) and/or horizontal (common customers, technology, etc.) relationships with the main players located in a single nation/state. A couple of years later, (Porter, 1998) expanded this definition by including institutions such as universities that would deliver and research the knowledge necessary to drive innovation within the cluster. Therefore, geographical proximity has been seen as an inevitable condition in order to facilitate the circulation of knowledge and the development of institutions, which in turn may enhance cluster effectiveness. According to Porter's (1998) arguments, regional agglomeration can encourage an enhanced division of labour among firms. Moreover, due to close physical proximity among numerous competing companies within the cluster, innovation is encouraged.

Innovation output can be seen as one of the most important measures for cluster energy and thus it is crucial for the member firms to support the entrepreneurial and start-up scene (young firms) in clusters with venture capital, business education and incubators (Rosenfeld, 1997). In well-functioning clusters, firms experience pressure to innovate. Reve and Jakobsen (2001) identify three distinct processes: advanced customer demand for innovative products and solutions; rich and open communication between customers and suppliers; and customers can choose between alternative suppliers (Reve & Jakobsen, 2001, p. 40). In less-functioning clusters, firms will, all else being equal, not be able to benefit from these processes, resulting in lower innovation rate and hence lower value creation (Reve & Jakobsen, 2001).

At this point it is important to mention that there are many synonyms for what we understand to be a cluster. Giuliani (2005) differentiates between geographical agglomeration *plus* sectoral specialization and geographical agglomeration *only*. In the group of geographical agglomeration plus specialization, we can find synonyms to the Porter's coined word "cluster" such as "technology district" (Storper, 1997), "Local innovation system" (Cassiolato, Lastres, & Maciel, 2003), or "Industrial cluster" (Morosini, 2004). In the group of geographical concentration only, we can see the synonyms "Milieu" (Capello, 1999), or "Productive arrangement" (Cassiolato et al., 2003). We want to point out that we will not stick to the classical word "cluster" but rather analyze whether

the conditions to be considered a cluster are met based on the above-mentioned definitions.

We argue that clusters are composed of private and public enterprises of various sizes, including producers, suppliers, and customers. Furthermore, professional associations (such as IKT Norge), academic and research institutes are essential parts of economic clusters.

Successful examples of cluster approaches can be found in regions focusing on predominantly high technological product outputs (e.g. Silicon Valley, Life Sciences Corridor in Boston area). These examples indicate that if economic activities are distributed and coordinated within a cluster, a stronger (national) competitiveness may result (Karaev, Lenny Koh, & Szamosi, 2007). Moreover, cluster-based economic development has proven highly successful in both smaller and larger West European countries (e.g. Norway).

2.4.1. Cluster theory in practice with the example of Norway

One of the most prominent researchers in cluster theory in Norway, Torger Reve, together with Amir Sasson, both from BI Norwegian Business School based in Oslo, presented the third large national study of industrial clusters in Norway, "A Knowledge-Based Norway" ("Et kunnskapsbasert Norge") (Reve & Sasson, 2012). In this research paper, thirteen Norwegian clusters were studied in close detail. Subsequently, the findings were presented to highly prominent economic and political players in Norway. In Reve's big three research projects about clusters in Norway, he tried to answer the question what makes an industry or an industrial location attractive for knowledge-based firms.

This question is subject to be answered when applying The Emerald Model (Reve & Sasson, 2012), which serves as a framework for analysis of the attractiveness of localities.

"It [The Emerald Model] conceptualizes attractiveness as six-dimensional. Localities differ in their attractiveness in accordance with their abilities to attract advanced education institutions and departments, highly talented employees, advanced academic specialist and research and development projects, competent and willing investors and owners, the creation and implementation of environmental solutions and a diverse and sizeable group of related firms. Cluster dynamics is the degree to which related firms compose their internal and external relationships to constitute an interrelated group of firms and institutions as

opposed to an augmentation of isolated firms and institutions merely sharing a certain geographical space." (Reve & Sasson, 2015, p. 8).

Overall, Norwegian cluster policies have focused on involving many actors such as the private sector, the investors, as well as academia (triple-helix approach) in order to build a sound cluster development program. The government saw its role more tailoring favorable market conditions than leading this process (Reve & Sasson, 2015). Today, Norway experiences wide acceptance for cluster models and the importance of knowledge externalities among policy makers and politicians, and many projects and programs have been started.

Norwegian Innovation Clusters, a government supported cluster program, currently aims to give support to cluster on three levels since 2014 (Norwegian Innovation Clusters, 2019). Arena is a 3-5 year, NCE a 10 year, and GCE a 10-year program, respectively.

The first level is the so-called Arena program. This program aims at immature clusters that are in an early phase of cluster collaboration. Clusters can be small or large, and the participants can be in a regional, national or international position. However, there must be a potential for increased innovation and value creation by way of increased collaboration between these parties. Arena offers financial and professional support for implementation of three-year development projects. Currently, the program consists of 19 cluster projects throughout Norway (Arena, 2019).

The second level is called Norwegian Centres of Expertise (NCE). The difference to Arena is that the clusters within NCE have already established systematic collaboration and have potential for growth in national and international markets. The members of the NCE clusters have considerable potential for growth in national and international markets. Within their respective sectors or technology areas, the clusters have a strong national position and the participants normally have clear and strong international ambitions. 14 current NCE clusters can be found throughout Norway currently. Well-known members such as NCE Aquaculture, NCE Seafood Innovation Cluster or NCE Oslo Cancer Cluster are represented (Norwegian Centres of Expertise, 2019).

The last and most known clusters of Norway are part of Global Centres of Expertise of Norway (GCE). GCE is characterized by mature clusters with a global position. Typically, these clusters have already established systematic collaboration and have developed dynamic relations with high interaction and a

broad strategic action area. The clusters have considerable potential for growth in national and international markets and are part of a strong innovation network. As mentioned before, academic and research programs are crucial here and GCE clusters reveal high-class educational programs that contribute with professional relevance to the cluster (e.g. University of Agder for GCE Node). Norway currently has three strong GCE clusters with companies that can claim top, global positions within their fields. These are GCE Blue Maritime, GCE Ocean Technology, and GCE Node (Global Centres of Expertise, 2019).

2.4.2. Acquired Firm Age and Cluster Belongingness

Due to a cluster's ecosystem and the principle of cooperation and competition within its system, a cluster can be described as a protecting force for (young) firms. Especially for young high-technology firms, theory suggests that agglomeration advantages such as knowledge spillovers and close ties to research and academia are important (Van Geenhuizen & Reyes-Gonzalez, 2007). Maybe even more important are linkages and cooperation. These linkages occur between entrepreneurial firms, between the scientists involved with the firms, between the firms and universities, and between corporations within the cluster. Entrepreneurial firms only gain from these linkages as long as they are part of the cluster and use them to maneuver their innovations through policy and legal approval thanks to the help of the cluster (Audretsch, 2001). In other words, new, technology-based firms are likely to become nested in innovation systems, trying to make profit through the innovative leveraging of the cluster community (Erkko & Helena, 1998).

Moreover, research indicates that clusters can enhance the survival of start-ups. Due to the affiliation with a cluster, young firms may find a larger number of specialized inputs and suppliers to work with, therefore allowing them to focus on their own work (Pe'er & Keil, 2013). Furthermore, young firms may find it easier to get access to a more skilled pool of labor due to their cluster belongingness (Pe'er & Keil, 2013). Again, the start-ups are only able to reap these benefits as long as they are part of the cluster.

Finally, research in Sweden found that locating in an industrial cluster has a significant positive effect on firm survival. These finding are explicitly applicable also for newly started entrepreneurial firms in particular. The authors suggest that new firms in stronger clusters not only have higher survival chances,

but also have higher economic performance by belonging to a cluster (Wennberg & Lindqvist, 2010).

Taking all these points together, we argue that clusters mitigate the liabilities of newness and smallness of young firms. We claim that cluster affiliation of target firms reduces the degree to which acquiring firms structurally integrate acquired firms and are more likely to give the cluster-affiliated target firms more autonomy. Therefore, cluster affiliation will act as a moderator compared to hypothesis (H1a). Based on this, hypothesis H1b will be as follows.

H1b: Acquired firm age will not be significantly related to structural integration of the acquired firm, if the acquired firm is affiliated to a cluster.

2.4.3. Acquiring Firm Relatedness and Cluster Belongingness

We have seen how cluster membership can have a positive impact on innovation as well as knowledge spillovers for member firms. Clusters provide firms access to a whole range of explicit and tacit knowledge relevant to their common industry sector (Tallman, 2013). Therefore, acquiring a firm that belongs to a cluster can be used as a network-opener and can help to bridge structural holes in a network (Zaheer & Bell, 2005). We argue that if firm relatedness between acquiring and acquired cluster firm is high, then more autonomy should be granted to the acquired firm because of its benefits of specialized infrastructure, its network of skilled regional workforce and its ties to regional academia. Despite the attractiveness of structural integration and the relatedness between the two firms, granting autonomy for the acquired cluster firm might be wise because of informal knowledge flow within the cluster that does not happen anymore if the firm is taken out and structurally integrated into the acquiring firm (Dahl & Pedersen, 2004).

Further, it may also be very likely the case that the acquiring firm, despite its relatedness, does not have the absorptive capacity (Cohen & Levinthal, 1990) to understand how knowledge is treated within clusters. On the other way around, the acquired cluster firm may not have the desorptive capacity (Lichtenthaler & Lichtenthaler, 2010) to convey technological knowledge without its cluster affiliation due to the strong relationships and collaboration (e.g. educational institutions) within the ecosystem. In other words, the acquired cluster firm has become dependent on the cluster institutions and without these “roots” it may be

hard for the acquired firm to fulfil its purpose to be an innovation tech driver as a structurally integrated unit within the acquiring firm.

To summarize, we hypothesize that one cannot just simply take out the Norwegian tech firm of its cluster because it can only function properly in its ecosystem. This leads us to the formulation of our last hypothesis, as follows.

H2b: Acquiring firm relatedness will not be significantly related to structural integration of acquired firm, if the acquired firm is affiliated to a cluster.

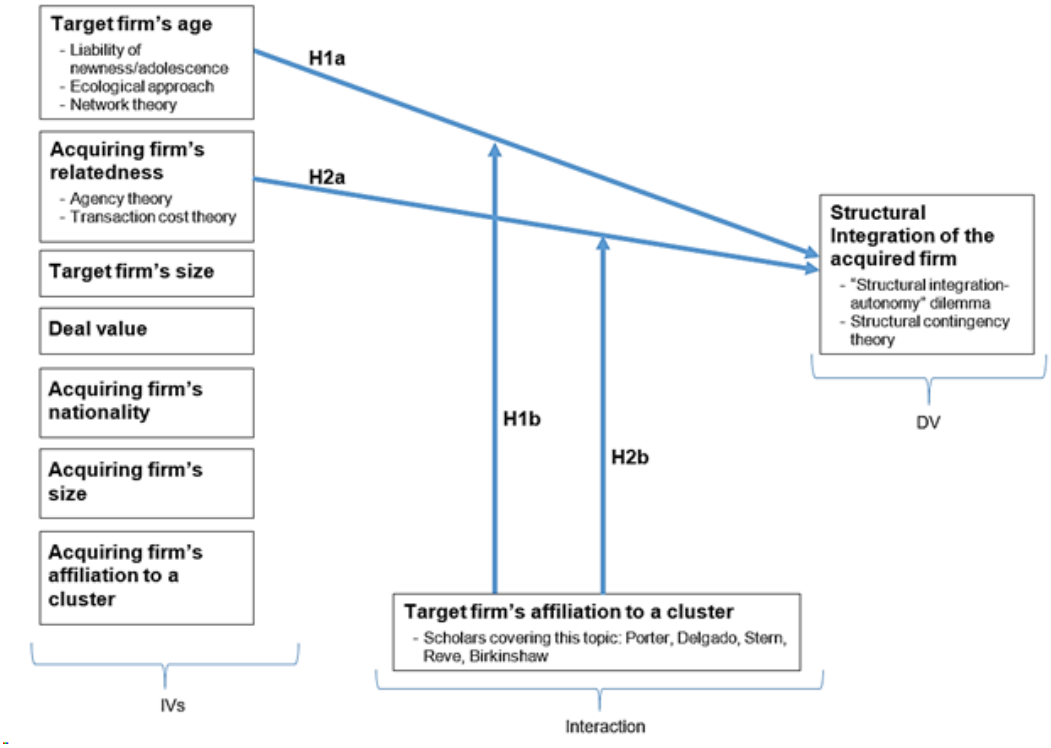


Figure 1 - Theoretical Model

Figure 1 summarizes our arguments graphically. We can see that the affiliation to a cluster of the target firm acts as a moderator for the relationships. We expect that exactly this affiliation turns or makes our estimates insignificant. The logic is that younger firms tend to have a higher degree of structural integration after acquisition because of liabilities of newness and smallness. The same is expected to happen if the relatedness of both the acquiring and the acquired firm is high.

However, the cluster affiliation would flip this relationship because of its protective and supportive ecosystem that creates incentives for giving autonomy to the acquired Norwegian tech firm.

3. Methods

This Master Thesis uses a deductive research approach. In other words, it applies the use of already established theory and earlier research to deduct hypotheses about the relationship between two or more variables (Collis & Hussey, 2013). The hypotheses are analyzed quantitatively with the help of an ordinal regression analysis.

3.1 Sample

Our data of Norwegian technology targets originates from the SDC Platinum M&A database provided by Thomson Reuters. It contains, depending on what information one filters, detailed deal and company information, dates about deal announcement and completion, deal value, target and acquirer SIC codes, acquirer nation as well as short business descriptions of the target and the acquirer. We complement and compare this data obtained from SDC with the M&A database Zephyr provided by Bureau van Dijk.

From SDC we obtained observations as follows. In a first step, we extracted all completed acquisitions within the time frame from 01.01.2006. until 31.12.2015. This 10-year period was put equal to acquisitions which had only Norwegian technology firms as targets. The choice of this time window was driven by the availability of good public information on acquisitions. This first filter resulted in 4,553 hits. Subsequently, we applied that the Norwegian target firm had to be within the high-tech industry[1]. This brought us to 864 hits after applying this criterion. Finally, we only selected deals that had a deal value greater or equal to 10 million Euro. The choice of this deal value was motivated by the availability of further secondary public data in the media and on the platforms (e.g. Zephyr). This left us with 183 deals. However, within these 183 deals, there were still some deals that were pending, rumoured or just intended. We removed these deals and only filtered for completed acquisitions. This brought us to a sample size of 151 observations from the database. The Zephyr database complements our data with a more detailed picture of the acquisitions, and we add information such as CEO rationale, financial statements as well as patenting information via the affiliated platform Orbis in our datasheet.

[1] SDC Target high-tech industry codes selected: 518, 516, 416, 233, 234, 136, 121, 216, 223, 413, 236, 242, 418, 243, 231, 517, 235, 222, 120, 417, 138, 116, 114, 113, 140, 420, 112, 111, 134, 512, 211, 132, 131, 137, 119, 412, 213, 415, 227, 225, 224, 118, 513, 232, 129, 249, 219, 319, 229, 239, 419, 519, 117, 214, 315, 313, 221, 314, 241, 514, 135, 122, 511, 414, 515, 226, 316, 311, 312, 133, 401, 411, 215, 237, 115, 212.

3.2 Measures

Dependent Variable

Our dependent variable is the *degree of structural integration* of the acquired Norwegian tech firm. The range of this variable extends from completed integrated into the acquiring organization to high autonomy of the target firm. Contrary to Puranam et al. (2009) we will not choose structural integration to be a binary variable but instead, we will deal with an ordinal dependent variable with the possible values from 0-4 (i.e. 0 for complete structural integration, 4 for high autonomy of the target firm). According to our views, this portrays reality better as acquisitions are not "black and white" (i.e. fully integrated or fully autonomous). Bauer and Matzler (2014) used the same procedure in their study with the help of a 7-point degree scale for structural integration.

In order to record the structural form of each acquisition, we will use the databases Zephyr and Orbis to track what has happened to each acquired Norwegian technology firm. Based on press & media releases, CEO rationales, website appearance and financial statements we will classify the degree of structural integration of the target firm. Furthermore, The Brønnøysund Register Centre of Norway will give us information about whether the target firm is still alive. If the firm is already dissolved or we cannot find any information about the firm anymore, we assume that the high-tech assets of the Norwegian target firm have been structurally integrated into the acquiring firm (i.e. Structural Integration = 0).

Independent Variables

Acquired firm age at acquisition is being measured as age in years until the actual completed date of acquisition. We will include this variable as a continuous variable in our model. For example, a firm that was born on the 01.01.2007 and the acquisition of that firm was completed on the 01.06.2011, we will count this as 4 years old.

Acquiring firm's relatedness is being measured as an ordinal scaled variable. We will work out degrees (0-4, lowest to highest) that differentiate the firm's relatedness based on SIC codes, employee turnover between the industries and CEO rationale for the acquisition. We decided to include other measures than just SIC codes because these do not accurately reflect industry relatedness alone. This interdependence is seen as necessary as SIC codes may convey that

sometimes industries are highly related but in practice these industries do not have anything in common.

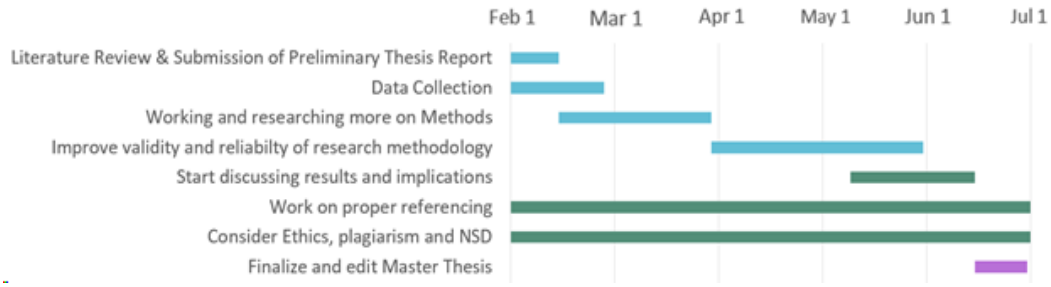
Acquired firm's cluster affiliation will act as a moderator in our model and is coded as a dummy variable (cluster affiliation - yes or no). Due to the fact that we will need to check whether firms belonged to a cluster in 2006, we will use the webpage "The Wayback Machine" in order to retrospectively analyze the internet during the time when the respective firm got acquired. This is how we will obtain the information to assess whether it belonged to a cluster.

In term of measurement, we will construct a model with 6 criteria that will help us to determine whether the acquire firm belonged to a cluster or not. These criteria are: location of the headquarters, location of R&D, membership to a cluster organization, proximity to suppliers and customers, proximity to educational facilities in the region (e.g. NHH, University of Agder, etc.), proximity to already established clusters in Norway. If the acquired firm is part of a cluster organization, we will say that it belongs to a cluster. However, if it does not belong to a cluster organization, it can still be part of a cluster and this specific case will need further investigation with the other criteria. If 4-6 criteria are met, we will give the acquired firm the value 1, i.e. it belonged to a cluster when being acquired. Otherwise it will receive the value 0.

Control Variables

We will also include around 6 control variables in order to strengthen the model. These will be *deal value (continuous), acquiring firm size in employees (continuous), target firm size in employees at acquisition (continuous), acquiring firm nationality (Norwegian/foreign), number of patents filed by target firm prior to acquisition (continuous),* and *acquirer acquisition experience (continuous).*

3.3 Plan for data collection and continuation with the thesis



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