Are IPS² always a Solution? Obstacles towards Buying Industrial Product Service Systems

Judith Gesing*, Kira Maiwald, Jan Wieseke, Ramona Sturm
Marketing Department, Ruhr-University Bochum, Universitätsstr. 150, Bochum 44801, Germany

* Corresponding author. Tel.: +49-234-32-25342; fax: +49-234-32-25342. E-mail address: judith.gesing@rub.de

Abstract
Nowadays manufacturing companies, that traditionally sell stand-alone products or services, shift towards selling industrial product service systems (IPS²). These offerings are mainly discussed as a chance for both; suppliers as well as customers. Customers profit for example by gaining access to expert knowledge or by outsourcing operations. Nevertheless, customers’ actual responses towards IPS² offerings have not been subject to research yet. By empirically analyzing reasons why customers step back from buying IPS² this paper contributes to existing knowledge. Results show that customers perceive higher risk when buying IPS², feel more dependent on the IPS² supplier and fear to loose know-how.

1. Introduction
For years now companies traditionally selling stand-alone products or services are following a trend called servitization, changing their offerings by adding innovative services to their product-dominant offerings [1]. Thereby, they are shifting towards selling industrial product service systems (IPS²) as a chance to remain competitive in globalized markets and to compensate for declining revenues in commoditized goods markets [2]. From a customer perspective these bundles of integrated and highly customized product and service components meet customers’ individual needs and thus create value that in most cases is higher than in case of separately purchasing single components [3]. Further, customers profit when buying these offerings by gaining access to suppliers’ expert knowledge [4] or by reducing own investments when buying IPS² means outsourcing operations [5]. According to this, literature mainly discusses positive aspects of IPS² [2,6].

Nevertheless, many IPS² projects still fail. Conducted in-depth interviews with manufacturing companies revealed that lots of customers stick to buying mere products or services in a transactional rather than a relational context. They are not willing to shift their procurement activities towards IPS² business. Yet customers’ reasons to choose or refuse buying IPS² have not been subject to research [3]. Moreover, the rare empirical research existing almost exclusively focuses the supplier’s side of IPS² provision.

Therefore, the paper at hand contributes to existing knowledge by shedding light on the customer’s perspective and focusing on reasons for not buying IPS². We theoretically identify the customers’ resulting dependence on suppliers, their fear of losing know-how, the heightened perceived risk compared to transactional purchases, and the lack of trust into suppliers as reasons for refusing IPS² offerings. In order to empirically validate our assumptions a survey study among 226 participants is conducted.
2. Buying IPS² – the customers’ side

Literature predominantly defines and discusses IPS² offerings from suppliers’ point of view. In this context an IPS² “…is an integrated product and service offering that delivers values in industrial applications…” and “…leads to new, customer-adjusted solutions…” [2]. While such offerings are focus of discussion in different literature streams – such as solution selling [7,8], servitization [9] or service infusion [10] – most researchers address change processes going along with IPS² provision or necessary supplier capabilities [e.g. 11,12,13,14]. In this literature streams the focus mostly lies on bundling and integrating product and service components, while the remarks still remain rather product centric [6].

In contrast, from customers’ point of view IPS² are found to be seen as relational processes including four phases shown in figure 1: the definition of requirements, the customization and integration of single components, the deployment and the post deployment support [6]. Hereby the major goal of both parties is to optimize customers’ performance by entering and maintaining a close business relationship over the whole lifecycle of an IPS². Therefore, suppliers should get deep insights into customers’ companies and processes in order to identify and solve their specific problems. This is only possible when suppliers not only consider customers’ recognized and current needs but also unrecognized and future needs, which can be foreseen in the market if there is a deep understanding of this as well [6].

Summarizing, purchasing IPS² for customers means entering close relationships, because IPS² provision requires high customer involvement as well as supplier integration into on-going business processes [15,16]. In these relationships customers act as co-creators of value [7], working closely and collaboratively with the supplier. This collaboration in turn requires the willingness of both partners to adjust to each other. For example customers have to learn how to handle new product components, like implemented machines or self-service devices. They further have to adapt to service times that are offered by suppliers, even if this affects their own working hours [6]. Thus, changes within customer companies are induced by IPS² provision and therefore resistance might evoke on the customer side [17].

Meanwhile research in this area is still scarce. Some authors name benefits customers gain from purchasing IPS². Windahl et al. (2004) [18] elaborate on customers’ opportunities to concentrate on their core business when they hand over process responsibilities to IPS² suppliers and thus gain flexibility. Customers who outsource operations to the IPS² supplier also reduce their initial investment and rely on guaranteed operational costs [5]. As suppliers have expert knowledge concerning IPS² customers are able to profit from this knowledge [4]. Furthermore, IPS² are designed to fit customers’ specific problems and thus are thought to offer best performances and outcomes [19,20]. However, most of these insights are side products of research analyzing IPS² delivery processes from suppliers’ perspective.

Up to now only Tuli et al. (2007) [6] take into account the customers view on IPS² by finally picturing their definition of IPS² and identifying customer variables that affect IPS² effectiveness. Their findings are based on in-depth interviews with managers in customer firms. To the best of our knowledge there has been no study on how customers perceive IPS² offerings compared to stand-alone products [3] in early stages of a buying process. Especially reasons for not buying IPS² are unknown yet. To close this research gap we conduct an empirical study among business customers analyzing obstacles towards buying IPS².

3. Obstacles towards buying IPS²

Working closely together with suppliers might cause several concerns on the customers’ side, on which we will elaborate in the following. These concerns explain why customers do not purchase IPS² and instead fall back into buying mere products and/or services.

3.1. Dependence on IPS² suppliers

Purchasing IPS² is a complex and time consuming task in the buying organization that requires high investments on both supplier as well as customer side. We assume that these investments make customers decide against IPS² because they fear to end up being overly dependent on IPS² suppliers.

Because IPS² are highly customized offerings that are designed in order to solve customers’ specific problems, suppliers need to get profound knowledge of customers’ markets and business processes [4]. Otherwise they are not able to develop individualized solutions fitting the customers’ needs. Gaining this knowledge of customers’ markets and deep insights into customers’ business processes consumes time and effort, on the one hand, but it is a key requirement of IPS² provision, on the other hand. Thus, IPS² suppliers have to invest in business relationships in order to make the IPS² work properly. As a result, suppliers might try to contract with customers in a way that makes it more difficult for customers to switch suppliers. Additionally, as explained above, IPS² implementations into on-going processes also require changes and adaptions on the customer side [6]. Therefore, customers have to put time and efforts into these adaptions, representing investments into the business relationship on the customers’ side. In most cases these changes will not fit other suppliers’ offerings. This is why switching suppliers is not easy.

Consequently, both customers and suppliers invest into IPS² provision and for both parties these investments are lost when customers decide to switch from one supplier to
another. Such investments are defined as sunk costs [21], representing “...perceptions of the non-recoupable time, money, and effort invested in establishing and maintaining a relationship” [21]. In case customers want to switch their suppliers invested efforts are not recoverable and instead have to be taken again when building up relationships with new suppliers.

To conclude, sunk costs make customers perceive to be overly dependent on IPS² suppliers compared to situations in which mere products are purchased [4]. Hence, we hypothesize:

H1: Customers choosing to buy an IPS² feel more dependent on the supplier than customers choosing to buy mere products.

3.2. Loss of know-how

Within IPS² provision suppliers typically manage parts of the operations of their customers. Thereby suppliers either add and integrate new processes or they take over responsibilities for processes that were previously in customers’ hands. In other words, customers engage in a close relationship and outsource operations they do not want to perform themselves. In this context we assume that fearing a loss of know-how prevents customers from buying IPS².

On the one hand adding new external procurement or outsourcing existing operations can be seen as an advantage. It has been argued that customers outsource activities that are more profitable and cost efficient when produced externally instead of internally because of suppliers’ specialization [22]. By handing over operations to IPS² providers, customers are able to release own internal resources. In doing so, they can better concentrate on their core competences and processes rather than on supporting ones. Thus, customers buying IPS² can put more time and effort in strengthening their core business and offerings and in turn improve efficiency and profitability [23]. Further, once suppliers gained specific know-how about the customers’ business processes and operations, customers buying IPS² offerings profit from suppliers’ know-how.

On the other hand counterarguments suggest that adding new external procurement or outsourcing existing operations can be seen as a disadvantage. Profiting from suppliers’ know-how in turn means to rely on suppliers’ and their skills instead of own internal capabilities [4,24]. While customers do not build up own capabilities, they will not be able to conduct processes that were outsourced by themselves again in the short-run. Instead, customers might even lose own know-how and specific skills they already build up [4]. By allowing suppliers’ to get deep insights into business and working processes customers might even expose confidential data and information about their own organization. This is why outsourcing of processes is discussed to lead to a disclosure of proprietary knowledge to external suppliers [23]. Thus, IPS² suppliers get access to customers’ know-how, which is consequently no longer unique.

Yet, even gaining profit from the supplier’s knowledge and expertise strongly stands against the fear of a loss of know-how on the customers’ side. Therefore, we hypothesize that:

H2: Customers choosing to buy an IPS² fear a loss of know-how more than customers choosing to buy mere products.

3.3. Perceived risk

Purchasing IPS² is seen to be a more complex process than purchasing a mere product or service. Among other things this is due to the fact that evaluating IPS² suppliers and their offerings is much more difficult than in case of stand-alone offerings. The difficulties in the evaluation process raise customers’ perceived risk which is defined as a combination of the probability and magnitude of negative consequences in case of a poor purchase decision [25,26].

Information economics analyse how customers’ ex-ante and ex-post possibilities to determine the quality and value of an offering affect buying decisions. Accordingly, products and services are categorized into three groups based on the customers’ ability to evaluate its characteristics before, during and after purchase [27,28]. The first category is search goods. For these goods customers can easily evaluate characteristics before buying it. The second category called experience goods includes offerings for which characteristics as quality are difficult to assess before purchasing it, but these can be experienced during consumption of the good or service. The third category is credence goods. Here it is very difficult or rather impossible for customers to assess characteristics like value even after usage. Because of a lack of knowledge customers are unable to evaluate suppliers’ performance, while suppliers are able to exploit their information advantage by acting opportunistically.

In case of IPS² offerings are composed of integrated product and service components. Due to intangibility the quality of included service components is more difficult to determine than for product components [29]. Thus, Rese et al. (2013) [30] classify IPS² as credence goods. They argue that customers most often face a problem that should be solved by the IPS² which is characterized by a certain degree of newness. Hence, they cannot rely on any experiences and lack knowledge in this field. Furthermore, IPS² address rather complex customer problems [3]. This leads to a relatively complex offering compared to stand-alone products. These are typically embedded in varying business models that differ in terms of sharing responsibilities, property rights as well as risks [31]. As a consequence in most IPS² provision situations customers are not able to determine suppliers’ performance for sure [30].

This lack to review upon the performance of the IPS² supplier and the value of the IPS² itself results in high level of customers’ perceived risk [30] which we assume prevents customers from buying IPS². Based on these arguments we hypothesize:

H3: Customers choosing to buy an IPS² perceive much more risk than customers choosing to buy mere products.
3.4. Lack of trust in the IPS² supplier

One core characteristic of IPS² is found to be the co-creation of value. Thereby, value co-creation is defined as the “…joint activities by parties involved in direct interactions, aiming at contributing to the value that emerges for one or both parties” [31]. While value should be increased due to close collaboration, this collaboration has to be based on trust at the same time in order to make it work. A lack of trust, therefore, hinders customers to engage in IPS² provision.

Co-creating value within the scope of IPS² provision leads to intense collaboration between customers and suppliers, in which suppliers become part of customers’ on-going operation processes [17]. Customers and suppliers both take over sub-processes of one production process [32]. This in turn requires the integration of suppliers into customers’ processes as well as continuous information flows between customers and suppliers [18]. In order to integrate suppliers in processes customers have to open up to them. By doing so, confidential data and information about the customers’ organizations is handed over to suppliers. Consequently, customers risk that suppliers take advantages of knowing customers’ business secrets. Suppliers might even forward crucial information to customers’ direct competitors. For example, it is entirely possible that once a supplier optimized the production process of a customer, he can easily do the same for another customer within the same market. Further, once suppliers invested in relationships by gaining a deep understanding of customers’ needs, operational processes and business models and developed a suitable and complex IPS² the customers will not be able to monitor or control suppliers’ actions [33]. Instead they have to trust in suppliers and rely on their honesty. So, if reliance on the business partners’ performance and actions is necessary, trust plays an important role in collaborations [34].

Summarizing, a trustful business relationship is needed in order to provide IPS² [32]. Concluding, we hypothesize:

H5: Customers choosing to buy an IPS² need more trust in the supplier than customers choosing to buy mere products.

4. Empirical Study

4.1. Sample and measurement

To test our hypothesis we conducted a survey study among practitioners between June and August 2013. Purchasing managers and other practitioners who are involved in buying decisions within their daily work were asked to remember their last buying decision and answer questions regarding their perception of the purchase situation and their final decision. In order to test whether the above listed reasons for refusing IPS² offerings are actually perceived as being higher for customers choosing IPS² data about IPS² purchases as well as product purchases were collected. The final sample consists of 226 answered questionnaires, including answers from 83 companies that were buying mere products and 143 companies purchasing IPS².

The sub-samples were built on the participants answers to the questions how they categorize the offering they finally chose in their purchase decision. Participants who chose mere products (category 1: purchase of an industrial product, processes are conducted by ourselves) built the first subsample, while those who chose an IPS² offering (category 2: purchase of an industrial product, processes are conducted by the supplier, category 3: no purchase of an industrial product but e.g. leasing, processes are conducted by ourselves, category 4: no purchase of an industrial product, processes are conducted by the supplier) built the second subsample.

In order to measure possible reasons for refusing IPS² the scales used in our questionnaire were adapted from previous research or self-constructed for the special purpose of this study. For each scale an exploratory factor analysis was conducted and constructs reliability was tested. All measures reached Cronbach’s Alphas greater than .70 suggested by Nunnally (1978) [35]. The items used are reported in table 1. To build factor scores we calculated the mean values off all items belonging to one scale.

Table 1: Measurement scales used in the empirical study

<table>
<thead>
<tr>
<th>Scale Items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>### Dependence on supplier (adapted from Scheer et al. 2010)</td>
<td></td>
</tr>
<tr>
<td>1. We achieve benefits from the cooperation which cannot be generated with other providers.</td>
<td>0.926</td>
</tr>
<tr>
<td>2. Stopping the cooperation with the supplier would make our products less attractive to our customers.</td>
<td></td>
</tr>
<tr>
<td>3. If we would end the cooperation with the provider the alternative(s) would be less effective.</td>
<td></td>
</tr>
<tr>
<td>4. When we end the business relationship it would be costly to find a replacement.</td>
<td></td>
</tr>
<tr>
<td>5. The dropout of the business relationship would cause enormous costs for the supplier change.</td>
<td></td>
</tr>
<tr>
<td>6. It would be expensive for our company to end the business relationship.</td>
<td></td>
</tr>
<tr>
<td>7. We are worried…</td>
<td>0.936</td>
</tr>
<tr>
<td>8. …to loose important intellectual property due to the collaboration with the supplier.</td>
<td></td>
</tr>
<tr>
<td>9. …to lose specific knowledge due to the collaboration with the supplier.</td>
<td></td>
</tr>
<tr>
<td>10. …to loose how much the supplier relies on their honesty.</td>
<td></td>
</tr>
<tr>
<td>### Loss of know-how (self-constructed)</td>
<td></td>
</tr>
<tr>
<td>All in all, I got the impression that the decision done is very risky.</td>
<td>0.937</td>
</tr>
<tr>
<td>I felt uncertainty during the decision phase.</td>
<td></td>
</tr>
<tr>
<td>All in all, I judge the decision during the decision making process to be very risky.</td>
<td></td>
</tr>
<tr>
<td>### Trust in supplier (adapted from Jean et al. 2010)</td>
<td></td>
</tr>
<tr>
<td>1. We trust our contract partner that he is able to fulfill contractual agreements.</td>
<td>0.871</td>
</tr>
<tr>
<td>2. We believe the information that our contractual partner provides us.</td>
<td></td>
</tr>
<tr>
<td>3. Our contractual partner is genuinely concerned that our business succeeds.</td>
<td></td>
</tr>
<tr>
<td>4. When making important decisions, our contractual partner considers our welfare as well as his own.</td>
<td></td>
</tr>
</tbody>
</table>
4.2. Results

Aiming on identifying whether companies that purchased an IPS² perceive a higher dependence, a greater loss of know-how, a higher level of risk and less trust in their supplier than companies purchasing mere products, we conducted t-tests. These can be used to compare two independent sub-samples to each other and determine if these significantly differ in the mean values of the measured constructs. The results are shown in table 2.

Table 2: Results of t-tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Means of product purchase group</th>
<th>Means of IPS² purchase group</th>
<th>t-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependence on supplier</td>
<td>4.0559</td>
<td>4.4155</td>
<td>-1.702*</td>
</tr>
<tr>
<td>Loss of know-how</td>
<td>3.7667</td>
<td>4.2333</td>
<td>-1.924**</td>
</tr>
<tr>
<td>Perceived risk</td>
<td>3.7078</td>
<td>4.1188</td>
<td>-1.943**</td>
</tr>
<tr>
<td>Trust in supplier</td>
<td>5.6216</td>
<td>5.4742</td>
<td>1.010 n.s.</td>
</tr>
</tbody>
</table>

* means that sub-samples significantly differ with p < 0.1
** means that sub-samples significantly differ with p < 0.05
n.s. means that sub-samples do not significantly differ from each other

The mean values regarding the dependence on the supplier, the loss of know-how, and the perceived risk were found to score significantly higher in the group of companies that purchased an IPS² compared to the mean values in the group of companies that purchased mere products. Thus, hypothesis H1, H2, and H3 find support in our study. For the variable trust in the supplier no significant difference between both sub-samples was found. Thus, hypothesis H4 has to be rejected.

4.3. Discussion of results

The results strongly support hypothesis 1. Customers in the group purchasing IPS² feel significantly more dependent on their supplier than customers purchasing mere products. Hence, IPS² customers are aware of the fact that they cannot switch between suppliers in the short run without making any major losses. Engaging in a close business relationship with the supplier like in case of IPS² provision is thus not perceived as unanimously positive by customers. Therefore, the resulting dependence on a supplier when purchasing an IPS² might prevent customers from deciding for an IPS².

Referring to hypothesis 2 we found that customers buying IPS² are significantly more worried to loose know-how than customers buying mere products. Intensely integrating a supplier into the own company simplifies the outflow of intellectual property. Additionally, relying on suppliers’ know-how weakens internal capabilities and leads to a loss of know-how in the long run. Customers fearing this loss of know-how might decide against purchasing an IPS².

We also found support for hypothesis 3. Perceived risk was significantly higher in the group of customers who purchased an IPS² than in the group of customers who purchased mere products. One explanation could be that customers buying IPS² struggle in evaluating its performance [30]. Therefore, they perceive high levels of risk when deciding for an IPS², and thus refuse to buy it instead.

Contrary, hypothesis 4 was not supported. There are no significant differences between the sub-samples regarding the trust in the supplier. Participants of both sub-samples show high levels of trust in their suppliers. The mean values score above the average of the scale of 3.5. Previous research identified trust as one crucial enabler of business relationships in both IPS² as well as product business [38]. Due to consolidating markets customers have been found to tend to use a declining number of suppliers with whom they build intense relationships. Thus, trust in the supplier is considered equally important in product and IPS² business.

5. Conclusion

Research up to now discusses IPS² mainly in a positive way, as a chance for both customers and suppliers [2]. Customers benefit from IPS² by concentrating on their own core competences [16,18], relying on the suppliers expertise [4,19], and receiving individualized value [7]. Meanwhile, our research suggests that customers also perceive obstacles when they are confronted with an IPS² offering. Despite profiting from close business relationships with suppliers, customers feel to be dependent on their supplier, fear to loose know-how due to the intense relationship and perceive purchasing IPS² to be more risky than purchasing stand-alone products.

Conducting a first empirical study analyzing the customer perspective we contribute to research on IPS². We theoretically elaborate on several concerns customers might feel when being confronted with IPS² purchase decisions. We further found empirical support for the existence of these concerns that are yet neglected by research. Nonetheless, there are limitations of our study. First, the survey only consists of respondents from one country, Germany. Second, we investigate the effects within a cross-industry sample. Further segmentation is needed and might provide deeper insights into the customer perceptions of IPS² offering.

This article addresses important questions of IPS² buying, but at the same time raises many new ones. Conducting t-tests we analyzed all variables separately. Meanwhile, there are most likely interactions among the different factors involved. For example a high level of trust might diminish the fear to loose know-how due to the outflow of intellectual property. Future research can use these first results as a basis to analyze customers’ IPS² buying behavior in more detail. Managers could also profit from research addressing strategies to overcome the obstacles perceived by customers.

Our research implies that managers must carefully assess customers’ purchasing decisions in case of IPS². They are not only perceived as beneficial but major concerns on the customers side may arise. Practitioners might want to proactively address these concerns while selling IPS² to potentially overcome or at least reduce them.
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References


