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ORIGINAL ARTICLE

Choice Behavior in Innovation Exchange Between Buyers and Sellers

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Abstract This article extends the research on Behavioral Supply Management, and specifically characterizes the decision to exchange supplier–developed innovations. For the innovation exchange to take place, both actors in the dyad must actually make the decision to exchange an innovation with one another. Therefore, buyers' as well as suppliers' decision making are part of this research. The decision to exchange innovation is highly relevant, as innovations play an increasingly important role in business research. The applied methodology is a mouse-lab process-tracing experiment. The study is based on computer cursor moving and click data from 658 managers. As the conceptualized decision situation is highly specific, practitioners can build upon their business experience and are the experiment respondents. The sample includes buyer and supplier sub-groups. We differentiate our findings based on innovation intensity (i.e., incremental vs. disruptive innovations). The findings show that the intensity of an innovation does not imply different decision-making per se, although distinguishing incremental from disruptive innovation is often

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proposed. Furthermore, the relevance of exclusiveness (i.e., a buyer has exclusive access to a supplier's innovation) is of minor relevance for the supplier but also for the buyer, even when these innovations are disruptive. Finally, the intensity of innovations is only relevant in high-quality buyer–supplier relationships. Under these circumstances, decision makers show irrational behavior, as they prefer alternatives with low economic benefits. That aspect points to the identification of relational decision traps and other theoretical and managerial implications.

Keywords Innovation · Buyer-Supplier Relationship · Decision Making · Experiment · Laboratory Studies

1 Introduction

In 2001, the company Apple Inc. developed the first version of the portable music player iPod (Pawar and Gupta 2007). While other music players could play about 16 songs, the iPod was able to store 1000 songs when it was launched, which was a clear competitive advantage (Pawar and Gupta 2007). Apple Inc. achieved this advantage by incorporating an innovation from supplier Toshiba. Toshiba had developed a small 1.8-inch hard disk with a storage capacity of five gigabytes, but the Japanese company had not yet found an application for it (Isaacson 2012). Although the iPod was not ahead of the competition solely because of its storage capacity, the example illustrates that an innovative preliminary product (pre-product) from a supplier can lead to a competitive advantage for the buying firm. Thus, the exchange of innovation in buyer-supplier relationships is of strategic relevance.

Porter and Schumpeter already stated that innovation is in general of great importance to companies and is an effective and sustainable way to compete (Porter 2004; Schumpeter 2005). The example above is described by the concept of the Supply Chain of Innovation (SCoI) developed by Mazzola et al. (2015). SCoI does not refer to the material flow but to the innovation flow between a focal buyer and a supplier. This research work is linked to the concept of SCoI and adds innovative pre-products to the list of exchanged innovations. In addition, the role of suppliers as exchange partners is also added to the concept of SCoI.

Thus, SCoI also comprises the exchange of innovation between a buyer and its suppliers. This exchange initially requires a positive decision by both actors to exchange the innovation with the other party. This mutual decision is thus the basic prerequisite for an exchange of innovations in the supplier-buyer dyad. Slowinski et al. (2009, p. 29) therefore argue: "Sourcing innovation is a two-company affair. It is equally important to understand how each of these issues impacts the collaboration from the partner's perspective." It can be assumed that decision-making processes related to innovations differ substantially from routine decisions, so that a differentiated consideration of the exchange of innovations, and the associated decision-making processes in contrast to the exchange of goods is useful (Slowinski et al. 2009; Hauschildt and Salomo 2011).

Thus, this research addresses decision-making in buyer-supplier relationships, and refers to Procurement and Supply Management (PSM) research. Within PSM

research Behavioral Supply Management (BSM) has gained importance since its introduction, in 2007. It is still at the beginning of its development (Kaufmann et al. 2017). BSM aims to identify deviations from the assumptions of homo economicus in the assessment, and decision making of purchasing managers (Carter et al. 2007). The focus is on identifying systematic errors in the decision-making behavior of procurement managers, and developing measures to avoid these errors (Kaufmann et al. 2009, 2010, 2012a; Hada et al. 2013). This research is also linked to BSM, as this analysis tries to explain the exchange of innovation in SCoI from a BSM perspective.

The overarching question of this research work is therefore, to answer how preferences arise in the exchange of innovation between suppliers and buyers. More specific, this research will operationalize the decision to exchange an innovation quite similarly to approaches which analyze the decision of supplier selection (Weber et al. 1991; Choi and Hartley 1996; Sarkis and Talluri 2002). Supplier selection already has been in the focus of BSM research (Kaufmann et al. 2010, 2012a, b). This research adds a new perspective, which has not been in the core focus of BSM so far. This is the dyadic perspective, because both actors in the dyad must make the decision of innovation exchange. Furthermore, this research adds new decision content to existing (cost or relationship) factors, and broadens the scope of BSM in this research field. One important aspect of the analysis in this research refers to innovation intensity. Innovation differs in its effects and potential for future value creation. What will be further explained below, the analysis adds innovation intensity degrees including disruptive innovation to the decision situation. It is assumed that the decision to exchange an innovation is influenced by innovation intensity.

Another important aspect of the analysis refers to exchange exclusivity. It is assumed that only exclusive innovation access bears the potential for competitive advantage. However, in many industries value creation activities in the SCoI are dispersed among many firms that specialize in a particular technology or activity, with a focal firm acting as the "knowledge integrator" to create greater value for the stakeholders (Narasimhan and Narayanan 2013). Such focal firms must obtain access to innovation and therefore have a need for "tapping supplier innovation" (Wagner 2012). Thus, exclusivity might be a relevant factor in buyer's decision-making.

Overall, the findings of the analysis reveal new dynamic rationale to explain innovation exchange in buyer-supplier relationships. This rationale is presented in a systemic approach and with reference to comparative advantage theory. To present this research, the article is structured as follows: First, we will briefly review the relevant literature and derive research questions. We will then operationalize the decision task and explain the methodology of this research. Lastly, we present and discuss our results, and we outline the study's conclusions.

2 Theoretical Background and Research Questions

2.1 Comparative Advantage Theory and Innovation Intensity

In this section, the Comparative Advantage Theory (CAT) by Hunt and Morgan (1995) is applied to ground the rationale that innovation intensity is a factor that potentially effects the decision of innovation exchange. The CAT can be understood as a counterproposal to neoclassical theory. The starting point of their considerations is the fact that neoclassical theory has some shortcomings and fails to explain differences between firms, goods and economic systems. Table 1 compares neoclassical theory and CAT and points out the differences.

Neoclassical theory assumes that perfect information is available to companies and consumers free of charge, that demand is homogeneous, i.e. tastes and preferences are identical, and that resources are available to everyone equally (Hunt and Morgan 1995; Williamson and Bercovitz 1996). While the goal of consumers is to maximize their own benefit, the goal of companies is to maximize profit. In doing so, the companies use the production factors capital, labor, and, if required, land. These resources are regarded as homogenous and completely mobile. The task of the management is to adjust the amount of production to environmental influences. Within the framework of this theory, competition in the short term consists in adjusting production volume to changes in market prices and costs for resources, and in adjusting the capacities of the plants in the long term. The behavior of the companies is controlled by their competitive environmental situation. In the same way, the environment determines the profit of the companies. Because all perfect markets strive for a balance in the long run, the market prices correspond to the marginal costs (Hunt and Morgan 1995).

In this perfect equilibrium, all companies have perfectly adapted their production volume, resource consumption and production capacities (Hunt and Morgan 1995). Because these adjustments are the only ones allowed under neoclassical theory, innovations would be exogenous influences. Because they would throw the market

Table 1 Comparison of Neoclassical and Comparative Advantage Theory (Hunt and Morgan 1995)

Perspective	Neoclassic Theory	Comparative Advantage Theory
Demand	Homogeneous within industries	Heterogeneous within industries
Consumer information	Perfect and costless	Imperfect and costly
Human motivation	Self-interest maximization	Constrained self-interest
Firm's objective	Profit maximization	Superior financial performance
Firm's information	Perfect and costless	Imperfect and costly
Resources	Capital, labour and land	Financial, physical, legal, human, organizational, informational and relational
Resource characteristics	Homogeneous, perfectly mobile	Heterogeneous, imperfectly mobile
Role of management	Determine quantity and implement production function	Recognize, understand, create, select, implement and modify strategies
Role of environment	Totally determines conduct and performance	Influences conduct and performance
Competition	Quantity adjustment	Comparative advantage

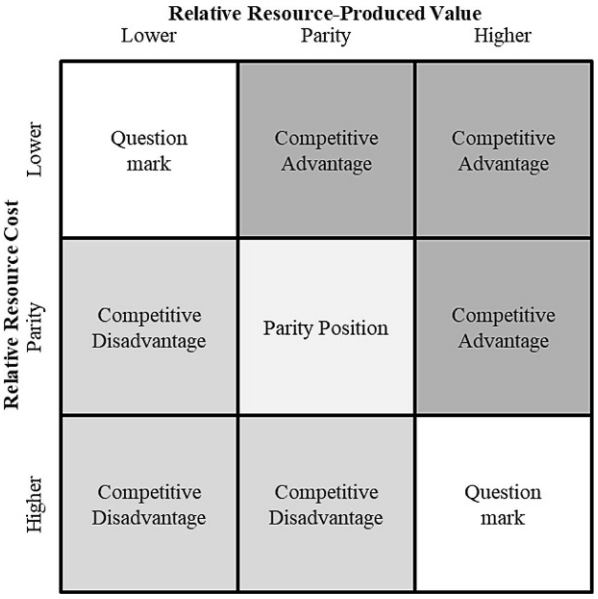

Fig. 1 Hunt and Morgan's competitive position matrix

out of balance, they can also be regarded as disturbances and thus remove it from its ideal state. Accordingly, neoclassical researchers considered, for example, the annual product maintenance measures of automotive manufacturers as damaging product differentiation costs (Hunt and Morgan 1995).

An alternative to neoclassical theory is, according to Hunt and Morgan (1995), the CAT approach. CAT assumes that demand is not heterogeneous, i.e. tastes are different and change over time. Information on products is not only incomplete, but also associated with costs. The pursuit of utility maximization is limited by values and moral concepts. As a goal of the companies, superior financial performance takes the place of profit maximization in CAT. In other words, companies try to achieve higher performance over the closest competitors but not by the maximization of profits per se.

The CAT divides resources into the categories of financial, physical, legal, human, organizational, informational and relational resources (Hunt and Morgan 1995). In contrast to neoclassical theory, these resources are not freely accessible to everyone, but are rare, heterogeneous and limited in their mobility (Wernerfelt 1984). Based on these considerations, Hunt and Morgan developed a competitive position matrix (Fig. 1) which provides nine possible positions in a market segment compared to competitors (Hunt and Morgan 1995). The dimensions of relative resource costs and relative produced value generated by the use of these resources are applied.

This illustrates how innovations can fundamentally affect competitiveness. On the one hand, innovations can lead to a higher customer benefit; this can be the case, for example, if a smartphone with more memory capacity comes onto the market. On the other hand, innovations can also reduce the use of resources, e.g. if processes within production are optimized. This allows products with the same customer benefit to be manufactured at lower cost. Finally, Hunt and Morgan see the role of so-called

"major innovations" as decisive for the competitiveness of a company. As a result, innovations should be viewed in a differentiated manner based on their intensity. Major innovations appear to have a different influence on the competitive position than smaller improvements. Therefore, the first research question (RQ) is:

> RQ 1: How does the intensity of an innovation influence the behavior of the decision makers?

In research, often no differentiation is made on the basis of innovation intensity, or the intensity is implicitly assumed (Veryzer Jr. 1998). There are recent contributions that use the term innovation intensity in a different way, e.g. to describe the intensity of company investments for R&D of a specific innovation project (Liao and Tsai 2019), but a differentiation of innovation with respect to the intensity of its performance effects is missing. Besides, there is research that focuses on radical innovations, i.e. innovations with a high degree of innovation intensity.

2.2 Resource-Based View and Exclusivity of Innovation Access

Resources represent one dimension in Hunt and Morgan's competitive position matrix. Referring to this dimension, the resource-based view (RBV) and competitive advantages are used to explain the rationale of exclusive innovation access. The RBV introduced by Barney in essence tries to explain why the performance of firms differs, although customer market conditions are similar for all firms (Barney 1991). The RBV explains the performance differences by heterogeneous resources and capabilities that firms possess or control (Wernerfelt 1984). The core message of the RBV is that the resources that a company controls are responsible for above-average company performance. These resources must be difficult to imitate, not substitutable and scarce.

A frequently discussed question in the PSM community is, how procurement function can contribute to a company's competitiveness (Ramsay 2001b, a; Mol 2003). Ultimately, their answer determines whether the procurement function has strategic relevance or not (Hartmann et al. 2012; van Weele and Eßig 2016). If supply management can support the company in building a Sustainable Competitive Advantage (SCA), then it is also strategically relevant (Barney 1991). In its original definition, an SCA is a strategy, not simultaneously being implemented by any current or potential competitors and when these other firms are unable to duplicate the benefits of this strategy (Barney 1991). For the purpose of this paper, the question arises whether purchasing management can help to establish SCA based on its activities in the area of innovations developed by suppliers.

First, it is necessary to clarify whether it is generally possible to gain a competitive advantage through an innovation. The above definition lists the necessary conditions. An innovation must be the source of a competitive advantage and must be sustainable. Barney argues that sustainability does not depend on calendar time, but on non-imitability. In his words: "a competitive advantage is sustained only if it continues to exist after efforts to duplicate that advantage have ceased" (Barney 1991, p. 102). Empirically, SCAs naturally exist on average over a long calendar time, but calendar time is not the criterion that defines the existence of SCA. Inno-

vations are usually subject to imitation, but it is often difficult, if not impossible, to imitate them successfully (Tidd and Bessant 2011). Therefore, if an innovation still exists after efforts to imitate it, it can be assumed that it is sustainable.

Second, a competitive advantage can only be achieved if the innovation is new for the purchasing company, but also for its competitors and potential competitors (Barney 1991). Since innovations are always new to a certain extent, it is the subjective dimension of the innovation that is addressed here that answers the question: "New for whom?" (Hauschildt and Salomo 2011). The innovation must be new to the competitors in an industry and to the potential competitors that might enter that industry in order to be the source of SCA. Furthermore, an additional condition must be met for an innovation developed by a supplier: The purchasing company must have exclusive access to this innovation. If all competitors of the purchasing company also had access, the innovation would no longer be an advantage for this company. Many authors reject the idea, that companies can buy a SCA through purchasing activities. However, their reasoning does not sufficiently consider that if something can be bought, this does not mean that it is freely available (Ramsay 2001a).

In summary, innovation from suppliers can become SCA if they are hard to imitate, and if a purchasing company has exclusive access to the innovation. This opens the arena to the exclusivity construct. The question of exclusivity is already discussed in the literature on Preferred Customer Status (PCS). With PCS, purchasing companies compete for the favor of suppliers so that they can be granted preferential treatment (Baxter 2012; Ellis et al. 2012; Hüttinger and Schiele 2013; Pulles 2014). One form of preferential treatment by suppliers is access to supplier innovations (Schiele 2012; Slowinski et al. 2009). Ramsay, too, sees the possibility to foreclose a supplier from the market, and thus from the competitors of the buyer, so that a SCA can be created through procurement (Ramsay 2001b). Porter also describes various ways of creating a SCA, including exclusive agreements with partners (Porter 1985). Slowinski and others point out that suppliers provide some buyers exclusivity for a certain period of time (Slowinski et al. 2009). The quest towards SCA is the basis for the rationale that the degree of exclusivity has an impact on the decision to exchange an innovation. Therefore, the second RQ is:

RQ 2: Under what circumstances do buyers get exclusive access to innovations?

2.3 Relational View and Positive Perception of Business Relationship

In the previous section, the focus was on the RBV. This section uses the relational view (RV) to underline the relevance of a positive buyer-supplier relationship in case of innovation exchange. The RV addresses a situation in which critical and required resources lie outside the boundaries of a company (Dyer and Singh 1998). When companies combine their resources in a unique way, they can be a source of SCA. Thus, RV is also a theory that explains why companies differ in performance (Dyer and Singh 1998). According to Dyer and Singh (1998), basic types of business relationships are arm's-length market relationships and partnership relationships. Arm's-length market relationships are characterized by, among other things, non-

specific asset investments, minimal information exchange, separable technological and functional systems, low transaction costs, and minimal investment in control mechanisms. Under these circumstances, it is easy to replace the exchange partner. It is also impossible to establish a SCA based on such a relationship, as they are neither rare nor difficult to imitate.

This would require partnership relationships. These are characterized with at least one of the following categories: Relationship-specific investments, routines for knowledge-exchange, complementary resources, and effective steering mechanisms. Overall, positive effects of a positive, collaborative relationship between a buyer and its supplier are broadly received in literature, e.g. Ralston et al. (2017).

The positive link of a collaborative relationship to relationship outcomes is the basis for the rationale that a positive buyer-supplier relationship also has effects on the innovation exchange decision. Therefore, the third RQ is:

RQ 3: To what extent does the relationship between a supplier and a buyer influence the decision-making behavior when exchanging innovations?

3 Background on Decision Criteria

We conceptualize the decision task as the choice of exchanging a supplier-developed innovation in return for a compensation. Thus, the innovation exchange decision (IED) depends on the evaluation of the innovation (the compensation). This section reviews the relevant decision criteria. On a first glance, the IED seems to be quite similar to the well-researched supplier selection decision because the decision-maker chooses between suppliers and their offers, and in IED between exchange partners and their innovation or compensation offers. Unfortunately, this basic similarity is misguiding because there are also a number of significant differences (Table 2).

The comparison shows, although the decision situations are similar, the IED has specific features that require separate consideration. Highly relevant for this work are the differences in the uncertainty and risk levels. In IED, information is either not available, or the information is uncertain. However, human decision processes essentially require the acquisition and comparison of information (Rogers 2003; Bamberg et al. 2012).

In supplier selection decisions, cost, quality and delivery performance are always among the most important decision criteria factors (Weber et al. 1991; Kannan and Tan 2002). However, these factors are not applicable to the IED, due to the high uncertainties and dynamics of innovations. The delivery performance of an innovation does not yet exist. Quality and cost of an innovation are at least very uncertain and hard to forecast. It is therefore necessary to go beyond the cost-quality-delivery scheme, and to link the IED to decision criteria coming from the characteristics of the innovation.

Innovation Intensity The innovation factor characterizes the innovation to be exchanged. There are three types of innovation intensity distinguished in this research work, as it is to be investigated how the intensity of an innovation affects the de-

Table 2 Comparison of supplier selection with innovation exchange decision

	Supplier selection	Innovation exchange
Involved actors	Supplier and buyer	Supplier and buyer
Exchange object	Physical goods or services	Innovative preliminary products
Initial specification of exchange object	Buyer	Supplier
Involved suppliers	Many	One
Use of exchanged object	Internal use or as part of own products	Internal use or as part of own products
Level of uncertainty	Low	High
Risk of opportunistic behavior	Low	High
Decision character	One/few out of many	Yes/No
Involved divisions	Procurement or various	Various
Task classification	Routine	Special

cision-making behavior of the actors (cf. RQ 1). Efficiency-increasing innovations are those that lead to improvements in internal processes (e.g. in production). The customer benefit remains the same, it is only achieved with less resources or lower costs (Bower and Christensen 1995; Tidd and Bessant 2011; Christensen 2015). Incremental innovations are those that create added value for the customer, and thus improve existing products, e.g. cars with more power than the previous version (Bower and Christensen 1995; Hauschildt and Salomo 2011; Tidd and Bessant 2011; Christensen 2015). Radical or disruptive innovations are those that make an existing product significantly simpler, significantly cheaper, and thus make it interesting for new target groups, e.g. from mainframe to personal computer, or even define a new product category, e.g. tablet computers (Bower and Christensen 1995; Hauschildt and Salomo 2011; Tidd and Bessant 2011; Christensen 2015). Therefore, disruptive innovations often lead to market growth.

Degree of Exclusivity In order to check whether or under which conditions suppliers grant their customers exclusive access to innovations (cf. RQ 2), another factor is necessary, which is called exclusivity factor. From the buyer's point of view, this factor describes the number of competitors with whom the supplier also exchanges a certain innovation. The smaller this number is, the higher the degree of exclusivity for the buyer. From the supplier's perspective, the factor indicates the number of customers with whom an innovation is exchanged. The expression of this factor is given in the experiment described below with one exchange partner, or an alliance of several exchange partners.

Relationship In the supplier selection literature, Ellram (1990, p. 8) stated: "Most of the research in the area of supplier selection focuses on the quantifiable aspects of the supplier selection decision—issues such as cost, quality, delivery reliability and other similar factors". It was argued that companies are more involved in strategic partnerships with their suppliers, and that therefore "soft" factors inherent in the buyer-supplier relationship need to be considered in addition to the more traditional and easily quantifiable factors such as cost, quality and delivery reliability (Ellram

1990). Therefore, this research investigates how the relationship between supplier and buyer influences the decision-making process (cf. RQ 3). Many research studies show that the relationship between economic actors is generally important (Anderson and Narus 1984; Dwyer et al. 1987; Morgan and Hunt 1994; Wilson 1995). In this research work, the evaluation of the relationship with the partner in the supplier-buyer dyad is an evaluation of the following factors: mutual trust, supplier satisfaction, and commitment of the partner. The relationship factor is not defined as a snapshot, but as an average evaluation of the partner over the duration of the relationship.

Economic Potential Although human behavior is influenced by systematic errors (Gino and Pisano 2008), it can be stated that objective economic criteria are important (Cartwright 2011). This also applies to supplier selection, where costs are a decisive factor. Costs could also be applied as a factor in the exchange of innovation, as it can be assumed that suppliers receive compensation for their innovation. However, costs do not take into account the fact that innovations also generate added value, which leads to more profit. For this reason, the economic factor is not defined as costs but as economic benefit potential. The economic factor of an innovation refers to the economic potential that the exchanged innovation offers over time. Innovations with high economic potential can have a strong positive impact on the company's success in the long term, and vice versa.

Overall, the IED is operationalized as follows: A decision maker is confronted with two situations of innovation exchange. The decision maker can get information about the situational characteristics, i.e. the decision criteria, for each situation. Next, the decision maker uses the retrieved information to make the IED, what results in a choice for one of the alternatives (Fig. 2). This understanding and operationalization of an IED is translated into an experiment methodology. The next section will present the methodology, which describes the measurement of all factors and their statistical evaluation.

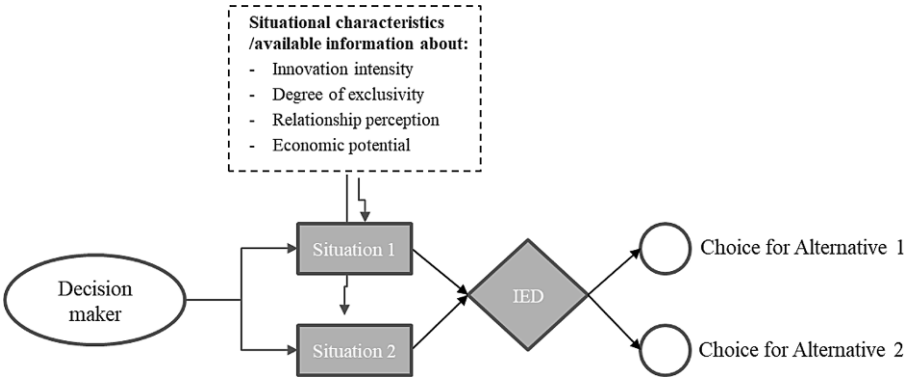

Fig. 2 Operationalization of the innovation exchange decision (*IED*)

4 Methodology

4.1 Process Tracing Method and Experiment Design

This study examines the IED, and the four factors with an experimental research design. The experiment is also using process tracing techniques. The experiment is established as follows: Each IED comprises two alternative situations of which one must be chosen. Each respondent is tasked to execute a sequence of IEDs. The sequence of IED's is structured in phases for control and stimuli purposes. Also, the respondents are grouped for control and stimuli analysis. In this section, the content of the experiment is explained in detail:

The method is a scenario-based stated-choice experiment that builds on descriptive decision models that investigate the real decision behavior of humans (Laux et al. 2014). Because in purchasing and supply management "the work is largely conducted by people (not machines) and thus people are a major factor" (Eckerd 2016, p. 259), the use of a behavioral experiment is very effective as a research strategy in this study. According to Elmazoski et al. (2016), most experiments in purchasing and supply management are scenario-based; thus, this approach is also adopted in this study. Furthermore, the use of experiments is in general not atypical in combination with decision-oriented research (Gillenkirch 2006; Cartwright 2011).

The presented alternative situations on which the IED builds on is designed as follows: Before making the decision, each respondent obtains access to information in the form of presented characteristic values of each of the four factors: (1) innovation, (2) exclusivity, (3) economic potential, and (4) relationship factor. The values of each factor differ for each scenario, and for each alternative. In other words, this study operationalizes the four factors in the form of ranking scales and characteristic values and presents only one characteristic per alternative and factor (Table 3). With this information, the respondent has to make the IED. Regarding the decision outcome, the extracted data is nominally scaled (alternative 1 or alternative 2). Appendix A depicts how the experiment appeared to respondents. In every IED additional explanations/definitions regarding the four factors was presented to the test persons.

Each respondent was tasked to execute a sequence of 15 IEDs. The sequence is structured in three phases of five IEDs each. Each phase includes a vignette followed by observations. The start vignette in phase 1 communicates to the respondents how

Table 3 Variable Measurement

Factor	Characteristic value/Ranking scale			
1 Innovation	Efficiency-enhancing	Incremental		Disruptive
	Low	Medium		High
2 Exclusivity	Exchange together with 5 other partners		Sole partner of exchange	
	Low		High	
3 Economic	Low	Medium		High
4 Relationship	Broken	Neutral		Good
	Low	Medium		High

Table 4 Experiment Design

Group	Perspective	Phase 1		Phase 2		Phase 3	
		t1	t2	t3	t4	t5	t6
1	Buyer (B1)	Start Vignette	Observation	Placebo Vignette	Observation	Standard Vignette	Observation
	Supplier (S1)		Observation		Observation		Observation
2	Buyer (B2)		Observation	Innovation Vignette	Observation		Observation
	Supplier (S2)		Observation		Observation		Observation
3	Buyer (B3)		Observation	Relationship Vignette	Observation		Observation
	Supplier (S3)		Observation		Observation		Observation
4	Buyer (B4)		Observation	Innovation +Relationship	Observation		Observation
	Supplier (S4)		Observation		Observation		Observation

the survey is designed, and how the software is used. Furthermore, phase 1 is used to compare and control the observations for all groups from each perspective, and to ensure there are no differences in their behavior (control for sampling bias). This element of the experiment is important because possible effects in phase 2 could otherwise be the result of initial differences in the groups, and would not necessarily be the result of the treatments (i.e., vignettes) in phase 2. The second phase is used to provide the respondents with specific information in the form of vignettes (treatments) such that several effects can be measured. The third phase is for control issues, e.g., to measure whether respondents really did undergo decision making, or merely clicked through the survey.

To further identify and measure causal effects, this study distinguished four main groups of respondents. The first one is the placebo group, which received no peculiar further information during phase 2 of the experiment. The next three groups received different treatments in the form of vignettes, which are written accounts of specific situations (Wilks 2004). For example, a vignette gives information to the respondents, that in all of the following exchange situations the innovation intensity is very high (group 2), the relationship to the partner is always very good (group 3), or the innovation intensity is high, and the relationship is good (group 4).

Lastly, each of the four groups was divided into sub-groups representing the buyer, or the supplier perspective. In fact, this division was either conducted when the respondents received an invitation to the experiment, in case it was known if the respondent is in the supplier, or buyer role, or at the beginning of the experiment by selecting a role in case the respondent's role was unclear.

By focusing on the supplier–buyer dyad, and using multiple respondents to measure individual behavior, this research adheres to the general guidelines for relationship research in supply chain management, recently postulated by Flynn et al. (2018). The experiment design aims to decrease the risk of bias by meeting the standards of a polyadic constructed, multiple-respondent experiment (Table 4).

Data is collected with an online experiment by applying a process tracing technique. Process tracings have their origin in psychological research (Willemsen and Johnson 2010) but are also used in marketing studies (Reisen et al. 2008). For this purpose, MouseLab Web software is used. This software is a basic process-tracing software package to observe individual decision-making behavior in an online ex-

periment. In this software, respondents can acquire information hidden behind boxes by moving their mouse cursor over the boxes (Willemsen and Johnson 2010). The software measures how often, and how long different boxes are chosen to acquire information. In addition, the software measures the sequence of boxes opened by the respondents. The advantage of the process tracing technique is that it measures not only the decision (which alternative is chosen) but also what information the decision maker is acquiring during the decision-making process.

The execution of the method was as follows: After a first pretest with faculty members at the authors' university, a second pretest was executed with students of business administration at Bundeswehr University Munich. Both pretests were used to improve language, readability, understandability, clarity and unambiguousness. After finalizing the experiment design and the software implementation, the first email invitation for the main study was sent on January 5, 2018, followed by a reminder on January 16, 2018. On January 28, 2018, the experiment field phase ended. The next section provides further details concerning the sample and response rate.

4.2 Sample

Although students are often a good choice for universalistic research, managers must be the respondents in this study because the conceptualized decision situation is very specific (Eckerd 2016). This study aimed and succeeded at using practitioners as respondents. Those practitioners are able provide information on the exchange of innovation between buyer and supplier from business experience. A database of 92,137 contacts from a German conference company focused on B2B events was used to solicit practitioners from suppliers, and buyers alike to join the experiment. Those contacts represent major industries. Moreover, the contacts in the database have a high hierarchical level within their organizations, which is important, because those respondents are actually more likely to make decisions within their companies about situations such as those conceptualized in the experiment. In advance, 4067 and 20,302 contacts could unambiguously be associated with buyers and suppliers, respectively (Table 5). The remaining 67,768 had to choose whether they belonged to the buyer or supplier side of the dyad.

When the experiment ended, 658 complete responses had been gathered from respondents who completed all decision situations with which they were confronted. The respondents comprise 64.7% on the buyer side, and 74.1% on the supplier side at least at manager level within their organizations. These numbers indicate that the external validity is good, because the respondents, from a hierarchical point of view, are responsible for decisions to exchange innovations with specific partners within their organizations. The majority of the respondents—45.3% of the buyers,

Table 5 Sampling Structure

	Buyer	Supplier	Unknown	SUM
Delivered	4067	20,302	67,768	92,137
Share	4.41%	22.03%	73.55%	100.00%

Table 6 Respondent Characteristics

Respondent hierarchical level	Buyer (%)	Supplier (%)	Sum (%)	Respondents by industry	Buyer (%)	Supplier (%)	Sum (%)
Owner/Board member	14.7	20.2	18.8	Industrial Products and Engineering	23.5	30.5	28.7
Managing Director	21.2	23.2	22.7	Automotive	11.2	20.5	18.1
Vice president	14.1	15.2	14.9	Aerospace and Defense	10.6	11.2	11.1
Manager	14.7	15.4	15.2	Consulting and Services	11.8	10.0	10.5
Team leader	7.6	4.6	5.4	Railway, Public Transport and Infrastructure	5.3	5.0	5.1
Project manager	8.8	7.8	8.1	Transport and Logistics	4.7	3.4	3.7
Staff member	11.2	11.0	11.1	Consumer and Retail	3.5	2.2	2.5
Other	7.6	2.4	3.7	Other	29.4	17.1	20.2
Sum			*100.0*	*Sum*			*100.0*

and 62.2% of the suppliers—come from the "Industrial Products and Engineering," "Automotive" or "Aerospace and Defense" industries. As in those industries, a tier-structured supply chain exists; consistently, 74.8% of the overall respondents are suppliers (Table 6).

Overall, the sample provides a good fit for this study because major industries with a significant supplier base account for the majority of respondents. For instance, the vertical integration in the automotive and aerospace sector is relatively low, which means that suppliers contribute significantly to the net output ratio and are thus an essential factor. This arrangement is important because exchanging supplier innovations clearly requires a vital supplier base that is innovative and actively pursuing research and development activities. Moreover, the sample largely comprises decision-makers from various departments within their organizations; thus, the situation that they are confronted with in this study is not a hypothetical one to them.

4.3 Analysis

The analysis calculates the relative influence of each factor on the IED. For this purpose, a choice-based conjoint (CBC) analysis is used. Therefore, CBC analysis is closer to real decision-making than a traditional conjoint analysis (DeSarbo et al. 1995). CBC analysis estimates the utilities of each factor from the experiment data; thus, there is no need to measure perceptions of information utilities directly (Backhaus et al. 2015). However, CBC analysis requires a nominal scale level. In this experiment, the respondent selects one of two alternatives (A or B). The experiment does not provide any information or indication, whether alternative A or B will be better or worse. There is no ranking between the alternatives in the experiment IED, thus the dependent variable is nominally scaled.

In the CBC analysis, utilities are combined into an overall benefit of an alternative u_s by using a benefit model (Eq. 1). In this study, a part-worth model is used that

combines the utilities additively, which is the standard model for CBC analysis (Backhaus et al. 2015). Therefore, the benefit of each alternative is

$$u_s = \sum_{j=1}^{J} \sum_{m=1}^{M_j} b_{jm} \times x_{\text{jms}} \tag{1}$$

where b_{jm} describes the part-worth utility of property j, property characteristic m and dummy variable x_{jms}, which is 1 if s has property characteristic m for property j, and 0 otherwise.

The CBC analysis also requires a choice model because probabilities cannot be directly measured. As respondents can choose between two alternatives per choice set, a binary logit-choice model is adopted (Eq. 2):

$$prob(1|2) = \frac{e^{u_1}}{e^{u_1} + e^{u_2}} = \frac{1}{1 + e^{-[u_1 - u_2]}} \tag{2}$$

Because nominal scale level of the CBC analysis, part-worth utilities must be estimated using the maximum-likelihood method. The aim is to maximize LL (Eq. 3):

$$LL = \sum_{r=1}^{T} \sum_{m=1}^{M_j} \ln\left[\text{prob}_r(1|2)\right] \times d_{kr} \tag{3}$$

with K alternatives per choice set r, T choice sets in the experiment and dummy variable d_{kr}, that is 1 if in situation r alternative k is chosen, and 0 otherwise.

The data output of the process tracing in the MouseLab web software was 34 CSV sheets for each sub-group, and 544 sheets in total. For better handling, all 544 CSV sheets were converted to an Excel format and consolidated using several macros and manual editing. Lastly, the CBC analysis was executed in the previously prepared Excel documents.

5 Findings

5.1 Relative Factor Relevance per Experiment Group

The standard test for logit models is the likelihood-ratio (LLR) test. Based on LLR statistics, which are chi-square distributed with seven degrees of freedom, the test calculates *p* values. The experiment findings are statistically highly significant with *p* values of 0.0001 for all sub-groups, and thus have an excellent fit. The hit rate, i.e., the correct ex-post forecast of the choices made, is between 67 and 83%, and thus is also good (Table 7).

In the absence of any treatment, (group 1) buyers and suppliers assessed the economic factor as the most important factor in their decisions, with 39.5% (B1) and 43.5% (S1), respectively. That group perceives the relationship factor as also highly important with 35.5% (B1) and 34.8% (S1). Buyers value the exclusivity factor as important (18.3%), and the potential of the exchanged innovation as relatively unimportant (6.3%). For suppliers, the assessment of the last two factors is 2.2 and 19.5%, inverted compared with the buyers. The following table depicts all factor

Table 7 Respondents per Experiment Group and Their Significance Levels

	Buyer				Supplier			
	B1	B2	B3	B4	S1	S2	S3	S4
Hit rate	78%	80%	79%	83%	71%	70%	72%	67%
p-value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
# Returns	39	41	40	46	118	122	118	134
Share of returns	5.9%	6.2%	6.1%	7.0%	17.9%	18.5%	17.9%	20.4%

N = 658, return rate = 1.64%

Table 8 Relative Importance of Properties

	Buyer				Supplier			
	B1 (%)	B2 (%)	B3 (%)	B4 (%)	S1 (%)	S2 (%)	S3 (%)	S4 (%)
1 Innovation	6.3	18.9	34.1	34.3	19.5	14.9	28.8	33.3
2 Exclusivity	18.8	8.2	17.8	16.6	2.2	11.4	12.5	12.4
3 Economic	39.5	43.4	15.9	17.0	43.5	40.2	28.4	22.0
4 Relationship	35.5	29.4	32.2	32.1	34.8	33.5	30.2	32.3
Sum	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

relevance values, and the findings of vignette groups 2–4, which received additional information (treatments) in experiment phase 2 (Table 8), are explained below.

Group 2 was given vignette information indicating that only innovations with a high intensity, i.e., disruptive or radical innovations, are exchanged. In other words, the innovation factor increased in intensity. With respect to the relative importance of the economic and relationship factor, this treatment has only a minimal effect. Buyers' assessment of the economic factor increases from 39.5 to 43.4%, and buyers' assessment of the relationship factor decreases from 35.5 to 29.4%. Suppliers' assessments decrease from 43.5 to 40.2%, and from 34.8 to 33.5%, respectively. In contrast, buyers' and suppliers' assessments of the innovation factor and the exclusivity factor change significantly. For buyers, the innovation factor gains in importance (from 6.3 to 18.9%), while the exclusivity factor decreases from 18.8 to 8.2%. Suppliers assess the importance of those two properties in an inverted manner because the importance of the innovation factor decreases from 19.5 to 14.9%, and that of the exclusivity factor increases from 2.2 to 11.4%.

The most interesting findings become clear by comparing groups 3 and 4 with group 1. Group 3 was told that they exchange innovations (of all types) only in positive relationships, and group 4 was told that they exchange only disruptive innovations in positive relationships. For buyers, the importance of the economic factor decreases from 39.5% (B1) to 15.9% (B3) and 17.0% (B4), respectively. From the buyers' perspective, the importance of the relationship factor remains stable with 35.5, 32.2 and 32.1% for B1, B3 and B4, respectively. The importance of the innovation factor increases from 6.3% (B1) to 34.1% (B3) and 34.3% (B4), and is now the property with the highest importance. The exclusivity factor remains stable (18.8, 17.8 and 16.6% for B1, B3 and B4).

For suppliers, similar effects occur, with the exception of the exclusivity factor, which is notably low in group 1 (2.2% for S1) and increases in importance to 12.5% (S3) and 12.4% (S4). The decrease in economic factor importance (43.5, 28.4 and 22.0% for S1, S3 and S4), the stable importance of the relationship factor (34.8, 30.2 and 32.3% for S1, S3 and S4) and the increase in innovation factor importance (19.5, 28.8 and 33.3% for S1, S3 and S4) are comparable to the buyers' perspective.

Overall, the relationship factor makes a large difference in the decision processes of suppliers and buyers, and it remains at a high level independent of the treatment. The economic factor significantly decreases in importance when relationships are positive.

5.2 Utility Analysis of Experiment Groups

In addition to relative importance analysis, the CBC analysis delivers part-worth utilities for every property characteristic. Tables 9, 10, 11 and 12 provide an overview of the part-worth utilities of every property characteristic for each group. The absolute amount of the utility is not important, but the differences in utilities between factors matter (Backhaus et al. 2015). The utilities can essentially be articulated in two ways. In the "part-worth utilities" column, one property characteristic serves as a base level, and is set to 0. The other property characteristics are estimated and indicate the difference in the base level. The column "centered" shows the part-worth utilities in another way, in which the sum of all part-worth utilities is 0. The range of a property is a measure of its importance.

In terms of range, the analysis confirms the observations of the relative importance analysis (previous section). For buyers, the properties of the economic factor (2.00) followed by the relationship factor (1.80) are most important in the decision process. This order also persists for suppliers, who assess those factors, and the most important ones (1.41 and 1.13 respectively). Next, buyers perceive the exclusivity factor (0.95) as more important than the innovation factor (0.32), with suppliers' perception reversed (0.07 and 0.63).

The differences in the part-worth utilities of the property characteristics are also interesting in many ways. For buyers and suppliers alike, we can state with confidence that for the economic factor property, the greater the economic factor is, the greater the utility of the characteristic is (for B1 and S1: $b11 < b12 < b13$). For the relationship factor property, both actors value neutral relationships the most, although suppliers also consider good relationships very beneficial. In terms of the innovation factor, suppliers and buyers view efficiency-enhancing innovations as most beneficial. Furthermore, on the one hand, suppliers consider having 5 exchange partners more valuable than having 1; on the other hand, buyers feel the opposite (exclusivity factor).

Group 2 was told that they exchange only disruptive innovations. For buyers, the only noteworthy difference between B1 and B2 is that the potential of the innovation property is currently more important than the exclusivity factor (an effect that was also apparent in the relative importance of property analysis), and the higher benefit of incremental innovations, which carry nearly the same benefit as efficiency-enhancing innovations. For suppliers, the only interesting difference between S1 and

Table 9 Part-Worth Utility Experiment Group 1

Factor	Characteristic value	Group 1					
		Buyer (B1)			Supplier (S1)		
		Part-worth-utilities	Centered	Range	Part-worth-utilities	Centered	Range
Innovation	*Efficiency-enhancing*	0.16	0.16	0.32	0.35	0.33	0.63
	Incremental	–0.16	–0.16	–	–0.28	–0.30	–
	Disruptive	0.00	0.00	–	0.00	–0.02	–
Exclusivity	*Five exchange partners*	0.00	–0.48	0.95	0.00	0.04	0.07
	Sole exchange partner	0.95	0.48	–	–0.07	–0.04	–
Economic	*Low*	–2.00	–1.05	2.00	–1.41	–0.73	1.41
	Medium	–0.83	0.11	–	–0.61	0.06	–
	High	0.00	0.94	–	0.00	0.67	–
Relationship	*Broken*	–1.17	–0.99	1.80	–1.00	–0.71	1.13
	Neutral	0.63	0.81	–	0.13	0.42	–
	Good	0.00	0.18	–	0.00	0.29	–
–		LL = –306.47			LL = –1087.62		
		LLR = 263.21			LLR = 426.84		
		p-value = 0.0001			*p*-value = 0.0001		
		Hit rate = 78.3%			Hit rate = 71.4%		

Table 10 Part-Worth Utility Experiment Group 2

Factor	Characteristic value	Group 2					
		Buyer (B2)			Supplier (S2)		
		Part-worth-utilities	Centered	Range	Part-worth-utilities	Centered	Range
Innovation	*Efficiency-enhancing*	1.36	0.40	1.54	0.57	0.37	0.57
	Incremental	1.54	0.57	–	0.03	–0.17	–
	Disruptive	0.00	–0.97	–	0.00	–0.20	–
Exlusivity	*Five exchange partners*	0.00	–0.34	0.67	0.00	0.22	0.43
	Sole exchange partner	0.67	0.34	–	–0.43	–0.22	–
Economic	*Low*	–3.54	–1.79	3.54	–1.53	–0.78	1.53
	Medium	–1.70	0.04	–	–0.72	0.03	–
	High	0.00	1.75	–	0.00	0.75	–
Relationship	*Broken*	–0.58	–0.99	2.40	–1.05	–0.77	1.27
	Neutral	1.82	1.41	–	0.23	0.50	–
	Good	0.00	–0.41	–	0.00	0.27	–
–		LL = –285.15			LL = 1136.21		
		LLR = 346.04			LLR = 419.76		
		p-value = 0.0001			*p*-value = 0.0001		
		Hit rate = 80.0%			Hit rate = 69.7%		

Table 11 Part-Worth Utility Experiment Group 3

Factor	Characteristic value	Group 3					
		Buyer (B3)			Supplier (S3)		
		Part-worth-utilities	Centered	Range	Part-worth-utilities	Centered	Range
Innovation	*Efficiency-enhancing*	–5.03	–0.54	8.46	6.56	1.05	9.97
	Incremental	–8.46	–3.96	–	9.97	4.46	–
	Disruptive	0.00	4.50	–	0.00	–5.51	–
Exclusivity	*Five exchange partners*	0.00	–2.21	4.43	0.00	2.16	4.33
	Sole exchange partner	4.43	2.21	–	–4.33	–2.16	–
Economic	*Low*	3.95	1.88	3.95	–9.81	–4.94	9.81
	Medium	2.24	0.18	–	–4.81	0.06	–
	High	0.00	–2.06	–	0.00	4.87	–
Relationship	*Broken*	–6.03	–1.36	7.99	5.40	0.12	10.44
	Neutral	–7.99	–3.31	–	10.44	5.16	–
	Good	0.00	4.67	–	0.00	–5.28	–
–		LL = –273.35			LL = 1098.58		
		LLR = 262.89			LLR = 454.82		
		p-value = 0.0001			*p*-value = 0.0001		
		Hit rate = 79.5%			Hit rate = 72.1%		

Table 12 Part-Worth Utility Experiment Group 4

Factor	Characteristic value	Group 4					
		Buyer (B3)			Supplier (S3)		
		Part-worth-utilities	Centered	Range	Part-worth-utilities	Centered	Range
Innovation	*Efficiency-enhancing*	–5.73	–0.39	10.27	–7.00	–0.55	12.34
	Incremental	–10.27	–4.94	–	–12.34	–5.89	–
	Disruptive	0.00	5.33	–	0.00	6.45	–
Exclusivity	*Five exchange partners*	0.00	–2.48	4.96	0.00	–2.29	4.58
	Sole exchange partner	4.96	2.48	–	4.58	2.29	–
Economic	*Low*	5.09	2.49	5.09	8.18	4.02	8.18
	Medium	2.73	0.12	–	4.29	0.13	–
	High	0.00	–2.61	–	0.00	–4.15	–
Relationship	*Broken*	–6.94	–1.43	9.59	–8.13	–1.42	12.00
	Neutral	–9.59	–4.08	–	–12.00	–5.29	–
	Good	0.00	5.51	–	0.00	6.71	–
–		LL = –225.25			LL = 1276.14		
		LLR = 300.87			LLR = 342.29		
		p-value = 0.0001			*p*-value = 0.0001		
		Hit rate = 82.8%			Hit rate = 67.2%		

S2 is that disruptive innovations are valued slightly less compared with incremental innovations, which nonetheless carry the lowest benefit. Overall, it becomes clear that the treatment has only a small effect on the decision behavior of buyers and suppliers alike.

Group 3 was told that they exchange innovations only in good relationships. The differences between S1 and S3 are minimal in terms of part-worth utilities. Incremental innovations now have the highest (S3) instead of the lowest (S1) value for the respondents. In terms of relative importance and range of the utilities, the results are very different. The relationship is currently the most important factor followed by the innovation factor, the economic factor, and the exclusivity factor. On the buyer's side, the differences are even more salient. The economic factor is not the most important (B1) but rather the least important (B3) property. The innovation factor is not the least important (B1) but rather the most important property (B3).

The most striking effect for group 3, however, occurs in the part-worth analysis. For the innovation factor, the higher the innovation's intensity, the greater the utility for the respondents; i.e., disruptive innovations now clearly carry the greatest benefit, which is a complete turnaround compared with group B1. The same finding is observed for the economic potential, in which the lowest (!) potential now has the greatest value. Positive relationships are now the most beneficial for buyers (B3).

On the buyer's side, the differences between groups B3 and B4 are minimal, whereas the differences on the supplier side differ significantly between S3 and S4. Suppliers are very similar to buyers in the 4th group (B4 $\approx$ S4); thus, S4 differs from S3 in many ways. The innovation factor is now the most important property, followed by the relationship factor, the economic factor, and the exclusivity factor. Even more interesting is that disruptive innovations now carry the greatest value, and positive relationships are valued most. Suppliers in S4 now also prefer a 1:1 exchange with buyers, and neglect economic factors because the lowest (!) economic potential has the greatest benefit.

To summarize the findings, all factors are ranked according to their part-worth utilities and compared per group and supply side (Fig. 3). Between groups 1 and 2, suppliers rank the factors similarly. Moreover, on the buyer's side, only the exclusivity factor changes from rank 3 to rank 4. Therefore, the perception of the situation of group 2, which must address disruptive innovation, appears not that different from that of the situation of group 1.

However, the ranking changes when the relationship to the supply partner is positive and stable. The relevance of the economic benefits then decreases in the buyer groups from rank 1 to rank 4, and on the supplier side this factor decreases from rank 1 to 3. The economic factor is also less relevant in group 4, in which a positive relationship meets disruptive innovation. Although the economic factor decreases in relevance for groups 3 and 4 on both sides of the buyer–supplier relationship, the relevance of innovation potential increases to rank 1 (buyer side) and ranks 2 (group 3) and 1 (group 4) for the supplier side. The "castling" in relevance between the economic, and the innovation factor is interesting, and will be discussed in the next section together with the finding that the factor of exclusivity never becomes highly relevant for the respondents, as it remains at ranks 3 or 4 for the buyer's side, and is stable at rank 4 for the supplier's side.

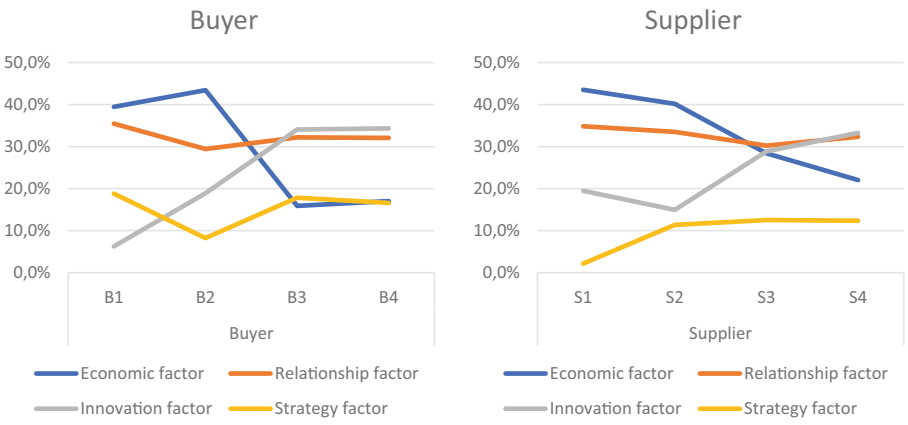

Fig. 3 Ranking of Factor Relevance per Group

6 Discussion

6.1 Differences in Decision-Making Behavior According to the Innovation's Intensity (RQ 1)

During the past decades, disruptive innovation has become a fashionable term, and can be traced back to the work of Christensen in the 1990s (Bower and Christensen 1995; Christensen 2015). Disruptive technologies are currently often used in the context of promising start-ups, particularly with such companies as SpaceX, Uber, and Tesla, and such technologies as 3D printing, or blockchain. Today, some authors from theory (Gobble 2015) and practice (Leigh 2016; Newman 2016) even consider the term a buzzword, due to its inflationary use. By differentiating the findings of this paper in terms of innovation intensity, a contribution is made to put the debate back on a factual basis. This research thereby follows the suggestions of Johnsen (2009), who identified differentiation between different innovation intensities as an important theme for future research, and Veryzer Jr. (1998), who found evidence that radical, and incremental innovations are managed differently.

However, the findings of this study show that the decision-making process does not differ according to innovation intensity. Buyers and suppliers alike behave similarly, and their decision-making process appears to be independent of the intensity of the exchanged innovation. It seems as if practitioners were not affected by the disruptive innovation hype, as they take a rational approach when assessing the value of an exchanged innovation. Procurement managers are not only looking for radical innovations among their suppliers, but also value efficiency, and incremental innovations that help to reduce costs (e.g. in production processes) and increases customer benefits to a small extent respectively. By integrating the findings in Hunt and Morgan's CAT theory framework by using their competitive position matrix it becomes clear that managers of suppliers and buyers alike see value in efficiency and incremental innovations. Fig. 4 shows the mechanisms how those innovations transform the competitive position according to their empirical assessment.

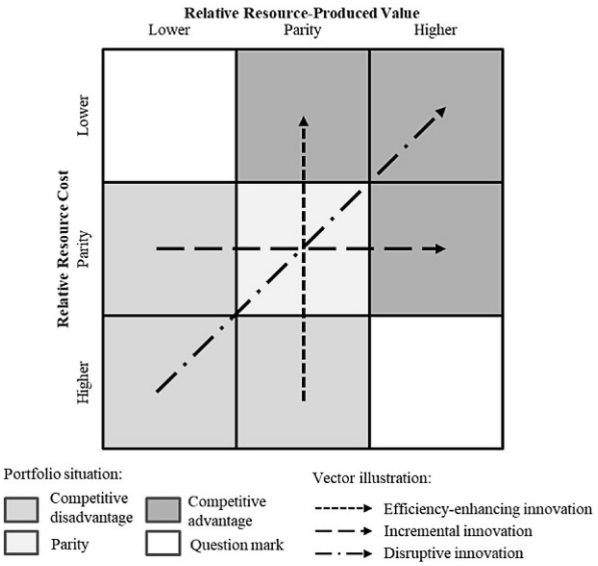

Fig. 4 Illustration of empirical effect of innovation intensities

6.2 Exclusive Access to Innovations (RQ 2)

The preferred allocation of supplier resources was initially discussed by Brokaw and Davisson (1978) four decades ago but has gained momentum since the 2000s, when such authors as Schiele, Hüttinger and Pulles published research on the topic. Since then, the topic has received some attention in the purchasing and supply management community. As explained in the introduction of this paper, the ultimate benefit that comes with preferred customer status is the preferential allocation of resources by suppliers (Schiele et al. 2012; Hüttinger and Schiele 2013). Preferential treatment can take many forms, such as the preferred allocation of employees, sharing the best ideas, allocating more financial resources, or preferred utilization of physical resources (Hüttinger and Schiele 2013). Preferred treatment can also come in the form of preferred access to innovations (Baxter 2012; Ellis et al. 2012; Pulles 2014). The initial assumption of this research was that preferred allocation of innovations and exclusivity agreements are an important element of decision making, because only if a supplier grants a buyer exclusive access to an innovation can that innovation be the source of a SCA for the buyer (RQ 2). This notion was also supported by the RBV literature that points out, that without exclusive access, externally sourced innovations cannot be the source for a SCA.

The findings of this research suggest, that in general, the question of exclusiveness—with how many buyers an innovation is exchanged—plays only a minor role in suppliers' and buyers' decision making. For the suppliers, the exclusivity factor is least important to the decision makers in all four groups. The findings show that both buyers' and suppliers' decision making is instead primarily influenced by economic and relationship factors. In other words, although buyers have a clear preference for an exclusive exchange of innovations, and suppliers clearly prefer to exchange with

multiple buyers instead, in both their decision making, it is relatively unimportant how many buyers have access to an innovation.

The fact, that suppliers prefer the exchange of an innovation with multiple buyers, suggests that they believe to realize the biggest profits in a non-exclusive exchange. However, there is also evidence, that suggests, that innovations are exchanged exclusively under very specific conditions. That is when radical innovations are exchanged in positive relationships. This means, that there is an exception to the above finding, that behavior is not different for efficiency and incremental innovations on the one hand, and disruptive innovations on the other hand. Because decision behavior is different for disruptive innovations, that are exchanged in good relationships.

6.3 Influence of Relationship on Innovation Exchange (RQ 3)

This study found that the relationship factor is of high relevance for the IED. Thus, it is argued that innovations are exchanged in different relationship modes (arm's length, partnership, relationship trap; cf. Fig. 5).

In arm's length mode, innovation exchange decisions are mainly based on economic criteria, but the relationship factor is even in this mode important. The partnership mode, is also characterized by a rational decision behavior, where economic criteria remain important, but the relationship factor is at least equally important in the decision process. This finding is interesting because a positive relationship can compensate for lower economic benefits to some extent. Suppliers switch to this mode, when relationships are positive.

However, when a relationship is good, buyers switch to a different mode, which we call relationship trap mode. In this mode economic criteria are neglected as often economic unfavorable exchanges are preferred. Hence, the decision processes are now biased, and the risk to tap into the relational resource trap for sourced innovations becomes evident. Whereas buyers tend to use this mode as soon as the relationship is good, for suppliers a second condition must be met. That is, disruptive innovations have to be exchanged. When switching to this mode, not only buyers, but also suppliers favor an exclusive exchange of innovations. Moreover, the innovation intensity is becoming very important, which could mean that the innovation halos other decision factors.

The situation in mode III relationship trap is highly interesting. Perhaps buyers and suppliers alike are in general skeptical about economic projections with respect to radical innovations (group 4). In practice, firms often "bet" on technologies because projections are highly uncertain—even pessimistic data are overruled by normative managerial decisions. For instance, in the automotive industry, companies invest in electromobility, or fuel cells, although the return on investment is unclear. Another explanation for preferring economic unfavorable exchanges, is that decision makers maybe blinded by the attractiveness of innovations, particularly disruptive ones.

It is also possible that decision makers tap into the "Relational Resource Trap for Sourced Innovations", which means that they are blinded by the attractiveness of the disruptive innovation, and a good relationship, and hence make an economically unfavorable decision. The innovation itself appears so attractive to deciders, that

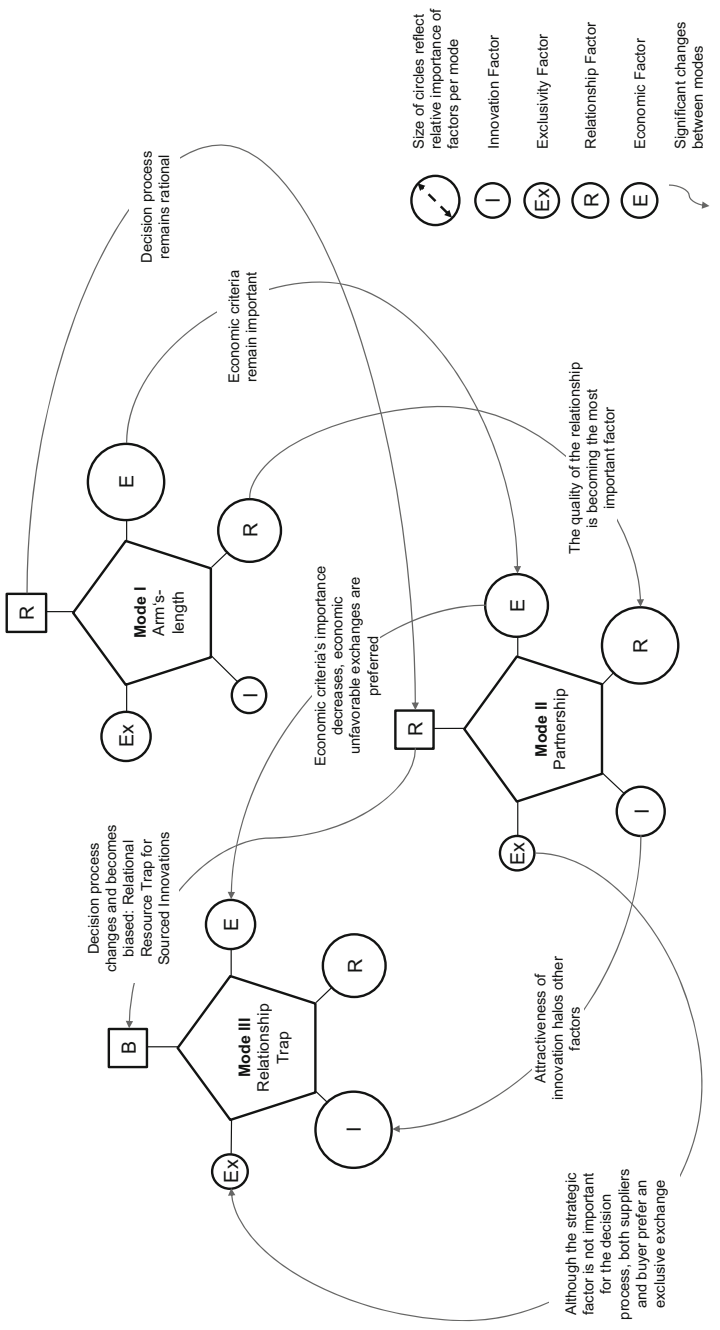

Fig. 5 Critical decision modes for the Innovation Exchange Decision in a systemic illustration

other criteria are ignored. Although we can in general confirm the importance of the economic factor in decision making, and are hence consistent with many researchers (Gooroochurn and Hanley 2007; Lichtenthaler 2008; Baxter 2012; Hüttinger et al. 2012; Bayarçelik et al. 2014), it would not be surprising when decision behavior is biased under some specific conditions, i.e. exchanging radical innovations in positive relationships. The research stream of BSM is focused on identifying such systematic violations of rational behavior, as explained at the beginning of this paper. We argue that we observed yet another bias of decision-makers, one related to the innovation exchange decision task. By identifying this specific bias, our research extends the existing stream on BSM horizontally in extending the literature to a not-yet-covered decision task.

Due to the fact that relationships are important in every mode, and are decisive for two modes, we argue that at least some innovation exchanges are subject to a relational exchange (Dwyer et al. 1987). Because the relationship factor is important in all groups under all circumstances, this study supports findings from previous research, especially the RV, that found a positive relationship between buyer and supplier, and an intense collaboration to be beneficial (Dyer and Singh 1998; Sjoerdsma and van Weele 2015). This finding is also consistent with the many studies that emphasize the importance of relationships (Dwyer et al. 1987; Lambe et al. 2001; Pulles 2014; Sjoerdsma and van Weele 2015).

In the New Product Development literature, there is conflicting evidence of the importance of supplier involvement in radical innovation projects with a high degree of technological uncertainty (Johnsen 2009). As this study found, radical innovations are primarily exchanged in positive and long-term relationships. Therefore, the results contrast with the notion that long-term supplier relationships have limited innovation potential (Primo and Amundson 2002; Phillips et al. 2006; Johnsen 2009), or are even obsolete when radical innovations are exchanged (Beckman et al. 2004; Mikkelsen and Johnsen 2018).

7 Implications and Future Research

The findings result in a number of theoretical and managerial implications and point to opportunities for future research. The first implication is related to the observed bias in decision making. Buyers and suppliers alike must be aware that soft factors such as a relationship cannot only compensate for economic factors but also might over-compensate for them. In other words, decision makers might choose an economically less beneficial alternative in favor of a long-lasting and positive relationship with the exchange partner. Future work could develop debiasing strategies similar to the work of Kaufmann et al. (2009), which would be highly relevant for firms given that rational behavior is positively related to financial, and non-financial performance (Kaufmann et al. 2017). It is inherent to innovations that their outcomes are uncertain. Business research found that in environments where uncertainty is high, decision making is influenced by experience, and emotions (Kaufmann et al. 2017). Hence, future research could validate our findings, and can try to explain the observed behavior.

The second implication refers to the perception that high innovation intensity is less important than are relationship and economic factors, and that its importance is only relevant in good buyer–supplier relationships. Management practice should be aware that innovation intensity per se is not the dominant factor in the IED decision, in contrast to Veryzer Jr. (1998) or Sandberg and Aarikka-Stenroos (2014). The "buzzword phenomenon" of disruptive innovation does not completely change how innovation is managed, even when future research could further differentiate between other innovation dimensions such as the process or content dimensions (Hauschildt and Salomo 2011). Conversely, management practice should also be aware that the more intense the innovation, the more relevant a good relationship will be. Future research could focus on how existing buyer–supplier relationships, which have been considered static and less innovative (Primo and Amundson 2002; Phillips et al. 2006; Johnsen 2009), or even obsolete when radical innovations are exchanged (Beckman et al. 2004; Mikkelsen and Johnsen 2018), could be useful in implementing new, disruptive innovations. This might also help explain why decision makers under specific conditions favor alternatives with inferior economic benefits but very positive relationships.

The third implication refers to the finding that exclusiveness is not considered an important factor in innovation exchange; this finding thus contradicts the research on preferential supplier treatment in the PSM literature. Future research could further investigate the relevance of exclusiveness, and investigate alternative explanations for the observed effects, such as that buyers require access, or at least "adequate" access compared with other buyers, but not exclusive access. Conversely, management practice nevertheless might have a blind spot with respect to exclusiveness of innovation access. Therefore, one management recommendation would be to consider this factor, and to evaluate the long-term consequences of (non-)exclusiveness, even when this factor is of far less relevance than other factors in the decision process.

8 Limitations and Outlook

Lastly, this study sheds light on the IED by analyzing the decision behavior of professionals from buyers and suppliers. Our concluding remarks focus on human decision-making. Human behavior is generally complex by nature, and most human decisions are based on heuristics, rather than cognitive processes (Cartwright 2011; Kahneman 2011). Fast and slow thinking, or in other words rational vs. intuitive decision-making rules, influence each decision, not only in the reported experiment but also in management practice. The findings show that in decision making, a positive relationship can compensate for lower economic benefits, especially when disruptive innovations are exchanged. Choosing an alternative with less economic benefit, and a significant decrease in economic factor importance appears irrational at first glance. We observe no indication of structural bias, as the sample represents practitioners with experience in similar situations and contexts. Nevertheless, hidden or unconsidered factors might exist other than the four factors included in the experiment. Furthermore, this research focuses on individual decision behavior and not on

organizational decision making. This is another limitation, as validity of findings, e.g., buying team decisions, must be evaluated.

Given these limitations, the apparent irrationality in decision making points to the identification of new heuristic decision making rules. Heuristic decision making was already part of the scientific discussion in the New Product Development literature (Dayan and Di Benedetto 2011). The experiment revealed a heuristic in which exclusiveness does not have high relevance, whereas the relevance of the relationship factor increases when the innovation intensity is high and disruptive. This topic could be the object of new and promising future research.

Other promising avenues for future research would be to investigate whether disruptive innovations are most efficiently exchanged with only one partner, as radical innovations usually involve more resources and close communication. Of interest would also be whether respondents might mistrust the predicted economic benefit of an alternative because they know from experience that disruptive innovations by definition carry higher levels of uncertainty, and therefore neglect this criterion. Thus, the relationship factor might serve as a replacement indicator for the economic factors in such situations. Another theme of future research could be to differentiate among different industries, and investigate whether managers' decision behavior changes. Moreover, we believe that further experimental and behavioral research designs could yield interesting findings, and new insight into PSM-related topics.

Appendix A

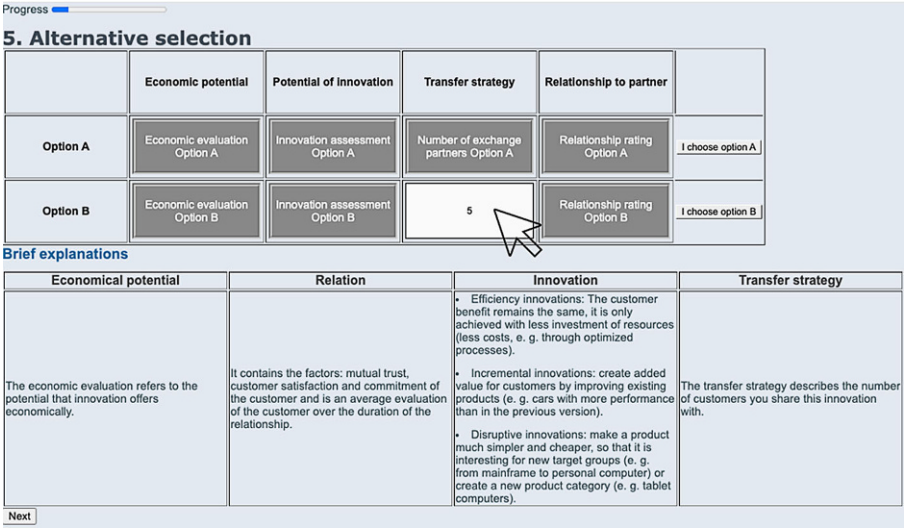

Fig. A.1 Impression of MouseLab Experiment

Appendix B

Table B.1 Vignette Information to Experimental Groups

Before entering phase 2 of the experiment, each respondent in a vignette group (groups 2 to 4) saw a text page with additional information. The text is presented below for all vignettes	
"Placebo" (Group 1)	After a couple of months, a colleague informs you that a new round of supplier innovation evaluation is occurring. Please evaluate and decide on another set of innovations
"Innovation" (Group 2)	After a couple of months, a colleague informs you that a new round of supplier innovation evaluation is occurring. He informs you that all innovations in this phase have an extraordinarily high level of disruptive potential. Please evaluate and decide on another set of innovations
"Relationship" (Group 3)	After a couple of months, a colleague informs you that a new round of supplier innovation evaluation is occurring. He informs you that with all suppliers considered in this phase, the relationship is extraordinarily positive. Please evaluate and decide on another set of innovations
"Innovation & Relationship" (Group 4)	After a couple of months, a colleague informs you that a new round of supplier innovation evaluation is occurring. He informs you that with all suppliers considered in this phase, the relationship is extraordinarily positive and that all innovations in this phase have an extraordinarily high level of disruptive potential. Please evaluate and decide on another set of innovations

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