

Examining to what extent internal and external information asymmetries affect the supplier performance under influence of buyer dependence.

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ABSTRACT

A satisfactory level of supplier performance is an important attribute for the buying company when trying to achieve a competitive advantage. Therefore, making sure the level of supplier performance is as good as possible is an important aspect for buying companies. On the basis of principal-agent theory, this study will investigate how internal and external information asymmetries and buyer dependence can potentially influence the supplier performance and how they relate to each other. Utilizing the SmartPLS software, the data of 69 interlinked buyer-supplier specific surveys will be analyzed and interpreted. Two conceptual models were set up, one to identify the direct effect of either internal or external information asymmetries on supplier performance, and the other to investigate whether buyer dependence has a causal relationship to this effect. The results show that there is no significant influence of internal information asymmetries, external information asymmetries, or buyer dependence on the level of supplier performance. A difference can be seen in the direction of the influence that internal and external information asymmetries have on supplier performance. Further, no significant effect of buyer dependence on either internal or external asymmetries was found. This paper opposes previous findings that information asymmetries and buyer dependence are underlying factors influencing supplier performance. Generally, this paper contributes to literature concerning principal-agent relationships, information asymmetries, and buyer dependence and new insights given as well as support for previous findings found are also discussed.

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Keywords

Information asymmetries, principal-agent theory, buyer dependence, supplier performance, internal dynamics, external dynamics

1. INTRODUCTION

Suppliers and their resources are a key to achieving a competitive advantage for the buying firm (Hitt, 2011; Ellegaard & Koch, 2012). Companies need to operate closely with their supplying partners to achieve cost reductions or quality improvements (Fisher 1997, Handfield & Nichols 2002). To do so, one of the main components is that companies and their business partners need to share knowledge and critical information with each other. This enables an enhanced operating performance and offers support to the relationship (Bruns & McFarlan 1987; Heide & John 1992). Further, exchanging information allows both firms to be flexible, and thus make use of opportunities and reduce the probability of making costly mistakes (Stank et al., 1996). Information asymmetries between two business partners can lead to a lower level of performance and trust between the two parties (Ramaswami et al., 1997). Previous studies have found that minimizing information asymmetries can lead to an enhanced business performance of companies (Stede et al., 2006; Dossi & Patelli, 2010). In case information are asymmetric between two parties, one party could decide to use the imperfect distribution of information to their own advantage, posing a problem to the trust and performance levels of the relationship (Jensen & Meckling, 1976).

Thus, to unlock the full potential of a supplier's performance, the companies need to establish a strong buyer-supplier relationship (Schiele et al., 2012; Ellram et al., 2013; Steinle & Schiele, 2008). One example of a buyer-supplier relationship in which information asymmetries are the main factor causing a problem between the buyer and supplier is a principal-agent relationship between two organizations (Eisenhardt, 1989). In principal-agent relationships, the principal decides to delegate some of their work to another party, the so-called agent (Wagner, 2019; Fernandez, 2020; Shapiro, 2005). Within a typical buyer-supplier relationship, in the context of the agency theory, the buyer can be seen as the principal, while the supplier can be identified as the agent (Eisenhardt, 1989). With the utilization of contracts, the buyer makes use of a supplier by delegating not just duties and responsibilities to the supplier, but also the decision-making authority (Eisenhardt 1989; Pratt & Zeckhauser 1985). By delegating the work to an external supplier, this supplier's knowledge and information in the specific field is being increased. In case the supplier does not share the knowledge with the buyer to a full extent, the level of information that the supplier possesses is deemed to be higher than that of the buyer (Steinle et al., 2014). Hence, almost always, information asymmetries are considered to originate from the supplier's side and can influence the dynamics of the relationship (Perrow, 1986; Zhao & Lu, 2008).

In general, information asymmetries are described as one of the main components of the agency theory construct, being part of the organizational assumptions made when entering such a relation (Eisenhardt, 1989). The problem in agency relationships arises, when the agent decides to act in a way that is not considered to be in the best interest from a principals' point of view (Jensen & Meckling, 1976). However, nowadays, using delegation relationships is more common (Steinle et al., 2014). This means, that the agency theory cannot just be applied to relationships between firms, but also to relationships within the same firm, where one person delegates work to another person. This can be any person that is not at the top or the bottom of the organization (Eggertsson, 2008). Subsequently, information asymmetries may not just create a principal-agent problem between two different organizations but may create a similar problem within the same organization. In relation to this, agency theory found evidence that relationships between different functions within the buying organization are also crucial. In addition, it can give insights into interorganizational relationships. These aspects are important as other departments than the buying department are also in contact with the supplier (Monczka et al., 1998; Pardo et al., 2011; Lassar et al., 1996).

Therefore, the thesis will answer the following RQ:

RQ: How do internal and external information asymmetries influence the supplier performance under buyer dependence?

In terms of practical relevance, 69 interlinked surveys were gathered, each survey equaling three participants, namely one member of the supplier, one purchaser from the buying firm, as well as one internal colleague of the purchaser. This offers insight about both internal and external relationships and how information sharing is handled in this setting. The companies may benefit from the findings on how to improve their supplier performance as well as the relationships to their suppliers, based on the information sharing with the supplier and their own colleagues.

The research's objective is to determine whether different levels of information influence the way a supplier performs. Further, this research aims to contribute both in terms of literature as well as in practice. Therefore, it will add a new layer of empirical data, that can be utilized for related research in the future. The aim is to close the empirical gap that exists in relation to the effects of information asymmetries when looking at supplier performance levels and how buyer dependence affects this. Information asymmetries and the use of a principal-agent relationship can have different implications for the relationship within the same company, as well as in a typical buyer-supplier relationship. These information mismatches have an impact on the relationship with the supplier, which is why this paper will examine how these asymmetries can affect the performance of said supplier, taking into consideration the dependence level of the buyer, underlining the academical relevance of this topic. Previous studies found different effects of information asymmetry on supplier performance, as it can e.g., help to assess the partnership performances (Cheng et al., 2012), help to reduce risk and produce benefits for both parties (Ozcan & Eisenhardt, 2009; Pongsiri, 2004), or help to enhance the overall business performance of the company (Stede et al., 2006; Dossi & Patelli, 2010). However, current research focuses on information asymmetries as one variable (Maestrini et al., 2018). Hence, it is important to divide between internal and external asymmetries when trying to analyze the effect of information asymmetries on supplier performance to a deeper extent. This is why this study will add another layer of data to this research field.

Firstly, this paper adds to the existing research by investigating the differences between internal and external information asymmetries and their respective effects on supplier performance. As a result, this paper has supported the literature by Bals et al. (2009) and Lambert et al. (2005), by showing that there is no direct effect of external information asymmetries on supplier performance. In addition, this study looks to close the theoretical gap when it comes to the potential effects of internal information asymmetries on the supplier's performance levels, as these have yet to be tested. This implicates the new perspective this research is aiming to offer as differentiating between internal and external asymmetries is important to grasp the full picture of information asymmetries in a principal-agent setting. Thus, this paper contributes to findings that claim business performance can be enhanced by lower information asymmetries, showing that internal information asymmetries have a weak, non-significant effect negative influence on supplier performance (Stede et al., 2006; Dossi & Patelli, 2010; Nayyar, 1993).

Secondly, implications for the direct effect of buyer dependence on supplier performance will be given, adding to existing literature in this topic (Kull & Ellis, 2016; Barnes et al., 2005; Heide & John, 1990; Andaleeb, 1996; Buchanan, 1992). While Buchanan (1992) found that higher buyer dependence leads to a higher level of supplier performance, this paper found no significant relationship between the variables. This contributes to the literature, as this paper found an extremely low effect between the variables, showing that there is potentially no direct influence. Also, findings by Kull & Ellis (2016)

are contradicted in this study, as they found that higher buyer dependence leads to a lower level of supplier performance.

Lastly, while previous research has analyzed different effects of buyer dependence on supplier performance, research on the effects of buyer dependence on information asymmetries is rare. This is where this paper aims to add new empirical data about the relationship of these two constructs. Thus, this paper contributes to findings looking for underlying factors that explain changes in the level of external information asymmetries, such as monitoring or incentives (Mudambi & Helper 1998; Müller & Gaudig 2011; Wathne & Heide 2000). While there was no significant effect found, the results show a moderately weak effect of buyer dependence on both external and internal information asymmetries. This indicates that buyer dependence could potentially be a factor influencing the asymmetry levels and further research into this topic is needed.

To answer the research questions this paper will follow a clear structure. Firstly, there will be a literature review, which will focus on the principal-agent theory, the problem of information asymmetries, and the supplier performance. Following there will be some hypotheses that will focus on the data gathered in the previous part. In the next chapter, the research method will be described, before the results of the data analysis will be presented. After this, the results will be discussed based on the chapters beforehand. Lastly, this paper will draw a conclusion before giving implications for future research as well as limitations of this paper.

2. THEORETICAL FRAMEWORK: PRINCIPAL-AGENT THEORY, BUYER DEPENDENCE, AND THE EFFECT ON SUPPLIER PERFORMANCE

2.1 Principal-Agent theory: An overview

Principal-agent theory describes the relationship between two parties, in which one decides to delegate work to the other. Typically, the buyer decides that he wants to delegate some part or the whole work to another party, the supplier. The delegation also includes delegating parts of the decision-making authority. This means, that the buyer is making use of a supplier, that will take care of what needs to be done, while being compensated in some way by the buyer. The buyer benefits' by utilizing the supplier's resources as well as capabilities (Jensen & Meckling, 1976; Eisenhardt, 1989).

In case both parties are looking to act in their own best interest, the supplier is believed to act in a manner that is not always in the best interest of the buyer (Jensen & Meckling, 1976), creating an agency problem. Hence, the buyer needs to implement certain incentives or monitoring processes that allow the buyer to limit these activities by the supplier (Mudambi & Helper 1998; Müller & Gaudig 2011; Wathne & Heide 2000).

Jensen & Meckling (1976) further pointed out, that the agency problem is a general problem that can be applied to a number of different settings, including firms, universities, governmental authorities, or the real estate market. In addition, to assess buyer-supplier relationships, the theory has been extended to inter-organizational settings (Whipple & Roh, 2010). It is also often portrayed in the setting of buying of contracts in the supply chain (Baiman, 1990; Eisenhardt, 1989). Generally, Arnold, Neubauer, and Schoenherr (2012) have found supporting evidence that suggests that the principal-agent theory is well suited for exploring the purchasing context. As a result, this study will use agency theory as the main framework, in which supplier performance will be measured.

2.2 Supplier performance as dependent variable: An important aspect for building a competitive advantage

Generally, to not just establish but also maintain a competitive advantage, the level of supplier performance is an important attribute (Humphreys et al., 2004). Supplier performance, in this paper, will be defined as the ability to which a supplier is able to deliver products, materials, or components to the buying firm and to what extent these fulfill the buying firm's needs and requirements (Shin et

al., 2000). The performance of the supplier is important to the buying firm, as it can directly influence the buying company's success (Prahinski & Benton, 2004). Poor product or material quality and unreliable deliveries can cause a detrimental effect for the buying firm's operational success, as e.g., the level of inventory increases (Li et al., 2006). Hence, it is important to implement supplier development activities. These development activities help the supplier to better meet the buyer's needs and demands and as a result help to achieve a competitive advantage for the buying firm (Prahinski & Benton, 2004).

Most research in relation to supplier performance is based on setting up the design of the measures of the construct, or implementing these measures (Paparoidamis et al., 2019; Dey et al., 2015; Maestrini et al., 2018). An aspect that did not get as much attention so far is identifying what causes an increase or decrease in supplier performance. The following research will focus on the effects that both internal and external information asymmetries in a principal-agent setting have on the supplier performance. To assess supplier performance levels, the most reliable and efficient way is to use performance measures (Gustafsson & Karlsson, 2012). These measures can be classified as either financial or operational performance measures (Venkatraman & Ramanujam, 1986). In this study, operational performance measures will be used. On the one hand, operational measures consist of key competitive success factors, like e.g., quality, price, or delivery. On the other hand, operational measures also consist of internal indicators relating to schedule realization or cost. (Venkatraman & Ramanujam, 1986). The performance indicators in this research consist of the product quality; delivery performance; sales, service and/or technical support; and the overall cost performance (Wu et al., 2010). Hence, this paper will concentrate on potentially identifying an underlying concept that is responsible for positive or negative changes in the performance of the supplier.

As supplier performance is also subject to different types of influencing factors, it is important to research how these factors influence the level of supplier performance. It was shown that setting up contract mechanisms, as well as incentives or monitoring processes, can help to increase the performance of the supplier (Zou et al., 2019; Maestrini et al., 2018). A similar effect was found when the level of trust between buyer and supplier is increased, showing that higher levels of trust lead to higher supplier performance levels (Narasimhan et al., 2008; Ahimbisibwe, 2014).

Another one of these factors that could potentially be directly influencing the supplier performance is information asymmetry, as a difference in information between the supplier and buyer, or between two members of the buying company, might affect how the supplier is performing. Previous research has shown that information asymmetry can, both positively and negatively, influence the level of trust and commitment between two companies, as well as the performance levels and the likelihood of one of the partners to act opportunistic (Bercovitz et al., 2006; Jaworski & MacInnis, 1989; Nayyar, 1993; Pavlou et al., 2007). Ramaswami et al. (1997), showed that a higher level of information asymmetries leads to a lower level of performance and trust between salespeople and their supervisors, with opportunism rising for the supplier. Lusch & Brown (1996) found that information sharing behaviors of both parties have a positive effect on the performance and commitment of the supplier. Hence, it is important to further investigate information asymmetries and to what extent they can play a role in supplier performance levels, when looking at internal as well as external information asymmetries from the same buying firm.

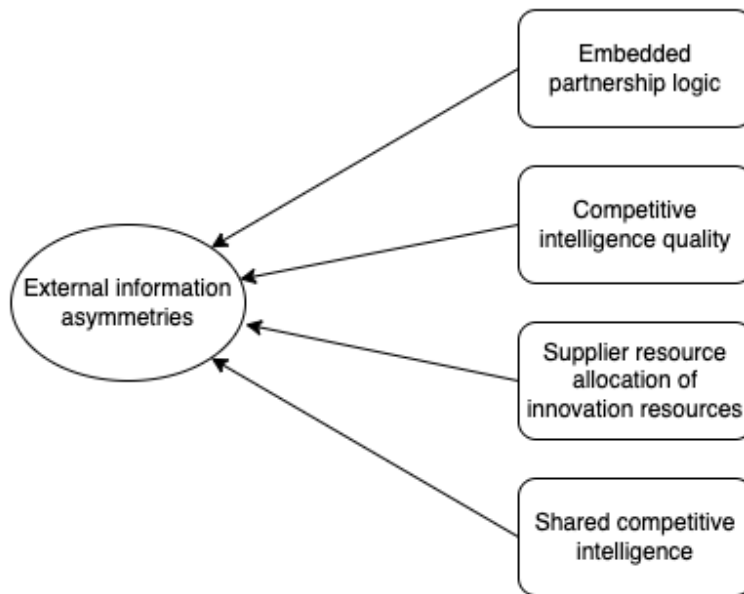
Summarized, information asymmetries are an important factor when trying to investigate how the level of supplier performance is influenced. Overall, it was shown that information asymmetry, like agency theory, can have a significant influence on the level of supplier performance (Ramaswami et al., 1997; Bercovitz et al., 2006; Jaworski & MacInnis, 1989; Nayyar, 1993). However, it is unknown yet if there is a difference between internal and external information asymmetries when investigating their effect on performance.

2.3 Information asymmetries: Definition and relevance

In general, principal-agent theory plays a major role in identifying and explaining information asymmetries. These asymmetries already start at the beginning of a typical buyer-supplier relationship, where it might lead to opportunism (Williamson, 1979). At the start of a new relationship, trust can be tested and potentially breached by the risks that opportunistic behavior is bearing. Related to this are information asymmetries, which mainly originate from a lack of transparency (Eisenhardt 1989; Pratt & Zeckhauser 1985). Hence, the buying firm lacks information about the supplying firm in regard to intentions, characteristics, and effort levels. This causes the potential for opportunistic behavior by the supplier, which can affect the relationship. The supplier might capitalize on the information asymmetries by not putting in the effort that was agreed upon beforehand (Furubotn & Richter, 2005). To cope with this behavior and limit it as much as possible, several studies have suggested to use one of many possibilities, including e.g., signaling, monitoring, or using incentives (Mudambi & Helper 1998; Müller & Gaudig 2011; Wathne & Heide 2000). For the buyer the goal is to motivate performance while mitigating opportunism between both parties. Eisenhardt (1989) states that to do so, contractual mechanisms are needed. A negative effect of information asymmetry can be that employee supervision is no longer performed efficiently which leads to the employees not attempting to share knowledge (Fan & Ju, 2008).

For this research, it is important to distinguish between internal and external information asymmetries. External information asymmetries describe the information difference that exists between two companies, the buyer, and the supplier (see figure 1). This is the case, as the supplier has more information about e.g., price or quality of the resources offered to the buyer (Eisenhardt, 1989; Pratt & Zeckhauser 1985). Hence, external information asymmetries can be defined as the level of information that the supplier possesses, which he does not share with the buyer to a full extent, leading to different knowledge levels between the partners (Steinle et al., 2014). To measure external information asymmetries, this study uses four main concepts (see figure 1). Firstly, measures about the competitive intelligence quality will be used (Ahearne et al., 2013). This describes the perceived competitive information sharing by the supplier and the quality it has to the buyer, which is an important part of the information exchange between partners. Secondly, shared competitive intelligence was used to investigate the level of external asymmetries. This adds to the previously investigated information sharing from the supplier and deals with the information the supplier is willing to share with the buyer about competitors or the market. Thirdly, supplier resource allocation of innovation resources formed a part of external asymmetries in this study. This will show, if the supplier is more likely to share key information about new technologies or resources to the buyer or not. Withholding information like these can cause information asymmetries between the companies to rise, and thus leave the buyer with a disadvantage compared to other buyers of the supplier. Lastly, embedded partnership logic was used. Here, the measure tests if the buyer is sharing information openly with the supplier, to get a direct impression on information sharing and thus a potential part of information asymmetries.

Figure 1. Composition of external information asymmetries for this study



On the other hand, internal information asymmetries (see figure 2) can be described as the difference in information that exists between corporate headquarters and divisional managers of the same firm (Chen et al., 2018). Internal information asymmetries can have two different sources. The top management can possess significantly more information about the firm compared to the divisional managers, posing an internal information asymmetry problem. Contrarily, divisional managers might possess private information about the firm and the firm's operations and value, which can cause internal information asymmetry (Chen et al., 2018). As a result, top management relies heavily on information sharing from divisional managers, to be able to make the best decision for the firm's performance, and thus minimize internal information asymmetries (Graham et al., 2015). This challenge becomes more difficult, the bigger, more dispersed, and more complex the company gets (Graham et al., 2015). While external information asymmetries refer to the different levels of information between buyer and supplier, that might have an effect on the supplier performance if the supplier acts opportunistic, internal information asymmetries can lead to top management making decisions that are not maximizing the potential benefit for the buying company and thus lead to a lower performance level of the supplier.

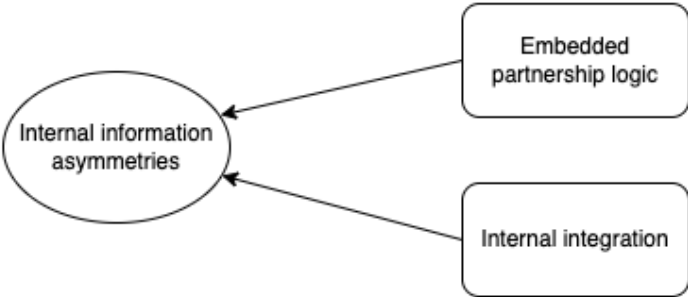
Conceptually, most papers only focus on external information asymmetries and identifying effects of these on concepts like supplier performance. Mostly, only one variable for information asymmetries is used to do so (Maestrini et al., 2018). However, as principal-agent relationships exist within the same company as well, and as delegating relationships between different members becomes more and more common, there seems to be a theoretical gap in principal-agent literature (Steinle et al., 2014; Eggertson, 2008). This gap can be described as a lack of research into the effects that only internal information asymmetries have on the level of supplier performance. While previous research has e.g., shown how increased information sharing can improve the performance (Stank et al., 2001; Germain & Iver, 2006), no findings have been made on the direct effect of internal asymmetries on supplier performance. Generally, distinctions have been made between internal and external information asymmetries. However, none of the studies have investigated how, in a principal-agent setting, the effects of internal and external information asymmetries might differ. This gap is being added in this paper, potentially leading to changes in future research concerning information asymmetries and principal-agent theory. As information asymmetries pose the main problem in principal-agent

relationships, potential differences between internal and external asymmetries could help to solve this problem to a greater extent and show solutions to the problem in more detail (Jensen & Meckling, 1976). Currently, it is still unknown if there are different effects internally and externally. If differences between internal and external information asymmetries' effect exist, future research needs to acknowledge these differences more, drawing clear distinctions between internal and external effects, to come to conclusions. Thus, the focus in principal-agent theory would also shift, leaving the focus on two separate variables, instead of just measuring one variable for information asymmetries (Maestrini et al., 2018).

To measure internal information asymmetries, this paper will use two main factors. The first is the level of internal integration that exists between the companies, which describes the interaction and collaboration between different parts of the same company, including purchasing. The second factor is the embedded partnership logic construct. Here, the measure tests if the two internal participants are sharing information freely. Together, these measures will form the latent construct of internal information asymmetries (see figure 2).

Hence, the difference between internal and external information asymmetries, and the different meanings that higher levels of asymmetries can have, are why it is important to investigate the effect that either might have on the supplier's performance levels.

Figure 2. Composition of internal information asymmetries for this study



2.4 Buyer dependence: Impact on buyer-supplier relationships

Buying firms are becoming increasingly vulnerable to supplier's behavior. This is a result of buying companies reducing their supplier base and subsequently becoming more dependent on the suppliers in their base. To achieve a competitive advantage, the buying company must ensure to meet the businesses' objectives and goals. To do so, buying managers need to make sure that suppliers are committed to the relationship and thus supplier performance levels are satisfactory (Prahinski & Benton, 2004). As a result, an additional factor that can influence the level of supplier performance is the extent to which the buying company is dependent on the supplier. Previous research has shown that buyer-supplier dependencies are a key characteristic of a buyer-supplier relationship (Kraljic, 1983; Krause & Ellram, 2014). For these reasons, this research will take a closer look at buyer dependence in particular. Buyer dependence, in this paper, will be defined as the extent to which the

buyer needs to maintain the relationship with the supplier, to ensure attaining the company's goals and securing the necessary resources for the company (Beier & Stern, 1969; Frazier, 1983). It describes the costs a buyer would incur when ending the relationship with the current supplier or deciding to switch to a different one (Heide & John, 1988). Dependence is present in a buyer-supplier relationship, if the outcomes of the current relationship are superior to those outcomes that would be attainable with potential alternative partners (Anderson & Narus, 1990).

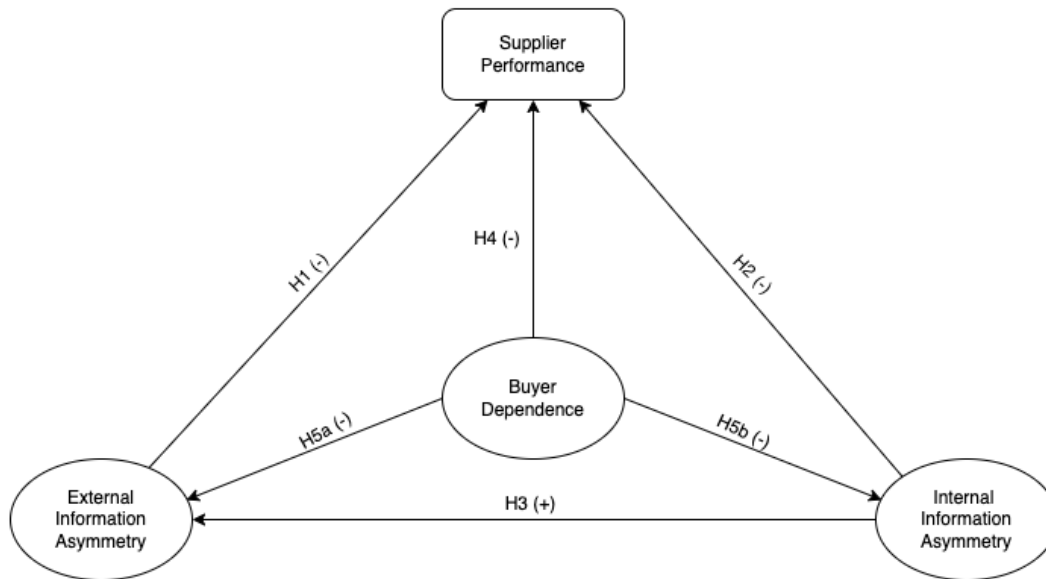
On the one hand, dependence can support cooperation between the two companies. Especially potential positive effects of high dependence, such as access to resources or improved financial gains for the buyer can encourage cooperation between the two parties (Kale, 1989). Further, dependence in a buyer-supplier relationship can also lead to an increased information exchange, mutual adaptations, or higher levels of relational satisfaction or performance (Barnes et al., 2005; Heide & John, 1990; Andaleeb, 1996; Buchanan, 1992). On the other hand, dependence builds the basis for power in a buyer-supplier relationship. Consequently, the party that is more dependent on the other, will have less power in the relationship and thus be more vulnerable to not maintaining the relationship (Cook, 1977; Pfeffer & Salancik, 1978). Hence, some companies can be dependent of another company to ensure potential negative outcomes are avoided. Potential negative impacts include a loss of access to resources or a loss of revenue. This is added by the fact that companies might be more dependent on another company if switching costs for switching to another party are high, or if alternative options for the buyer are limited (Kim et al., 2010; Kim, 2007). High buyer dependence may also be caused by a high level of investments into the supplier, making the buyer more hesitant to end the relationship and thus more dependent on the supplier (Ganesan, 1994). One way to mitigate potential negative effects of being dependent on the supplier is achieving a preferred customer status with the supplier. Schiele & Vos (2015) showed that companies that are the preferred customer for a supplier can accept the risk of being more dependent on the respective supplier.

For this study, buyer dependence will be measured based on the paper of Terpend & Krause (2015). The measures refer to the level of replaceability of the supplier, how impacted the operations of the buying company would be when ending the relationship with the supplier, as well as the overall dependence on the supplier as perceived by the buying company (Terpend & Krause, 2015).

3. HYPOTHESES

Next, the hypotheses will be introduced based on the principal-agent theory. To investigate the direct effect between information asymmetries and supplier performance, and how buyer dependence influences this relationship, there will be two models tested. In the first model (model A), the direct effects of external and internal asymmetries on supplier performance, as well as the direct effect of internal asymmetries on external ones' will be tested (see Appendix A). In the second model (model B) the direct effect of buyer dependence on internal asymmetries, external asymmetries, and supplier performance will be tested. Buyer dependence will be included as the independent variable, to see if it is the cause of the effect of information asymmetry on supplier performance (see figure 3).

Figure 3. Research model B



3.1 External information asymmetries effect on supplier performance

In general, information asymmetries are expected to be found between two companies, in this case a buyer and a supplier, that engage in a principal-agent relationship, as the supplier acts in a way that is not in the best interest of the buyer. Hence, information asymmetries between two companies are expected to lead to negative results in the relationship dynamics and the overall performance of the relationship (Perrow, 1986; Zhao & Lu, 2008), as it is negatively influencing several factors in the working relationship between buyer and supplier. If a company can decrease information asymmetries, it can help to achieve a competitive advantage by improving the relationship with the supplier(s), which in turn can gain advantages such as new technologies or a price reduction (Zsidisin et al., 2015). With increasing length of the relationship, it is also possible that supplier and buyer goals can adapt to each other, which in return leads to the supplier not taking advantage of the surplus of information he possesses (Schulz, 2005). Lower level of information asymmetry shows that there is improved monitoring, incentive, or other mechanisms in place. These allow for information to be shared more freely and to a full extent between the organizations. In addition, it helps to minimize the desire of the supplier to act in a non-desirable way for the buyer. This was underlined by the fact that informational imbalances can be decreased if there is a higher average number of meetings between both parties involved. Another positive effect of more frequent meetings between both parties is that information exchange between both can be improved (Gassenheimer et. al, 1996; Hawkins et al., 2008; Müller & Gaudig, 2011). Further, Burney and Widener (2007) also supported these findings by showing that the goal congruence between supplier and buyer can be increased by using monitoring and incentives mechanisms. As a result, the buyer's aim should be to minimize information asymmetries, to gain the benefits of the principal-agent relationship to a full extent. Hence, this paper builds on the fact that increasing external information asymmetry has a detrimental effect on the performance of both parties involved, as the relationship does not reap the full potential benefits. In case of high information asymmetries, it is more likely that the supplier acts in a way that is not in the best interest of the buyer, to maximize his personal gains from the information surplus the supplier possesses (Jensen & Meckling, 1976). Hence,

H1: Lower external information asymmetries negatively influence the level of supplier performance.

3.2 Internal information asymmetries effect on supplier performance

There have been multiple studies including principal-agent theory in the context of performance measurement literature. It was shown that reducing information asymmetry between top management and the shareholders can enhance business performance (Stede et al., 2006; Dossi & Patelli, 2010). Generally, information asymmetries cannot just exist between the buyer and the supplier in a typical buyer-supplier relationship, but also between internal members of the same company (Monczka et al., 1998; Pardo et al., 2011; Lassar et al., 1996). Research has shown that every individual in a company that is not at the very top or bottom can act as both the principal and the agent inside a company (Eggertsson, 2008). In general, employees in an organization have different levels of knowledge on different topics, depending on their experience, expertise or proximity to a topic or problem (Davenport & Prusak, 1998). An internal information asymmetry problem can arise from two different causes. On the one hand, employees can decide to withhold valuable information from other employees. On the other hand, employees may decide to distort the information they have, to maximize their individual or group goals, or capitalize on the fact that others might not have read or missed the relevant information (Brown & Woodland, 1999; Dyerson & Mueller, 1999). Motives for this include factors such as internal competition for resources or financing, career concerns, or trying to maximize their own benefit (Adams & Zhou, 2022). Generally, the problem of internal information asymmetries is more likely to arise in multi-national companies (MNCs), where also differences in e.g., culture, language, legal systems, or the geographic dispersion make information sharing more complex (Shroff et al., 2014; Adams & Zhou, 2022). Contrarily, companies in which internal information sharing is working to a better extent, and asymmetries are minimized as far as possible, can secure financial benefits, including e.g., lower tax rates (Gallemore & Labro, 2015). The level of information asymmetries between the buyer and the internal other member is another important factor when considering the level of supplier performance. As both internal parties are in contact with the supplier, information sharing between these two individuals is important to maintain a close and collaborative relationship with the supplier, in which different parts of the buying company can make accurate decisions which will benefit the overall performance, and thus also the suppliers' performance.

Therefore, minimizing the level of information asymmetry within the same firm can help to achieve a better performance, as it should follow the same principle internally as externally as well. By minimizing the information imbalance between internal members, it ensures that only the correct information are being shared with the supplier and that top management has all the necessary information to make the best decision for the buying company (Chen et al., 2018; Graham et al., 2015). This helps the supplier to fulfill his obligations to a better extent, leading to an increased supplier performance. Hence, this paper proposes,

H2: Lower internal information asymmetries positively influence the level of supplier performance.

3.3 Internal information asymmetry effect on external information asymmetry

On the one hand, internal information asymmetry can potentially directly influence the performance of the supplier. On the other hand, it can be investigated whether minimizing internal information asymmetries will have an effect of the level of external information asymmetries existent. In case information exchange within the company is high and well-functioning, it could have a positive effect on the external information exchange, which as a result reduce external information asymmetries. One can argue, that if internal information asymmetries are low, all parts of the company know all the available information about the supplier and the relationship. This in return could influence the level

of external information asymmetry positively, as everyone in the buying company that is involved in the information exchange can exchange them with the supplier directly and precisely. Further, if top management is able to make the best possible decision for the company, it is likely that information asymmetries with the suppliers can be minimized, as the top management has received all necessary information by their employees or divisional managers to make the best decision for the company (Chen et al., 2018; Graham et al., 2015). Adding to this, as principal-agent relationships also exist within the same company (Monczka et al., 1998; Pardo et al., 2011; Lassar et al., 1996), one can argue that if individuals can form a functioning principal-agent relationship within their company, then building a similar environment with external suppliers is easier to achieve. Setting up monitoring, incentive, and other mechanisms to ensure information can be shared more freely is an important step when trying to avoid an agency problem and thus minimizing asymmetries between the two parties. If these mechanisms are functioning within the buyer's company, it is more likely that similar practices are used for external business partners as well, allowing for more information sharing and thus less information asymmetries. This reduces the likelihood of the supplier acting in a way that is not wanted by the buyer and helps to improve supplier performance (Jensen & Meckling, 1976).

Hence, this paper will investigate whether internal information asymmetries do not just have a direct impact on supplier performance, but whether internal information asymmetries can also improve the level of supplier performance by decreasing the level of external information asymmetries. Therefore,

H3: Lower internal information asymmetries positively influence the level of external information asymmetries.

3.4 Buyer dependence influence on supplier performance

To investigate whether there is another independent variable that influences the effect of information asymmetries on the level of supplier performance, buyer dependence's influence on supplier performance will be tested in this research. Firstly, this study will aim to assess whether previous findings in different settings, who found that a higher level of buyer dependence has a negative effect on supplier performance, are confirmed in this setting (Kull & Ellis, 2016). Kull & Ellis (2016) found that in an interorganizational learning theory setting, the supplier becomes the more powerful party in the buyer-supplier relationship, which especially, in regard to the agency problem, can bare risks for the buyer. Hence, because of the imbalance in power, the supplier decides to not perform to the highest standard, as e.g., another buyer might be more important for the supplier, or more benefits can be gained for the supplier by not sharing information with this buyer. In addition to that, multiple studies have identified a reverse effect, stating that supplier performance increases the level of buyer dependence (Tan et al., 1999; Trent, 2008). Khan et al. (2022) found supporting evidence for this, as increasing levels of supplier performance lead to a more sustainable buyer-supplier relationship (Terpend & Krause, 2015). Contrarily, buyers, who are dependent on their supplier may run into the risk of not performing at an optimal level (Khan et al., 2022). Subsequently, this paper proposes, that buyer dependence should have a negative effect on supplier performance. This is due to the fact, that the supplier can act more on the dependence of the buyer, as the supplier has more power in the relationship (Emerson, 1962). As the agency problem states that the supplier acts in a matter that is not in the best interest of the buyer, the shift in power means that the supplier is more likely to use this information advantage to his favor, if the buyer has a higher level of dependence on the supplier (Jensen & Meckling, 1976). In this scenario, the level of performance relies more on the supplier, as the supplier decides in what way he wants to act, and to what extent he uses the buyers' dependence to his own advantage. As a result, this paper expects the effect of buyer dependence on supplier performance to be negative, as the supplier will be more willing to act in his own interest and thus use the power he has to improve the own standing, instead of the performance levels that the buyer receives (Londsdale, 2001). Hence,

H4: Higher buyer dependence negatively influences the level of supplier performance.

3.5 Buyer dependence influence on internal and external information asymmetries

On the other hand, buyer dependence can also influence the level of information asymmetries that are persisting within the buying company, and between the buyer and the supplier. Here the focus is more on the buyer, and how he acts knowing that the own dependence on a certain supplier is higher or lower. If the dependence of the buyer is high, the buying company should do more to ensure that information about a supplier are shared by the supplier, as well as within the own company. Here, a higher buyer dependence can mean that the buyer is putting in more effort to try to keep the performance of the supplier to a higher level. This study will investigate whether a higher level of buyer dependence does likely lead to a lower level of supplier performance by the mediating effect of internal and external information asymmetries. The supplier might act on the shift in power that comes with higher buyer dependence and use it to his advantage, if it is known that buyer dependence is at a high level. However, at the same time, the buyer will also put in more of an effort to ensure that supplier performance stays high, as the buyer is very dependent on the supplier and needs him to perform well (Prahinski & Benton, 2004). As a result, the buying company will maximize its' efforts to share and receive all relevant information with their suppliers, to maintain a strong buyer-supplier relationship, which can in return help to form a sustainable competitive advantage. This leads to decreasing levels of external information asymmetries, as information sharing, and quality are likely to increase. In addition, the buying company's internal information sharing will also have to be maximized, as different parts of the company are in contact with the supplier. If buyer dependence is high, this indicates that decisions need to be made as quickly and accurately as possible. To do so, all parts of the buying company need to be informed on all necessary information between the parties. Hence, high buyer dependence should alert the buying company to share their information as accurately as possible within the own company, to make the best decisions in their external relationship with the supplier. This is the result of maximized internal efforts on the buyer side, whose origin is a high dependency on the buyer.

Therefore, this paper will also test the relationship between buyer dependence, information asymmetries, as well as supplier performance. It is expected that buyer dependence does not only have a direct, negative effect on supplier performance, but also a direct negative effect on the level of information asymmetries, both internally and externally, that are perceived by the companies. As a result, the maximized efforts of the buyer will lead to a lower level of internal and external information asymmetries. Following the argumentation of H1 and H2, this would indicate that buyer dependence helps to minimize information asymmetries, and as a result would have an indirect positive effect on supplier performance, which increases as information asymmetries decrease. As a result,

H5a: Higher buyer dependence negatively influences the level of external information asymmetries.

And,

H5b: Higher buyer dependence negatively influences the level of internal information asymmetries.

4. RESEARCH METHODOLOGY

4.1 Research Design

A quantitative study was used to test the hypotheses in this research. Since the knowledge used to test the hypotheses in this paper is derived from already existing research, a quantitative study is well suited (Carr, 1994). In this research, it will be investigated how internal and external information

asymmetries influence the supplier performance, under the influence of buyer dependence. Hence, a quantitative study is best fitting for this research as multiple variables were measured. In addition, a quantitative study was used for this research to analyze the cause-and-effect relationships between the variables (Carr, 1994). Further, a quantitative study was the best method for this research model, since they are best suited to answer “how” questions, as also done in this research (Rasinger, 2013). To successfully analyze and assess this model, the results were first exported to Excel, before the SmartPLS 4 software was used to analyze the research model and the correlations between the variables in this study. After constructing the model, the results of the survey were added to the software. This helped to gain insights on the correlations between the four variables, which were calculated using a Structural Equation Model with the PLS 4 Software, utilizing the Bootstrapping method. Normally, it is suggested that to carry out path modeling, a sample size of 100 to 200 would be needed for a reliable starting point (Hoyle, 1995). However, using the SmartPLS software for this research makes sense because it is well suited for analyzing models with a smaller sample size, as is case in this study (Bacon, 1999; Wong, 2010).

4.2 Sample

The study was completed in cooperation with a total of five buying companies. The first is a German company that produces and develops water pumps for private and industrial customers and is an important player in the water management industry. With about 8,000 employees the company successfully operates in different markets, dealing with a global customer and supplier base. Adding to that is firm 2, a cable manufacturer located in the Netherlands. With around 925 employees this firm can be considered as a large enterprise (OECD, 2017). They provide cables, systems, and services to their worldwide customer base. The third company is a Dutch heating systems manufacturer, that operates internationally. The company has existed for 75 years but is since recently part of a big Italian thermal company, that runs its operation on a big scale globally. Moreover, it specializes itself in producing heating products and devices, such as central heating systems and heat pumps. As the firm operates globally, it also has a lot of suppliers dispersed worldwide. Case company four is a large enterprise with approximately 650 employees located in the Netherlands, specializing in bakery machinery and fully integrated bakery lines (OECD, 2017). They are a family-owned company that has been around for the better part of two centuries. Lastly, company five operates in the healthcare sector. With about 3,800 employees, the company is engaging with suppliers globally.

Due to the reach of the companies, communication and information sharing with their external partners is important across different parts of the company. At the same time, internal information sharing is an important aspect for the companies to function well. In addition to that, there are differences within some of the companies (geographical, culture, etc.) that influence the internal information sharing. Due to their international business and relationships with different kinds of suppliers across multiple parts of the companies, they are well suited to analyze how information asymmetries can have an impact on the performance of suppliers. Further, there is a difference between the dependence on the companies’ suppliers, which fits well to the research at hand. A more detailed profile of the companies can be found in table 1.

Comparative t-tests were conducted to ensure that there is no nonresponse bias. To do so, the available data of four buying companies was used. The first company did not share the necessary data, as it was considered too confidential. Firm 2 had an average spend of 7,552,998 Euros for the respondent suppliers and 2,236,244 Euros for the nonrespondent suppliers ($t = 0.963$, $p = 0.344$). The average spend for respondents of firm 3 was at 506,339 Euros and 547,081 Euros for non-respondents ($t = 0.042$, $p = 0.967$). For firm 4, the average spend was 933,168 Euros for respondents and 604,562 Euros for non-respondents. ($t = 1.333$, $p = 0.194$). For the fifth company, the average spend for

respondent suppliers was 925,353 Euros, while the average for nonrespondent was at 710,206 Euros ($t = 0.572$, $p = 0.570$). The differences in all four investigated firms are not significantly different which means there was no nonresponse bias found.

Table 1: Company profiles

	Firm 1	Firm 2	Firm 3	Firm 4	Firm 5
<i>Industry</i>	Water systems	Cable manufacturing	Heating systems	Bakery Lines	Healthcare
<i>Size (employees)</i>	8,000	900-950	196	650	3,800
<i>Supplier Surveys</i>	15	23	17	8	6
<i>Response rate</i>	55,56%	76,67%	37,78%	28,57%	12%
<i>Turnover</i>	€1900 Mil.	€450 Mil.	€80,885 Mil.	€180 Mil.	€450 Mil.

As can be seen, similar to the purchasing companies, also the participating suppliers are mostly located in the Netherlands (46,4%) or in Germany (31,9%), making up more than three quarters of the participants (see table 2). Out of the 69 suppliers, the biggest part is involved with industrial machinery (20,3%). However, the industry sectors of the suppliers were spread, as 63,8% are in the category “others”. This shows a good variance in the suppliers’ industries. Further, 42% of the supplying companies have more than 250 employees. The average work experience and organizational tenure were also investigated, to evaluate the competency of the respondents. Here, the average work experience is at 26,8 years, while participants spent 13,2 years on average at their current company.

The same procedure was followed for the purchasers as well as the internal other members (see table 2). As there were only 16 purchasers and 36 internal other members participating in the study, most of the participants had to fill out surveys for more than one supplier. Most of the participating purchasers had a strategic or operational function (31% each). The average work experience for the purchasers is at 23 years, with 75% of the participants working for longer than 10 years already. Further, half of the participants have been at their current company for more than 10 years, with an average organizational tenure of 14 years. Looking at the internal other members, the average work experience lies at 17 years, with 79% of the participants working for more than 10 years. In addition, 67% of the internal other members have been at their current company for more than 10 years. The average organizational tenure lies at 14 years. Most frequently, the participants were active in the engineering (28%) or logistic (19%) department. As the purchasing department’s tasks and responsibilities are wide-spread and differ in each company, some internal members are also part of a purchasing department. However, if this was the case, the internal other member was from a different part of the purchasing department than the purchaser, to ensure different parts of the company were answering the surveys (see table 2).

Table 2: Respondents profiles

<u>Profile participating suppliers</u>		
Suppliers (N=69)	Frequency	Frequency

<i>Industry Sector</i>			
Industrial machinery	20,3%	<i>Country</i>	
Consumer goods	2,9%	The Netherlands	46,4%
Automotive	2,9%	Germany	31,9%
Chemicals/Pharmaceuticals	2,9%	Italy	8,7%
Services	7,2%	Austria	2,9%
Other	63,8%	Spain	2,9%
		United Kingdom	2,9%
		Finland	1,4%
		Norway	1,4%
		Poland	1,4%
<i>Number of employees</i>			
< 50	21,7%		
50 – 250	36,2%		
>250	42,0%		
<u>Profile participating purchasers</u>			
Purchasers (N=16)	Frequency		Frequency
<i>Work experience</i>			
0-5 years	0%	<i>Function</i>	
5-10 years	25%	Strategic	31%
10-20 years	19%	Operational	31%
≥ 20 years	56%	Generic role	19%
		Managerial	13%
		Tactical	6%
<i>Organizational tenure</i>			
0-5 years	38%		
5-10 years	13%		
10-20 years	19%		
≥ 20 years	31%		
<u>Profile participating internal others</u>			
Internal others (N=36)	Frequency		Frequency
<i>Work experience*</i>			
0-5 years	12%	<i>Function/</i>	
5-10 years	9%	<i>department</i>	
10-20 years	29%	Engineering	28%
≥ 20 years	50%	Logistics	19%
		Procurement	17%
		Management and	14%
		coordination roles	
		Other roles	17%
		Not answered	6%
<i>Organizational tenure*</i>			
0-5 years	18%		
5-10 years	15%		
10-20 years	38%		
≥ 20 years	29%		

*Excluding two missing cases

Data was collected by suppliers of the cooperating company, which were taking part in surveys. The companies were all contacted from June to July 2023, in cooperation with a group of fellow students.

Each student gathered data together with one of the participating buying companies, before results were bundled together. After an introductory E-Mail was sent by the buying company, invites were sent out to all the listed suppliers of the buying company. After another week, a reminding E-Mail was sent out to the suppliers. In some cases, suppliers were contacted personally to participate in the study. The next step was to invite both contact persons from the buying company, the to the supplier corresponding purchaser and internal other member, to fill out the survey. A total of 15 suppliers filled out the survey, which means a response rate of 55,56%. In the end, the results of all participants were bundled, which gives this study a total of 69 complete samples, collected by 5 students.

Even though using the SmartPLS software is well suited for analyzing models with small sample sizes, Marcouliders & Saunders (2006) found that for a model with a maximum of five arrows pointing towards a latent variable, just as is the case in the second model tested in this study, the sample size should be at least 70. With the final sample size of 69, one can say that this study does largely conform with data validity purposes, as it is close to the number of surveys needed to fully conform. Hence, this study's data can be deemed appropriate for the model used. However, a sample size of 69 is still difficult to generalize.

4.3 Measures

All variables in the study will be measured using the seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). *Internal and external information asymmetries* will be measured using different measurement items to assess their latent construct. *Buyer dependence* will be measured by the purchaser of the buying company. *Supplier performance* will be measured as perceived by the purchaser and the internal other member of the buying company, compared to other suppliers of the same company.

Supplier performance will build the dependent variable in this study. To analyze the perceived level of *supplier performance*, the purchaser as well as the internal other of the purchasing company were asked to evaluate the performance of the corresponding supplier compared to other suppliers. The evaluation was based on the average of four measures, namely product quality; delivery performance; sales, service and/or technical support; and the overall cost performance (Wu et al., 2010; see table 3). *Supplier performance* will be measured to potentially identify underlying factors that can have a significant effect on the level of performance and can explain changes in the level of performance. To measure *supplier performance* in this study, the average scores of the purchaser and internal other member for each item were used.

Buyer dependence is used as an independent construct, which will be measured by the inputs the purchaser has given. It will form one of the constructs which will be analyzed to see if they have an impact on *supplier performance*. In addition, *buyer dependence* will be measured in this research as it can potentially also give an insight on what influences the level of *information asymmetry*, both internally and externally. Hence, *buyer dependence* will be measured to investigate whether *information asymmetries* are actually a direct factor influencing *supplier performance*, or whether *information asymmetry* is a mediating variable in the relationship between *buyer dependence* and *supplier performance*. The level of *buyer dependence* will be determined using three items. The measurements are based on the work by Terpend & Krause (2015) and can be found in table 3 below. For the first two items, the answers were reverse-coded, to align with the answers given in the third item.

Internal information asymmetry will be measured by using three items of different variables that were used in other previously conducted studies. To analyze these measures, the buyer and the internal other member of the buying company will give insights to each item. The three measures of internal

integration are integrated based on the work of Zhao et al. (2011), as well as Horn et al. (2014). This is further enhanced by a measure from the embedded partnership logic construct (Brattström & Faems, 2020). Together, these items will help to paint a picture of the level of internal information asymmetries that exist within the buying company. *Internal information asymmetry* will be measured to identify whether it can have a direct effect on both *external information asymmetries* as well as *supplier performance*. In a second step, *internal information asymmetries* will be measured as a mediator to investigate the relationship between *buyer dependence* and *supplier performance* and whether higher *buyer dependence* leads to lower levels of asymmetry (see table 3). To analyze the levels of information asymmetries, the scores given by the internal other members were subtracted from the scores of the purchasers for each item. As the difference can exist in both directions of the relationship and as for this study the overall level of *information asymmetries* and not the direction of the asymmetries is important, absolute differences were used. Thus, a lower score implies a lower level of *internal information asymmetries*. This was done as it shows the levels of difference in perceived information exchange between the two internal members and give an impression on the existing level of *information asymmetries*.

For the other latent construct, *external information asymmetries*, a similar approach was taken. Here, one measure also includes the beforementioned construct of embedded partnership logic (Brattström & Faems, 2020). This is enhanced, by measures about the competitive intelligence quality, that the purchaser perceives he is getting from the supplier, which are derived from Ahearne et al. (2013). Further, the supplier will add to this by giving insights on the supplier resource allocation of innovation resources (Pulles et al., 2023). Lastly, the shared competitive intelligence will be measured from the supplier's perspective (Hughes et al., 2013).

Combined, these measures will measure the latent variable *external information asymmetry* (see table 3). Input for each measurement item was taken from the purchases and the suppliers. *External information asymmetry* will be measured to identify whether it can have a direct effect on *supplier performance*. In a second step, *external information asymmetries* will be measured as a mediator to investigate the relationship between *buyer dependence* and *supplier performance* and whether higher *buyer dependence* leads to lower levels of asymmetry (see table 3).

Similarly to the approach for *internal information asymmetries*, the scores of the supplier were subtracted from the scores of the purchasers for each item. For external information asymmetries, the answers of the supplier on *shared competitive intelligence* were subtracted from the buyer's answers in relation to *competitive intelligence quality*. As there were two items for the buyer, but only one for the supplier, the supplier's answers were used twice, once for each item of the buyer. Again, absolute differences were used to calculate the level of *information asymmetries* existing in the external relationships. Negative differences after subtracting the scores were made positive, while differences that came out as 0 were changed to a 1, as this is the lowest point of the 7-point Likert scale. The same procedure was followed for both internal and external information asymmetries.

The newly created variables for *internal* and *external information asymmetries* were used in the SEM. As a result, the items for *internal information asymmetries* have the same factor loading for both the buyer and the internal other member. The same goes for the answers given by the buyer for *competitive intelligence quality* and the supplier for *shared competitive intelligence*. As the latter was used twice, there will be two factor loadings given (see table 3).

Table 3: Measurement items

Construct	Measurement items	Factor loadings
		Model B
External information asymmetries		
Embedded partnership logic (Brattström & Faems, 2020) (buyer)	In dealing with this supplier I am sharing information openly.	Removed (B)
Competitive intelligence quality (Ahearne et al., 2013) (buyer)	this supplier ...	
	... shares competitive information that is usually accurate. ... shares competitive information in a timely manner.	0.951 ^a (B) 0.941 ^b (B)
Supplier resource allocation of innovation resources (Pulles et al., 2022) (supplier)	... we are more willing to share key technological information with <this customer>.	Removed (S)
Shared competitive intelligence (Hughes et al., 2013) (supplier)	I often give <this customer> a substantial amount of information about their competitors and the marketplace.	0.951 ^a (S) 0.941 ^b (S)
Internal information asymmetry		
Internal integration (Zhao et al., 2011; Horn et al., 2014) (buyer, internal other function)	My department often interacts with other departments in dealing with this supplier.	0.750 (B; I.O.)
	We have good communication with other departments regarding this supplier.	0.549 (B; I.O.)
	My department has good collaborations with the purchasing department in dealing with this supplier.	0.933 (B; I.O.)
Embedded partnership logic (Brattström & Faems, 2020) (buyer, internal other function)	... I am sharing information openly	Removed (B; I.O.)
Buyer dependence		
Dependence (Terpend & Krause, 2015) (buyer)	If this supplier decided to stop selling to us, we could easily replace its volume with purchases from other suppliers. (Reverse-coded)	0.915 (B)
	If the relationship with this supplier was terminated, it would not hurt our operations. (Reverse-coded)	0.928 (B)
	We are very dependent on this supplier.	Removed (B)
Supplier Performance		
Supplier Performance (Wu et al., 2010) (buyer, internal other function)	Compared with other suppliers, how does this supplier perform in the following areas? (1 = Needs improvement, 7 = Superior performance)	
	Product quality	0.683
	Delivery performance	0.788
	Sales, service and/or technical support	0.833
	Overall cost performance	0.819 (B; I.O.)

(I.O.) = Internal other member; (B) = Buyer; (S) = Supplier

4.4 Data analysis

To test the hypotheses used in this study, the bootstrapping feature in the SmartPLS 4 software was used. Further, this research project will consider the average variance extracted (AVE), which explains the convergent reliability, the composite reliability (CR) values, the Cronbach's alpha as well as the item loadings. In addition, HTMT will be used to test for discriminant validity of the model.

Following, the assessment of the item loadings will show the size of the effect that each item has on the variable. Table 3 shows the factor loadings of the construct. For factor loadings, any value that is between 0.4 and 0.7 should be considered for deletion (Hair et al., 2017). Items which are in this range and lead to a higher value of composite reliability after being deleted, were removed from the construct. Items with a loading factor below 0.4 should be deleted as well. A factor loading can be declared as valid if the value for the loading is equal to or higher than 0.7. Following this principle there were five items left out the first research model due to their loading values being insufficient and the convergent reliability rising when deleting the items (see appendix A). Two items that had a loading value between 0.4 and 0.7 were kept in the model as they were only marginally below 0.7 and helped to complete the measurement of the latent variables. In addition, excluding these items did not influence the level of reliability and validity measures to a beneficial extent, which is why they were kept (see Appendix A). For the same reasons there were two items in model B that were kept in the model, even though their value was below 0.7. However, there were five items that were deleted for model B, as their factor loadings were too low, and their effect was detrimental for the models' reliability and validity (see table 3).

In the next step, the AVE was investigated, which should have a threshold of over 0.5. This means all constructs explain 50 percent or more of the indicator's variance that makes up the construct (Hair et al., 2021). These results show that all variables in the first model qualify for the discriminant validity requirements (see Appendix A). For model B the results were the same, as all values for the four variables were above 0.5 (see table 4).

Next, the composite reliability was analyzed. For this, rho's c was investigated. Here, the values should be above 0.7 to be at a satisfactory level of internal consistency reliability (Nunnally, 1978). The results show that this is the case for all three variables in model A. In addition, Cronbach's alpha was also assessed, where the same threshold of 0.7 holds. For Cronbach's alpha, the assessment showed the same satisfactory results (see Appendix A). The threshold of 0.7 was also met by all the variables in model B in relation their values for both the rho's c (CR) as well as Cronbach's alpha (see table 4). Hence, both the models and their respective variables' level of composite reliability is satisfactory. Further, this study is looking at the HTMT values to ensure there is no discriminant validity. One can see that the effects are all below the threshold of 0.9 in model A (see Appendix A). Similarly to this, the threshold for HTMT is also met by all variables in model B (see table 4) indicating no violations of the discriminant validity for this study.

Lastly, the measurements for the dependent and independent variables were separated, to account for a potential common method bias, as data was collected using surveys. This was investigated using a collinearity test (Kock, 2015), underlining that there is no violation of the common method bias.

Table 4. Means, standard deviations, reliability, and validity for model B

Construct	Cron- bach's α	AVE	CR (Rho's C)	HTMT		
				1	2	3
1. Supplier performance	0.797	0.613	0.863			
2. Buyer dependence	0.823	0.849	0.919	0.107		
3. External information asymmetry	0.883	0.895	0.945	0.191	0.203	
4. Internal information asymmetry	0.706	0.578	0.797	0.159	0.186	0.112

M, mean; SD, standard deviation. N=69

4.5 Control Variables

To make sure there are no alternate underlying reasons for findings, control variables will be added to this study (De Battisti & Siletti 2019). A couple of control variables were included to test if there are any supplier-specific aspects influencing the relationship, as they also help to minimize error terms. Further, control variables are useful to maximize statistical power, which is why *supplier size* was one of the variables used. *Supplier size* refers to the number of employees of the supplier. In addition, the *relationship length* between the companies will be used as another control variable. This is useful as it shows whether performance is also influenced by a longer *relationship length* between buyer and supplier or not. To measure relationship length, the averages of the given answers will be taken. For both control variables it is not expected that they have a direct effect on the dependent variable, which is why they are well suited as control variables.

5. RESULTS

In figure 4 one can see the results of the structural equation model B. The results show that there is a non-significant weak positive effect of external information asymmetries on supplier performance ($\beta=0.160$; $p=0.235$). This is the opposite effect of what was expected and H1 is thus rejected. Next, internal information asymmetries have a weak negative effect on the level of supplier performance ($\beta=-0.131$; $p=0.510$). While the effect has the predicted influence on the dependent variable, H2 is still rejected as the effect is not significant. In addition, internal information asymmetries have no significant effect on the level of external information asymmetries, opposed to what was hypothesized ($\beta=-0.033$; $p=0.848$). Thus, H3 can also be rejected. Further, the results show that buyer dependence also has no significant effect on the level of supplier performance ($\beta=0.022$; $p=0.881$). As a result, H4 is rejected. Looking at buyer dependence's effect on external information asymmetries, one can see that there is a moderately weak negative effect, but the effect is not significant at the $p<0.05$ threshold. However, there seems to be an effect between the two variables, as the effect is significant when using a $p<0.10$ threshold ($\beta=-0.179$; $p=0.074$). Nevertheless, for this study H5a can be rejected. Lastly, buyer dependence seems to have a weak negative influence on internal information asymmetries. While the direction of the effect is as predicted before, also here there was no significant effect found ($\beta=-0.159$; $p=0.378$). Hence, H5b can also be rejected (see figure 4; table 5). The results for model A can be found in Appendix A. There were no significant findings in model A that differ from the findings in model B, thus only model B will be discussed.

Figure 4: Results of structural equation model B

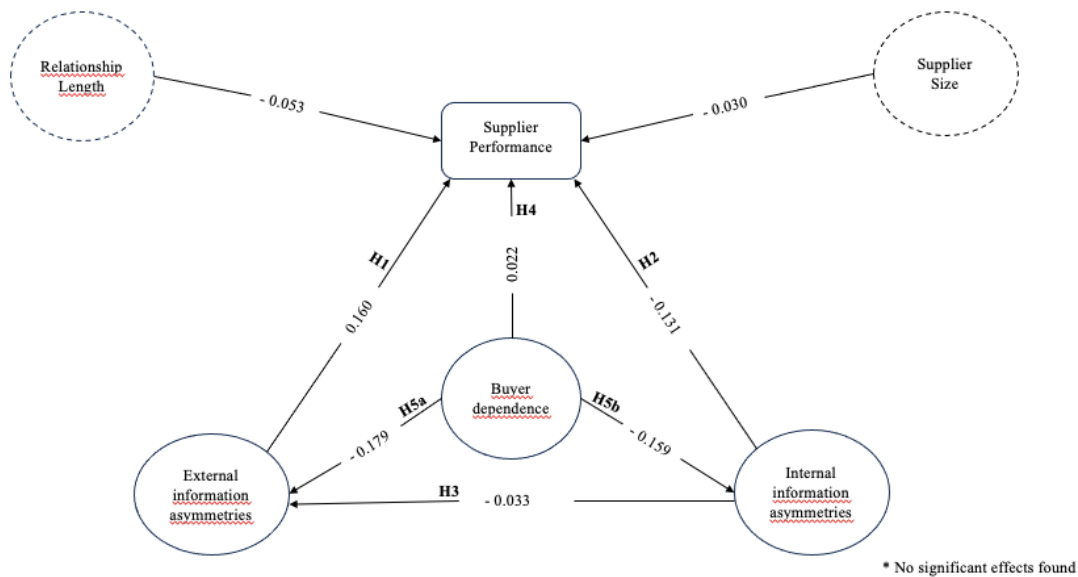


Table 5: Results of hypotheses tests

Hypothesis	p-value	Hypothesis supported
External information asymmetries → Supplier performance (H1)	0.235	Not supported
Internal information asymmetries → Supplier performance (H2)	0.510	Not supported
Internal information asymmetries → External information asymmetries (H3)	0.848	Not supported
Buyer dependence → Supplier performance (H4)	0.881	Not supported
Buyer dependence → External information asymmetries (H5a)	0.074	Not supported
Buyer dependence → Internal information asymmetries (H5b)	0.378	Not supported

6. DISCUSSION

The aim of this paper was to identify potential underlying concepts that influence the perceived level of supplier performance. On the one hand, information asymmetries, both internally and externally, and their relationship to supplier performance was investigated. In addition, this study looked at how these effects of information asymmetry are influenced if seen as a mediator variable, with buyer dependence being the independent variable. This research aimed to answer the question *How do internal and external information asymmetries influence the supplier performance under buyer dependence?* The study showed that there is no significant influence of neither internal or external information asymmetries, nor buyer dependence on the level of supplier performance. However, effects of internal and external information asymmetries should be further investigated, as this study showed a separation of both can show differences in the effects on supplier performance.

6.1 Findings and theoretical contributions

This paper adds to the literature regarding supplier performance (Narasimhan et al., 2008; Ahimbisibwe, 2014; Lusch & Brown, 1996), information asymmetries (Bercovitz et al., 2006;

Jaworski & MacInnis, 1989; Nayyar, 1993; Pavlou et al., 2007; Ramaswami et al., 1997), and buyer dependence (Barnes et al., 2005; Heide & John, 1990; Andaleeb, 1996; Buchanan, 1992; Cook, 1977; Pfeffer & Salancik, 1978).

The results show that there seems to be only a small and no significant positive effect of external information asymmetries on supplier performance. Contrarily to what was expected, external information asymmetries seem to positively influence the level of supplier performance. This means that with lower asymmetries, there is a lower level of performance. This finding is rather unexpected and should be investigated further. Internal information asymmetries have a weak negative influence on supplier performance. While the direction of the effect is as predicted, the study showed no significant relationship between the two variables. Therefore, this paper adds to the literature in terms of information asymmetry and principal-agent theory (Bercovitz et al., 2006; Jaworski & MacInnis, 1989; Nayyar, 1993) and makes a distinction between internal and external asymmetries when analyzing the effect on supplier performance. Currently, most research is about how information asymmetries generally affect supplier performance (Brouthers et al., 2003; Bercovitz et al., 2006), which often focuses on more external factors than internal factors. However, as principal-agent relationships also exist within a company, it is important to analyze how this affects the supplier performance as well as the external information asymmetries. Making a distinction between internal and external information asymmetries can help to find underlying concepts and make decision making as well as information sharing between and within a company more accurate. While external information asymmetries have largely been used as a synonym for information asymmetries in general, differentiating the two can offer new insights into the effects it has on performance and other factors and thus add another layer of analysis to information asymmetry and principal-agent theory literature. The need for a differentiation between the two variables becomes more apparent when looking at the results of this study (see table 5). While external information asymmetries are perceived to be positively influencing the supplier performance, internal asymmetries are found to affect performance negatively. As the effect is opposite, one can see the need to focus on both variations of information asymmetries when trying to draw definitive conclusions. Due to the small sample size of this study, combined with measures of information asymmetries that are not fully suitable, results of this study are difficult to generalize. However, this paper underlined the new and opposing perspectives that internal information asymmetries can have on e.g., the supplier performance.

In addition, this study partially contradicts previous findings that showed that information asymmetries can help to enhance the overall business performance of companies (Stede et al., 2006; Dossi & Patelli, 2010). While lower internal information asymmetry can, if investigated further in detail, potentially pose an underlying factor which influences supplier performance negatively, lower external asymmetries were found to positively influence the level of supplier performance. Thus, the findings for external information asymmetries are opposed to previous findings in this research field. This also contributes to the supplier performance literature. None of the three variables measured had a significant influence on supplier performance, as buyer dependence was also found to have an extremely low, non-significant effect on supplier performance. This contradicts previous findings by Buchanan (1992), who found that buyer dependence leads to a higher level of relational performance. Opposed to this, Kull & Ellis (2016) previously found that higher buyer dependence leads to a lower level of supplier performance, as the supplier can more likely act opportunistic since he has more power in the relationship (Cox et al., 2002). The findings in this study also do not support the findings by Kull & Ellis (2016) as there was no significant effect of buyer dependence found on supplier performance. On the other hand, the findings for internal information asymmetries partially support findings for internal information sharing's effect on supplier performance. Baihaqi & Sohal (2012) found that there is no significant relationship between internal information sharing and organizational

performance. Opposing, Huo et al. (2013) found that internal information sharing improves supply chain performance, confirming previous findings stating the same (Stank et al., 2001; Germain & Iver, 2006). This study confirms the findings by Baihaqi & Sohal (2012), showing no apparent significant relationship between the variables.

When further investigating underlying factors that increase or lower the level of external information asymmetries, previous studies have found that signaling mechanisms can be used to decrease the level of asymmetries. In addition, closer monitoring of the agent, or using relevant incentives were identified as underlying factors reducing external information asymmetries (Mudambi & Helper 1998; Müller & Gaudig 2011; Wathne & Heide 2000). This study adds to the existing literature by introducing another factor that could be significant in lowering external asymmetries. While the effect of buyer dependence on external information asymmetries is insignificant in this paper, the effect can be investigated further, as there seems to be some moderate to weak relation between the two variables. Due to the small sample size, there was no significant effect, however there might be an observable effect if the sample size was bigger. Thus, the results add another layer to the literature concerning external asymmetries, as the level of asymmetries can potentially be lowered by higher buyer dependence. The same can be said about the effect of buyer dependence on internal information asymmetries, where there is an even weaker effect, but still a possible relationship between the variables that needs further investigation to come to meaningful conclusions. The effect of internal information asymmetries on external information asymmetries was found to be extremely weak and not significant, which indicates that there is no relationship between the two variables and a clear distinction is needed when trying to analyze the effects and implications of information asymmetries. This also indicates that internal information sharing does not have any implications on the level or quality of external information sharing.

6.2 Practical implications

Following the theoretical implications of this paper, there are also some practical implications that can be taken into account. On the one hand, lower internal information asymmetries have a negative impact on the level of supplier performance. Contrary to this, lower external information asymmetries have a positive effect on the level of supplier performance. As a result, companies should focus on internal alignment of information between all parts of the company, to enable the best decisions for the company can be made (Graham et al., 2015). The focus of the buying company should be on sharing and collaborating within their own company across all functions. This can, but must not, help to increase supplier performance. As external asymmetries positively influence the supplier's performance, it is better to focus on factors like trust and aligned goals that can improve the performance in a buyer-supplier relationship, and thus ensure that goals of the buyer are met (Santa et al., 2010). Especially in a principal-agent setting, in which the supplier is supposed to act in the best interest of the buyer, it is more important to build a well-functioning relationship between both parties.

Some previous studies have shown, that e.g., organizational performance is not influenced by only implementing better communication mechanisms. To increase performance, consistent goals between the companies are needed (Santa et al., 2010). The results of this paper are in line with previous findings (Bals et al., 2009; Lambert et al., 2005), that claim information sharing and thus the minimization of information asymmetries, can be a very time-consuming component of the buyer-supplier relationship, which as a result is harmful for the level of organizational performance. Hence, these results indicate that companies should focus more on the buyer-supplier relationship and other factors influencing the relationship, as lower external information asymmetries do not seem to have a negative or significant effect on performance.

Lastly, another practical contribution of this paper comes in relation to the level of buyer dependence existent. If the buying company is highly dependent on the supplier, this could help to decrease the

level of external and internal information asymmetries. By decreasing internal information asymmetries, it could potentially benefit the performance of the supplier. Generally, as high buyer dependence means the buying company will put in more of an effort to make the supplier achieve performance goals, the company will also improve internal communication and collaboration, thus leading to decreasing information asymmetries. Hence, the buying company could capitalize from the high level of dependence, when acting on it in the right manner. Not just internally information could be shared to a better extent. The information exchange and quality with the external supplier can also benefit from a high level of buyer dependence.

6.3 Limitations and future research

There were a set of limitations that must be taken into account when interpreting the results of this paper. Firstly, according to Hair et al. (2011), it is suggested that to carry out path modeling in PLS, the sample size should be at least ten times as high as the maximum number of structural paths in the inner model which are connected to one construct. As the maximum number in this study is five, a minimum sample size of 50 is suggested to be useful (Hair et al., 2011). Adding to this, Marcouliders & Saunders (2006) found that for a model with a maximum of five arrows pointing towards a latent variable, just as is the case in the second model tested in this study, the sample size should be at least 70. As this study has a sample size of 69, it can be said that compared to these thresholds, the sample size is largely big enough to be used for this research. However, a sample size of 69 is still small and the results of this study are difficult to generalize, and further research is necessary to do so. Additional studies need to be made including a larger sample size as well as more participating buying companies with different industries and countries of origin. This would give more reliable insights on the effects.

Secondly, due to low item loadings and detrimental effects on the model's validity and reliability measures, certain items were removed. This led to two major limitations in terms of measurement. On the one hand, for internal information asymmetries, the only measures that were left after removing items were measures concerning the perceived differences in internal integration. This covers a part of internal information asymmetries, however, does not paint a full picture of the latent construct. Thus, implications are more difficult to be drawn and more precise measures for internal information asymmetries need to be used in order to get more interpretable results. On the other hand, for external information asymmetries, there were only measures related to the perceived differences in (shared) competitive intelligence (quality) used in the final model. Similarly, this only covers part of the latent construct, meaning that the measures for both internal and external information asymmetries are not fully suitable to explore the effects on supplier performance. Further research is necessary to explore the full effects of these variables. However, this study gives implications on possible effects, taking into account parts of both asymmetries.

The results for the impact of internal information asymmetry supplier performance can be investigated more to analyze whether there is a significant relationship and how and to what extent this effect exists (Baihaqi & Sohal, 2012; Huo et al., 2013). Regarding external information asymmetries, research can be done to investigate if the effect on supplier performance is indeed positive or not (Stede et al., 2006; Dossi & Patelli, 2010). In addition, further research can be done to investigate underlying factors that have a significant effect on internal and external information asymmetries, such as potentially buyer dependence. This could also be further investigated as to how internal and external information asymmetries are influenced and minimized to the best extent (Mudambi & Helper 1998; Müller & Gaudig 2011; Wathne & Heide 2000). Also, the effect of buyer dependence on supplier performance can also be researched further, as the implications of the relationship seem unclear (Buchanan, 1992; Kull & Ellis, 2016).

While this research analyzes the information asymmetry aspect of the principal-agent theory, it leaves other aspects of the theory untouched, giving the possibility for further research into the effects of agency theory on the supplier performance. When conducting further research about these constructs, it is important to meet requirements for sample size and have more clear measurements of the items, to avoid limitations from this paper.

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APPENDIX A

Figure 5: Research model A

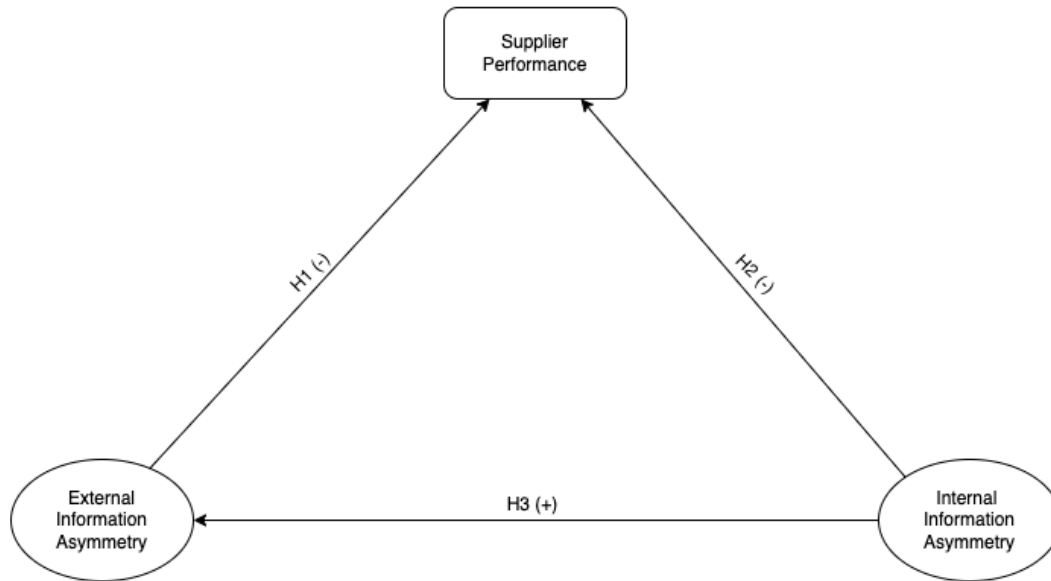


Table 6: Measurement items

Construct	Measurement items	Factor loadings
		Model A
External information asymmetries		
Embedded partnership logic (Brattström & Faems, 2020) (buyer)	In dealing with this supplier I am sharing information openly.	Removed (B)
Competitive intelligence quality (Ahearne et al., 2013) (buyer)	this supplier ...	
	... shares competitive information that is usually accurate. ... shares competitive information in a timely manner.	0.951 ^a (B) 0.941 ^b (B)
Supplier resource allocation of innovation resources (Pulles et al., 2022) (supplier)	... we are more willing to share key technological information with <this customer>.	Removed (S)
Shared competitive intelligence (Hughes et al., 2013) (supplier)	I often give <this customer> a substantial amount of information about their competitors and the marketplace.	0.951 ^a (S) 0.941 ^b (S)
Internal information asymmetry		
Internal integration (Zhao et al., 2011; Horn et al., 2014) (buyer, internal other function)	My department often interacts with other departments in dealing with this supplier.	Removed (B; I.O.)
	We have good communication with other departments regarding this supplier.	0.541 (B; I.O.)
	My department has good collaborations with the purchasing department in dealing with this supplier.	0.995 (B; I.O.)

Embedded partnership logic (Brattström & Faems, 2020) (buyer, internal other function)	... I am sharing information openly	Removed (B; I.O.)
Buyer dependence		
Dependence (Terpend & Krause, 2015) (buyer)	If this supplier decided to stop selling to us, we could easily replace its volume with purchases from other suppliers. (Reverse-coded)	-
	If the relationship with this supplier was terminated, it would not hurt our operations. (Reverse-coded)	-
	We are very dependent on this supplier.	-
Supplier Performance		
	Compared with other suppliers, how does this supplier perform in the following areas? (1 = Needs improvement, 7 = Superior performance)	
Supplier Performance (Wu et al., 2010) (buyer, internal other function)	Product quality	0.655
	Delivery performance	0.793
	Sales, service and/or technical support	0.822
	Overall cost performance	0.844
		(B; I.O.)

(I.O.) = Internal other member; (B) = Buyer; (S) = Supplier

Table 7. Means, standard deviations, reliability, and validity for model A

Construct	Cron- bach's α	AVE	CR (Rho's C)	HTMT	
				1	2
1. Supplier performance	0.797	0.611	0.862		
2. External information asymmetry	0.883	0.895	0.945	0.191	
3. Internal information asymmetry	0.770	0.641	0.767	0.140	0.092

M, mean; SD, standard deviation. N=69

Figure 6: Results of structural equation model A

