

Business solutions as market signals that facilitate product sales

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Highlights

- Signaling theory helps to understand why firms continue with solution business despite often mixed to negative results.
- Engagement in solution business functions as a signal to prospective buyers of products.
- Positioning as a solution seller has a positive effect on the customer's purchase intention in cases where the customer is only considering the purchase of a single, product-based component.
- The signal works through a risk reduction mechanism and the observed effect is stronger if the seller can boost the credibility of the signal through prior reference projects.

Abstract

Many manufacturers claim to be solution providers. However, solution business is notoriously difficult to manage and the associated profitability difficult to demonstrate. This raises the question: why should companies keep trying? We provide one possible answer by applying signaling theory to understand how engagement in solution business functions as a quality signal to a prospective buyer of products. The results of two scenario-based online experiments show that positioning oneself in the market as a solution seller has a highly significant and positive effect on the customer's purchase intention in cases where the customer is only considering the purchase of a single, product-based component. This signal functions as a risk-reduction mechanism and the observed effect is stronger if the seller can boost the credibility of the signal by citing prior reference projects. The primary theoretical contribution of the study is to provide an empirically grounded explanation of a possible outcome from engagement in solution business. For practitioners, our research suggests that a market positioning as a solution provider is strategically important because it supports the product business. Thus, it is advisable

for manufacturers to consider persisting with the solution business even in cases where the direct revenues generated by this particular form of service provision in question may not offset the related costs.

Keywords: Solution business, signaling theory, experiment, servitization

1. Introduction

In an attempt to maintain competitiveness in increasingly commoditized markets, many manufacturers position themselves as solution providers. In doing so, they communicate a commitment to supporting customers in a holistic way by providing a customized and integrated portfolio of products and services (Evanschitzky, Wangenheim, & Woisetschläger, 2011; Tuli, Kohli, & Bharadwaj, 2007; Ulaga & Reinartz, 2011).

A successful transition to solution provider status is difficult to achieve due to the capability development requirements associated with this transition. The further the manufacturer moves from an established basis in the selling of equipment and related, product-oriented services, the more difficult it becomes to servitize profitably (Fang, Palmatier, & Steenkamp, 2008; Neely, 2008). In addition, not all customers are receptive to the idea of purchasing solutions, particularly if they have their own capacities for integrating components. This may restrict the manufacturer's efforts to grow the share of their revenues associated with solution sales (Adamson, Dixon, & Toman, 2012; Gosh, Dutta, & Stremersch, 2006). Given these implementation-related challenges, it remains difficult to assess whether and how manufacturers' efforts to engage in the solution business pay off, and there is little empirical research that examines these outcome effects (Lilien 2016, p. 549; Worm, Bharadwaj, Ulaga, & Reinartz, 2017).

This study aims to fill this gap by examining how engagement in solution business functions as a market signal that helps to sell products. The experimental design adopted in this study, consisting of two scenario-based online experiments, demonstrates that positioning oneself in the market as a solution seller has a highly significant and positive effect on the customer's purchase intention in cases where the customer is only considering the purchase of a single, product-based component. By applying signaling theory (Spence, 1973, 2002) and existing solution business research, we demonstrate that this signaling effect functions as a risk-reduction mechanism (Ulaga & Kohli, 2018) in which a seller's status as a solution provider decreases the buyer's perceived purchase risk. The observed effect is even stronger if the seller can boost the credibility of the signal by citing prior reference projects (Anderson & Wynstra, 2010; Terho & Jalkala, 2017).

The primary theoretical contribution of the study is to provide an explanation of an outcome from solution business (Lilien 2016; Worm et al., 2017) that has its basis in a foundational theory (Kowalkowski, Gebauer, & Oliva, 2017; Rabetino, Harmsen, Kohtamäki, & Sihvonen, 2018). While prior research suggests that advanced forms of service provision support the manufacturer's underlying product business (see e.g. Antioco, Moenart, Lindgren, & Wetzles, 2008), to date there has been no empirically and theoretically grounded explanation of the mechanisms that produce this observed effect.

For practitioners, our research adds credibility to the claim that investment in solution business is strategically important. The results from this study demonstrate that customers prefer to buy product-based components from solution providers because this is seen to entail lower risk. This is particularly the case if the seller can provide credible references for solutions they have delivered in the past. Thus, manufacturers should consider persisting with solution business even in cases where the direct revenues generated by this particular form of service provision may be insufficient to recuperate the related costs. However, to fully realize the benefits of these positive spill-over effects, solution providers should systematically document the solutions delivered and leverage them through customer reference marketing.

2. Conceptual background

In the first part of this section, we explain why an understanding of solution business benefits from explanatory studies that utilize strong foundational theories and quantitative evidence to explain company-level outcomes from engagement in solution business. The first part ends with a proposed conceptual framework which adopts signaling theory as a foundational theory on which to build an explanation of how engagement in solution business functions as a market signal that helps to sell products. In the second part, we discuss the key premises of signaling theory and apply them to the context of solution business to develop a series of hypotheses that result in a research model to be tested in an experimental setting.

2.1 Theoretical foundation and proposed framework

Research into business solutions can be positioned under the servitization domain (Vandermerwe & Rada, 1988), which is an umbrella term used to refer to a cross-disciplinary field of research dedicated to understanding how product-centric companies transition to service-based business. Although voluminous, the research in this area remains theoretically

and methodologically nascent (Kowalkowski et al., 2017; Rabetino et al., 2018). Thus, while much is known about how product-centric companies introduce increasingly sophisticated service portfolios and the potential outcomes of doing so, the research that has generated this understanding is mostly exploratory and descriptive in nature, and typically lacks strong theoretical grounding.

Nevertheless, it is generally thought that companies in the process of servitization introduce services of an increasingly advanced nature that can be classified as either services that support the supplier's product (SSPs), or services that support the customer's process (SSCs) (Mathieu, 2001; Oliva & Kallenberg, 2003). Furthermore, these different types of services assume diverse roles in the manufacturer's servitization strategy and lead to different performance outcomes (Antioco et al., 2008; Eggert, Högrevé, & Muenkhoff, 2014; Salonen, Saglam, & Hacklin, 2017). For instance, Antioco et al. (2008) find, based on survey data, that SSCs appear to boost the manufacturer's product sales while SSPs generate service volume for the manufacturer.

Business solutions can be characterized as a form of SSC (Salonen, 2011). Engagement in the solution business builds on a supplier-customer relational process that spans the solution life cycle (Tuli et al., 2007). During this process, the provider integrates product- and/or service-based components into customized responses to complex customer needs (Evanschitzky et al., 2011) and offers sophisticated forms of post-deployment support (Ulaga & Reinartz, 2011). In doing so, the manufacturer seeks to enhance the customer's value-in-use (MacDonald, Kleinaltenkamp, & Wilson, 2016).

While the potential advantages to both the seller and the buyer of engaging in solution business are well known, the underlying business model is difficult to implement (Storbacka, 2011). The profitability of solutions is threatened, for instance, by high costs of customization (Anderson, Fornell, & Rust, 1997; Lampel & Mintzberg, 1996) and long project durations (Arto, Valtakoski, & Kärki, 2015; Nordin, Kindström, Kowalkowski, & Rehme, 2011). Sometimes the vendor commits to a total resolution of the customer's business problem and payment is contingent on the outcome, which can be risky for the provider (Ulaga & Reinartz, 2011). Furthermore, convincing customers of the inherent value in buying integrated solutions rather than components is not always easy. Customers may have their own capacities for integrating components, or may simply prefer a more transactional approach in dealing with vendors

(Adamson et al., 2012; Gosh et al., 2006). Given these challenges, some have questioned whether it is worthwhile for sellers to persist with solution provision (Worm et al., 2017).

Against this backdrop, both the theory and practice of servitization can arguably be advanced through explanatory studies that utilize strong foundational theories and quantitative evidence (Kowalkowski et al., 2017; Rabetino et al., 2018) to explain the outcomes of engagement with solution business (Lilien 2016; Worm et al., 2017). To this effect, and as summarized in Figure 1, we draw on signaling theory (ST) (Spence 1973, 2002) to argue that positioning oneself as a solution vendor should be understood as a market signal that helps to sell products. Beyond demonstrating the existence of such a signaling effect, we also examine the conditions that mediate and moderate this relationship. Here we demonstrate that the signaling effect functions as a risk-reduction mechanism and is strengthened by the seller’s ability to add credibility to the emitted signal through provision of prior references.

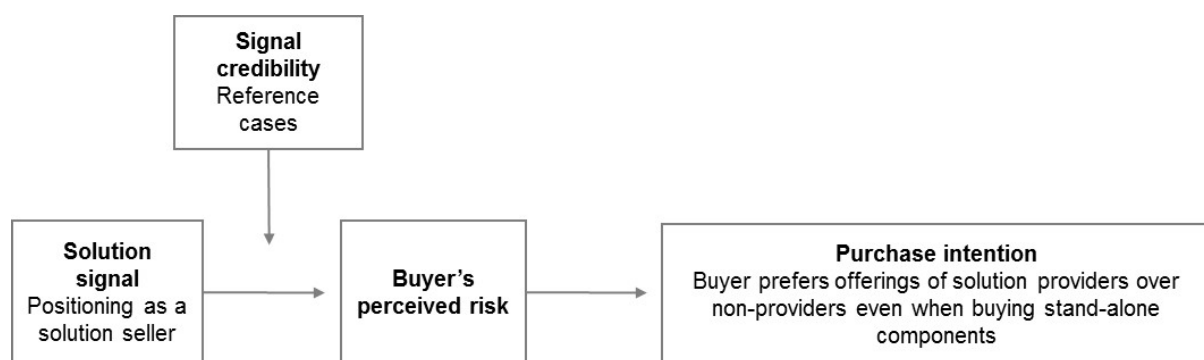


Figure 1: Proposed framework

In the next section, we draw on signaling theory and prior solution business research to develop a series of hypotheses that are consistent with the framework presented in Figure 1.

2.2 Development of hypotheses

The fundamental assumption of this research is that positioning oneself as a solution provider should be understood as a market signal, in terms that are consistent with signaling theory (ST). ST (Spence 1973, 2002) focuses on the transmission of information that helps to reduce information asymmetry between transaction parties. ST has been applied in a variety of research fields (Connelly, Certo, Ireland, & Reutzel, 2011), such as human resource management, finance, entrepreneurship, and marketing.

In accordance with the literature on signaling, we focus on the parties involved (the signaler-receiver dyad), the signal itself, and the signaling environment (Connelly et al., 2011). The signaling environment – in our case the B2B market place – is characterized by information asymmetry (Kirmani & Rao, 2000; Stiglitz, 2002): one party has an information advantage over the other party regarding a transaction. The party that lacks the information tries to derive it from information that the other party provides for that purpose.

2.2.1 Business solutions as market signals

In our setting, the signal is emitted by a vendor of complex B2B market offerings (e.g. a manufacturer of industrial goods and services) and received by a potential new customer¹. The signal is information about the *quality* of the vendor in the sense that it is able to truly offer solutions as it claims. In signaling theory, high-quality companies signal the true state of their capabilities, while low-quality companies send a false signal, that is, they are not able to actually offer solutions (see Connelly et al., 2011, p. 43 for the concept of “quality” in signaling theory). We assume that signaling a market position as a solution seller positively influences the customer’s purchase intention due to capabilities associated with solution providers (Storbacka, 2011; Tuli et al., 2007), which may also be perceived as useful by customers who are not seeking solutions.

To serve as signals in terms of ST, solutions have to meet two more criteria, which have been identified as central in prior research (Connelly et al., 2011). Firstly, signals must be *observable* by the recipient. In the solution business context, the signaler can utilize corporate communication channels that are easily accessible to potential customers (websites, advertising, brochures, public relations activities, trade fair stands, etc.) where the keyword “solution” is included in logos and claims (e.g. “IBM – solutions for a smarter planet”) (Lanzolla & Frankort, 2016). Hence, we hypothesize as follows:

Hypothesis 1: Customers have a greater willingness to buy from sellers that emit a “**solution signal**” (i.e. that communicate that they are solution providers) than from sellers that do not emit this signal.

¹ For repeat purchases from the same supplier, previous experience might reduce the information asymmetry to such an extent that no signaling is necessary.

2.2.2 Prior references enhance signal credibility

Secondly, transmission of a credible signal should be associated with costs to deter dishonest vendors who do not have sufficient capacities for offering genuine customer solutions. The credibility of the solution signal is difficult for customers to evaluate *ex ante*. Solution projects usually have long lifespans and comprise service elements (Stremersch, Wuyts, & Frambach 2001), which are characterized by *credence quality* attributes (Nelson, 1970), that is, the customer has to rely on the provider to deliver on promises made to them (Parasuraman, Zeithaml, & Berry, 1985). As a consequence, both genuine and false solution providers would be better advised to refer to themselves as solution providers (Kirmani & Rao, 2000).

This leads to a “pooling equilibrium” (Spence, 1973) in which the original signal loses its discriminatory power. Thus, “genuine” solution providers need to look for ways to boost the credibility of the signal. Provision of information that is otherwise unavailable at a reasonable cost (e.g. through references) can be an effective way to add credibility to a signal (Connelly et al., 2011). For this reason, citation of customer references has been shown to have a positive influence on a company’s selling performance (Anderson & Wynstra, 2010; Terho & Jalkala, 2017). Hence we hypothesize as follows:

Hypothesis 2: *The positive effect of the solution signal on the customer’s purchase intention is amplified when the seller presents **reference cases to enhance its credibility** (reference cases moderate the impact of the solution signal on willingness to buy).*

2.2.3 Solution signals function as a risk-reduction mechanism

The use of customer references is particularly effective for companies that sell higher-value goods and services, and in sales situations that are characterized by a high degree of uncertainty (Anderson & Wynstra, 2010; Hada et al., 2014). This is a typical situation faced by industrial purchasers. Purchases of capital equipment are often characterized by a relatively lengthy decision-making process involving a large number of stakeholders. The purchased product may represent a significant capital investment and the proper functioning of the equipment during its life cycle is important in maintaining operational performance. Reducing uncertainty and risk on the part of the actor with insufficient information is one of the fundamental mechanisms of ST (Kirmani & Rao, 2000; Mishra, 2013). The seller’s market position as a solution provider and the associated capacities for offering sophisticated forms of post-deployment support

services (Uлага & Reinartz, 2011) are likely to reduce the customer's perceived purchase risk (Uлага & Kohli, 2018), even if at the time of purchase the customer is only interested in buying a single product as opposed to an integrated solution.

It is our expectation that during the purchasing process, the buyer is confronted with three types of risk that he or she will wish to minimize (Nordin et al., 2011; Wiedmann, Hennings, Pankalla, Kassubeck, & Seegebarth, 2011): *performance risk*, *financial risk*, and *time risk*. Since business solutions are usually composed of several parts, there is an increased risk that individual components may become incompatible with each other and thus endanger the functioning of the overall solution (Harris & Blair, 2006). A single component by a manufacturer with the capacity for mastering complex solutions, perhaps sold under a performance-based contract, may imply a higher propensity for working flawlessly in conjunction with other technical components and for achieving the promised performance (Uлага & Reinartz, 2011). Consequently we expect lower perceived performance risk, which in turn increases the intention to purchase a component from a solution provider.

Furthermore, a key feature of solution providers is their focus on their customers' financial success. For instance, companies that are experienced in the solution business are typically able to adopt the customer's financial performance as a basis for customer interactions during the sales process, rather than product features (Storbacka, 2011; Terho et al., 2012, 2017). This may also have the result of reducing the perceived financial risk on the part of the customer in the context of product sales. Finally, companies that succeed in offering solutions usually have superior project management skills (Artto et al., 2015; Azimont, Cova, & Salle, 1998; Günter & Bonaccorsi, 1996; Kumar, Steward, & Morgan, 2018), which should lead to a perception that the purchase of a component from a solution provider is likely to be associated with less time wastage than if it were purchased from a component seller.

We thus hypothesize as follows:

Hypothesis 3a-c: The “***solution signal***” (i.e. the provider communicating that it is a solution provider) reduces the customer's perceived a) *performance risk* b) *financial risk*, and c) *time risk*.

Hypotheses 4a-c: The “solution signal” increases the customer’s purchase intention by reducing the customer’s perceived (a) performance risk b) financial risk, and c) time risk. That is, perceived risks mediate the effect of the solution signal on purchase intention.

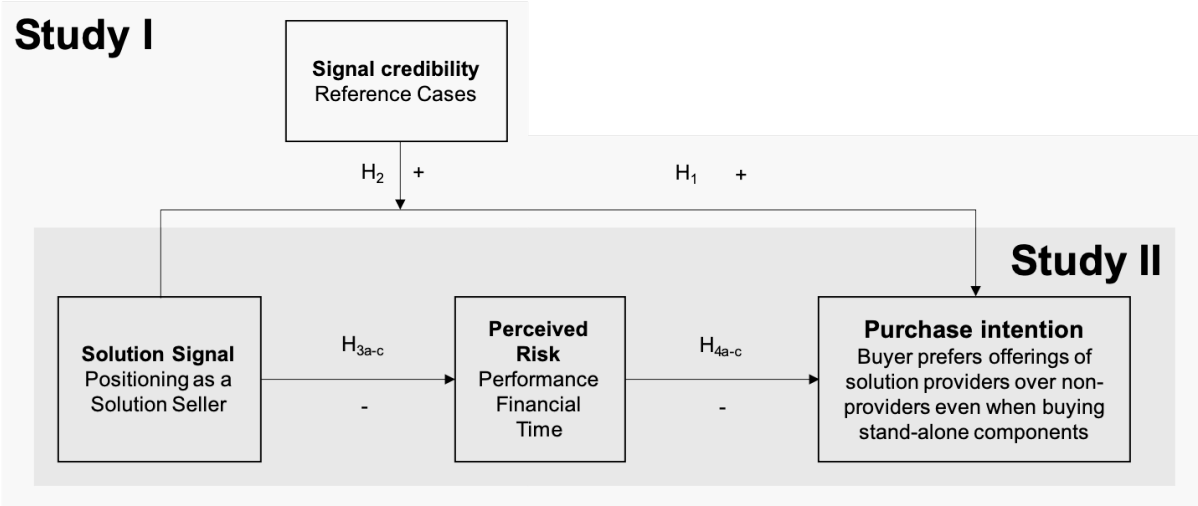


Figure 2: Model to be tested

3. Empirical validation

We next describe how the model presented in Figure 2 was tested through two rounds of experiments we will refer to as Study I and Study II.

3.1 Study I

The objective of Study I was to establish the main effect, which is the impact of the solution signal on the customer’s purchase intention in the context of product sales (H1). Study I also examines the moderating role of signal credibility (H2).

3.1.1 Study design

Hypotheses 1 and 2 were tested in a within-subject full factorial scenario experiment (Alexander & Becker, 1978; Auspurg & Hinz, 2015; Luoma et al., 2018; Saab & Botelho, 2020). In full factorial experimental designs, participants are presented with every possible combination of factor levels. The advantage of such a design lies in its greater efficiency, as it requires a smaller sample size than between-groups design. Disadvantages such as fatigue and learning effects can be easily avoided by rotating the presentation of the vignettes (Seltman,

2018). In addition, presenting a sequence of multiple alternatives better reflects real-world buying decisions, thus increasing external validity.

The experimental factors are the “solution signal” (solution vs. component seller) and the availability of reference projects (binary yes/no). As price plays an important role in multi-attribute comparisons and can also serve as a product quality signal (Erickson & Johansson, 1985; Monroe, 1973; Zeithaml, 1988), two purchase price levels (USD 45,000 and USD 50,000) for the component were included as a third factor. This results in a 2x2x2 experiment with eight conditions.

The experiment begins with a short description of a fictitious buying situation: A company is setting up a new production line for which the participant wishes to buy a *single compressor*. The respondent should assume that she has already made a pre-selection of eight suppliers that meet the minimum technical requirements and that her company has not previously purchased equipment from any of the sellers.

This is followed by eight scenarios in which the factors “solution vs. component seller”, “references” and “price” were varied systematically. The component sellers were introduced as manufacturers specialized in industrial compressors. In addition to the compressors, the component sellers also offer basic product life-cycle services such as installation, maintenance and repair, which are sold and charged separately. The solution providers, in contrast, not only manufacture and sell component-based compressors and the aforementioned basic life-cycle services, they also offer advanced services such as pre-emptive monitoring and client training to ensure the functional performance of their solutions (Ulaga & Reinartz, 2011). Much like the component seller scenarios, solution seller scenarios indicate that services are not part of the core component offer. According to our hypotheses, however, they signal the underlying knowledge and capabilities of the providers that enable them to offer such services as a part of a solution.

3.1.2 Measurement and survey structure

Purchase intention was measured using a single item (“If you were going to buy a compressor, how likely would you be to buy it from this company?”) on a seven-point rating scale. Single-item measurements are equal to multi-item measurements in many aspects of validity

(Bergkvist & Rossiter, 2007; Bergkvist, 2015). In addition, the brevity of the response counteracts fatigue, as the answer must be given for each of the eight scenarios.

After the initial greeting and screening, the respondents underwent an instructional manipulation check (Oppenheimer, Meyvis, & Davidenko, 2009), in which they had to click on a university logo instead of the forward button. Inattentive participants were screened out. The remaining subjects were presented with the introduction to the experiment and the eight scenarios in a randomized order to avoid carry-over or learning effects. The survey concluded with questions on the participants' professional backgrounds and the option of giving feedback.

3.1.3 Data collection

The scenarios were first pre-tested for comprehensibility and plausibility on a sample of 21 MBA students and three senior managers. Participants for the main study were recruited in the US and the UK through an online panel provider. The requirements for respondents were that they were managers in the manufacturing industry, and that they were involved in purchasing decisions exceeding USD 10,000 at least once a year. In total, 400 managers participated in the experiment. After removing those who completed too quickly (less than 1/3 of the median duration) or with incomplete answers, the final sample comprised 333 participants. On average, these managers had 14 years of professional experience with 11 years in their current company. Of these, 28% were in top-level management, 54% in mid-level management and 16% in first-level management (e.g. team leaders), and 2% had no management function. In geographical terms, 278 participants (83%) were resident in the US, 55 in the UK (17%).

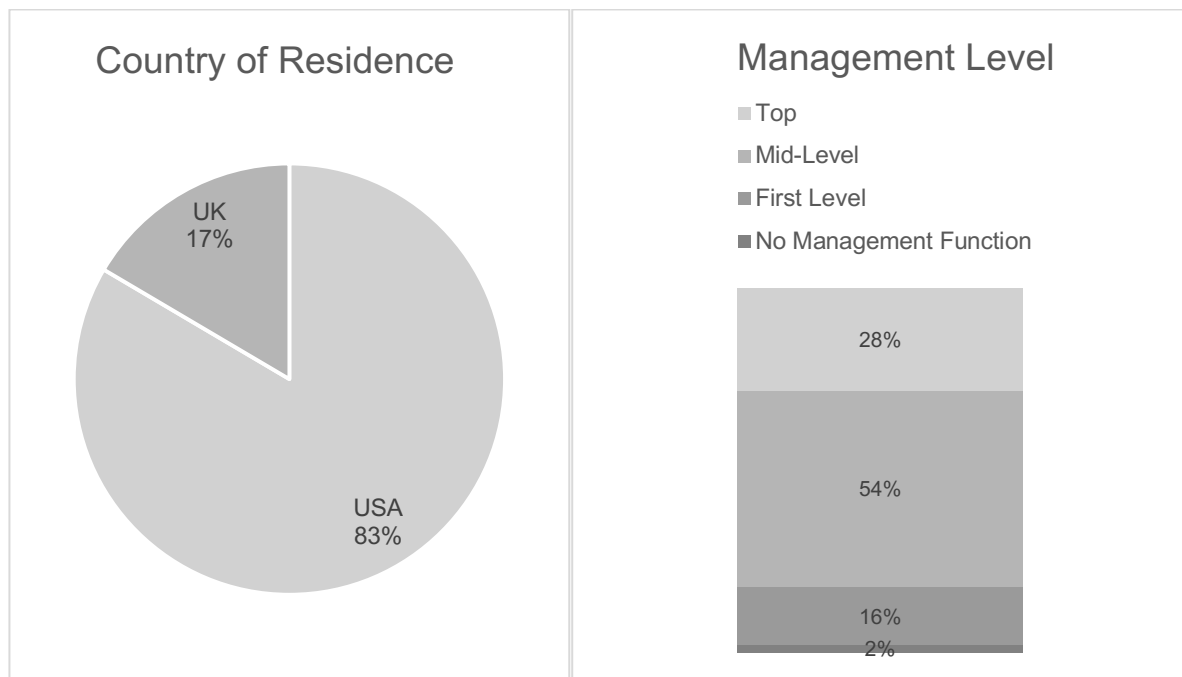


Figure 3: Sample profile

3.1.4 Results

The data was analyzed using a three-way ANOVA for repeated measures (GLM in SPSS 25) due to the assumption of correlated within-subject error terms as a result of multiple measurements of the dependent variable. Since all three factors only have two levels, sphericity is not an issue.

The results show a highly significant ($F = 88.84$; $df = 1, 332$; $p < .000$) mean difference for purchase intention between scenarios without the solution signal (i.e. component sellers) and scenarios with the solution signal (i.e. solution providers); the effect size is mid-range (partial $\eta^2 = .21$). Consequently, we consider our first hypothesis to be confirmed; assuming identical components, customers have a greater willingness to buy from vendors that communicate that they are solution providers compared to those who do not.

We also find a highly significant ($F = 35.95$; $df = 1, 332$; $p < .000$) interaction effect with a mid-range effect (partial $\eta^2 = .10$) between the solution signal and references, thus supporting hypothesis 2. The positive effect of the solution signal is amplified if the seller presents reference cases.

Further analysis shows a strong, highly significant direct effect for the factor “references” ($F = 369.49$; $df = 1, 332$; $p < .000$; partial $\eta^2 = .53$). Vendors can thus increase their customers’ purchase intentions by listing references together with the product, regardless of whether they are solution providers or not. This result did not form part of our hypotheses, but is in line with findings from previous studies (Anderson & Wynstra, 2010; Terho & Jalkala, 2017) that demonstrate the importance of reference cases.

A further insight not formulated as a hypothesis which was nonetheless in line with expectations was that a lower price level increases the purchase intention ($F = 51.05$; $df = 1, 333$; $p < .000$; partial $\eta^2 = .13$). None of the other interaction effects was significant.

Looking at the samples for the two countries in isolation, we see basically the same results. For the US sample, the effect of the solution signal is highly significant ($F = 77.23$; $df = 1, 277$; $p < .000$; partial $\eta^2 = .22$), so too the interaction effect of the solution signal and references ($F = 30.54$; $df = 1, 277$; $p < .000$; partial $\eta^2 = .10$). The effect of the solution signal in the UK sample is also highly significant albeit a little weaker ($F = 11.56$; $df = 1, 54$; $p < .01$; partial $\eta^2 = .18$). The same applies to the interaction effect of the solution signal and references ($F = 5.36$; $df = 1, 54$; $p < .05$; partial $\eta^2 = .09$). A single bipolar item concerning a preference for either a) components that need to be integrated into a larger system, or b) a fully integrated and customized solution, does not produce any significant difference between the two countries ($F = 5.80$; $df = 1, 331$; $p > .50$). We can therefore exclude any influence of the respondents’ country of residence on the effect of the solution signal. Furthermore, the preference for solutions does not depend on the management level of the respondents ($F = 1.80$; $df = 3, 329$; $p = .146$).

3.2 Study II

Study II extends the model presented in Figure 2 by examining how the customer’s perceived risk mediates the effect of the solution signal on the customer’s purchase intention (H3a-c and H4a-c).

3.2.1 Study design

Hypotheses 3 and 4 were tested in a between-groups online scenario experiment. Two mockup websites for a compressor served as experimental stimuli. The component condition highlights

the fictional manufacturer's technological know-how concerning stand-alone compressors (Figure 1) while the solution condition focuses on the same company's expertise in compressors as part of a business solution (Figure 2). As with the first experiment, the participants in both conditions are instructed that the study is concerned with a fictional purchase of a *component* compressor and not a full solution.

3.2.2 Measurements and survey structure

We adapted the measurements for perception of performance risk, financial risk, and time risk from Stone and Grønhaug (1993). The measurement for individual risk propensity was adapted from Meertens and Lion (2008). For reasons of consistency, purchase intention was again measured using a single item.

The survey structure was similar to that of the first experiment. After the work-related screening questions, the respondents had to pass the same instructional manipulation check (Oppenheimer et al. 2009). Depending on the random assignment, participants were routed to either the experimental (solution provider) or control condition (component seller). After expressing their risk perception and purchase intentions, the respondents had to answer questions on their professional backgrounds.

3.2.3 Data collection

The scenarios were pretested for comprehensibility on a sample of 22 European eMBA students and two executive managers. The final survey was distributed to a sample of senior managers in the US and the UK who were recruited through an online B2B panel provider. As with the first study, only respondents who worked in manufacturing companies and who had been involved in purchasing decisions worth more than 10,000 USD at least once a year were considered for the survey.

A total of 221 individuals took part in the survey. After removing those who failed to complete questions or answered them too quickly, the total sample comprised 151 respondents. On average, these managers had 15 years of professional experience with 13 years in their current company. Of these, 17% were in top-level management, 52% in mid-level management and 23% in first-level management, with 9% having no management function. The three most frequent functional roles within their respective companies were general management (32%),

production and production planning (23%), and purchasing (21%). In geographical terms, 110 participants were resident in the US (67%), 41 in the UK (33%).

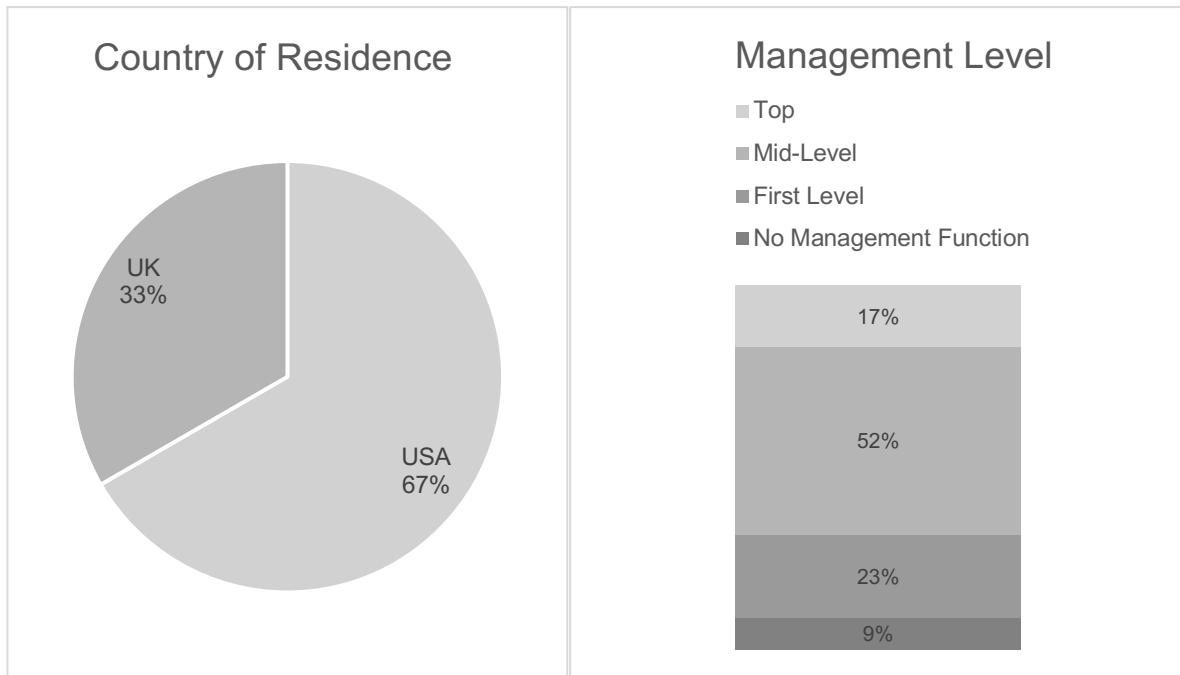


Figure 4: Sample profile

3.2.4 Results

Prior to hypothesis testing, the factor structure of the risk scales was tested by means of confirmatory factor analysis using lavaan 0.6-3 for R 3.5.2. A three-factor model proved to be an acceptable fit ($\chi^2 = 54.85$; $df = 24$; $p = .14$; $RMSEA = .09$; $CFI = .96$; $SRMR = .04$, Cronbach α between .79 and .88, AVE between .55 and .71; see Table 1).

Mediation tests were conducted using Hayes’s PROCESS 3.2 plugin for SPSS 25 (template 4 for multiple parallel mediation, 50,000 bootstrap samples, 95% confidence intervals).

The results showed that those who were presented with the solution offer had a significantly lower perception of performance risk ($a_1 = -.438$; $p = .007$; $CI_{95} = [-.753, -.124]$), financial risk ($a_2 = -.426$; $p = .008$; $CI_{95} = [-.724, -.093]$), and time risk ($a_3 = -.409$; $p = .012$; $CI_{95} = [-.724, -.093]$) when buying a component compressor compared to those presented with a component offer. Hypotheses 3a-c are thus confirmed.

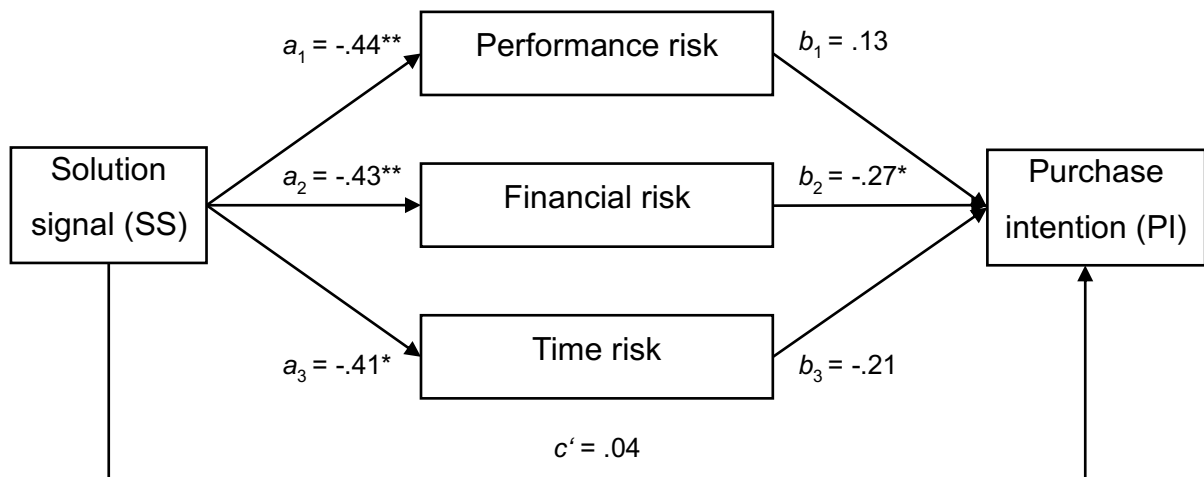


Figure 5: Risk perceptions as mediators

A lower perceived financial risk increases the purchase intention for the component compressor significantly ($b_2 = -.273$; $p = .022$; $CI_{95} = [-.604, -.047]$), while performance ($b_1 = .132$; $p = .197$; $CI_{95} = [-.083, .397]$) and time risk ($b_3 = -.209$; $p = .050$; $CI_{95} = [-.498, .000]$) do not have a significant impact on purchase intention.

The only positive, significant indirect effect is for financial risk ($a_2b_2 = .116$; $CI_{95} = [.004, .265]$). Performance risk ($a_1b_1 = -.058$; $CI_{95} = [-.166, .040]$) and time risk ($a_3b_3 = .085$; $CI_{95} = [-.007, .214]$) does not mediate the relationship between the solution signal and purchase intention. Hence, only hypothesis 4b is confirmed.

The purchase intention does not depend on whether the participants are presented with the solution or the component offer; the direct effect of the solution signal is insignificant² ($c' = .047$; $p = .805$; $CI_{95} = [-.326, .419]$). The total effect is also insignificant ($.218$; $p = .263$; $CI_{95} = [-.165, -.602]$), which can be explained by the different signs of the indirect effects of risk perceptions (Hayes 2013, p.157). In total, our model explains 14% of the variance of the purchase intention ($R^2 = .141$). All coefficients, except for the total effect, are standardized.

² The direct effect (“effect to be mediated”) needn’t necessarily be significant (Hayes 2009; Zhao, Lynch Jr., & Chen, 2010).

A series of control variables was then tested. The general risk propensity has neither a direct nor an indirect effect (as a moderated mediator for risk perception) on purchase intention. Furthermore, neither purchase intention nor perception of risk are dependent on the participants' management level or function within their respective companies. While the intention to buy does not vary by place of residence, UK participants perceived a significantly higher performance risk than participants from the US in the total sample (ANOVA, $F = 7.545$; $df = 1,149$; $p < .01$). However, with country included in the mediation model as an additional moderator (moderated mediation, Hayes model number 7), the index of moderated mediation (defined as difference between conditional indirect effects) is insignificant ($CI_{95} = [-.069, .293]$).

4. Discussion

We know that manufacturers struggle to transform into solution providers and attainment of the related growth and profitability targets is challenging (Neely, 2008; Storbacka, 2011; Worm et al., 2017). Yet most companies appear to retain their belief in the strategic importance of solution business. This leads to the question: Why do companies bother?

The fundamental assumption of this research was that a market position as a solution seller should be understood as a market signal, as proposed by signaling theory (Spence, 1973, 2002). We thus assume that signaling a market position as a solution seller positively influences the customer's purchase intention due to capabilities associated with solution sellers (Tuli et al., 2007; Storbacka, 2011), which may also be perceived as useful by non-solution customers, thus increasing their intention to purchase products. Our findings support this assumption.

The results are consistent with Antioco et al. (2008) who note, based on survey-level data, that engagement in advanced services appears to boost the sale of products and product-related services, thereby reinforcing the manufacturer's established product-centric business model logic. However, prior studies have not been able to explain the specific mechanism that causes this observed effect.

Beyond confirming the existence of a signaling effect, the results further suggest that solutions carefully executed in collaboration with selected customers (Restuccia & Lecoux, 2019; Saul

& Gebauer, 2018; Windler, Jüttner, Michel, Maklan, & Macdonald, 2017) can be used as an effective tool in customer reference marketing (Terho & Jalkala, 2017). Seen as such, manufacturers do not necessarily have to view a transition to solution business as an organization-wide disruptive undertaking that cuts through its business model, culture, and processes (Storbacka, 2011; Salonen, 2011). Many customers prefer to continue buying unbundled offers (Steiner, Eggert, Ulaga, & Backhaus, 2016), but may still appreciate the capabilities associated with solution providers. Thus, engagement in solution business can be seen as a marketing and capability development tool that allows the manufacturer to send effective and credible market signals about its reputation as a provider.

As to why customers respond to the solution signal, our results support the hypothesis that this functions as a risk-reduction mechanism. Prior studies have found that the customer's perceived level of uncertainty explains variation in organizational buying behavior to a large extent (Johnston & Lewin, 1996). Compared to providers of products and related services, solution providers develop deep customer insights, along with unique resources and capabilities (Storbacka, 2011; Ulaga & Reinartz, 2011). Ulaga and Kohli (2018) suggest that these assets help solution sellers to reduce the customer's uncertainty.

Based on the findings of this study, it appears that customers specifically believe in the solution provider's ability to limit their financial risks in the context of product sales. This is probably explained by the fact that in many cases solution sales complement rather than replace product sales, and the salesforce may well be the same for both sales types (Storbacka, 2011). Thus, customers may feel that salespeople employed by solution sellers are more adept at presenting value-based evidence in addition to technical product features also in the context of product sales (Terho et al., 2012, 2017).

5. Theoretical and Managerial Implications

5.1 Theoretical implications

The B2B marketing community has long considered the trend of manufacturers transforming into solution providers as one of its major research challenges (Belz, Backhaus, & Lilien, 2013; Evanschitzky et al., 2011). While much is known about how product-centric companies introduce increasingly sophisticated service portfolios and the potential outcomes of doing so,

the research that has generated this understanding is mostly exploratory and descriptive in nature, and typically lacks strong theoretical grounding (Kowalkowski et al., 2017; Rabetino et al., 2018).

The primary theoretical contribution of this study is thus to provide an empirically grounded explanation of an outcome from engaging in solution business (Lilien 2016; Worm et al., 2017) that has its basis in a foundational theory (Kowalkowski et al., 2017; Rabetino et al., 2018). While prior research suggests that advanced forms of service provision support the manufacturer's underlying product business (see e.g. Antioco et al., 2008), to date there has been no empirically and theoretically grounded explanation of the mechanisms that produce this observed effect.

Furthermore, beyond demonstrating the signaling effect of solution business, we explain the conditions that mediate and moderate this observed relationship. More specifically, we demonstrate that the market signal functions as a risk-reduction mechanism (Ulaga & Kohli, 2018). To fully leverage the positive effects of this market signal, the seller can boost the credibility of the signal by citing prior reference projects (Anderson & Wynstra, 2010).

5.2 Managerial implications

Given the substantial prerequisites for building new sets of capabilities, the transition to solution business is likely to be an uphill battle for many manufacturers. Even in cases of successful execution, it is likely that portions of the market will resist migrating to solutions, preferring instead to buy discrete products and services in a transactional form. Thus, managers responsible for the solution business are likely to face repeated internal challenges concerning the legitimacy of their operations.

To alleviate these managerial hurdles, our research provides a specific and empirically verified explanation of why solution business is strategically important for the manufacturer and why manufacturers should persist with their efforts, even in cases where the direct revenues generated by this particular form of service provision may not offset the related costs. This is because a market position as a solution provider helps them to sell products. Thus, rather than focusing on the difficulties associated with trying to sell solutions to customers with no interest in buying them, an alternative approach would be to see engagement in solution business as a

marketing and capability development tool that allows the provider to send credible market signals about its competencies, which is helpful in the context of product sales.

This argument is likely to be helpful for managers struggling with the process of transitioning to solution business. These companies often continue to generate a substantial part of their revenues and profits from the sale of products and basic, product-related services. If it can be demonstrated to managers responsible for these operations that solution business helps their business units to perform better, this represents a benefit for the solution business manager.

Manufacturers that lack genuine capabilities in solution provision may be tempted to exploit the signaling effects of solution business, thus resulting in a “free rider” problem. This underlines the importance of systematic reliance on customer reference marketing for manufacturers with demonstrated capabilities in solution provision, to ensure that they fully benefit from investments made in development of the related capabilities. It therefore becomes important to ensure that solutions created in collaboration with selected customers are carefully executed and documented, and then fully leveraged to reduce future customers’ uncertainty associated with the purchase of products.

6. Limitations and suggestions for further research

Like all studies, this study has limitations, which are primarily due to the methodology adopted. Scenario experiments take place under laboratory conditions, with limited external validity but increased internal validity. The scenario descriptions represented fictional purchase situations. This is particularly relevant for the measurement of risk perceptions, as the participants were not taking real risks and could make decisions without facing real-life consequences. Since the second study was designed as a between-groups experiment, the participants did not have the same selection of decision alternatives as they did in the within-subject experiment in the first study, which could affect the plausibility of the decision-making situation. Furthermore, we cannot exclude the possibility that prior knowledge, especially with regard to compressors, may have influenced the response behavior. In addition, the study only covers manufacturing companies; the signaling effect could be different for other industries.

This study leads to a wide array of future research questions: To what extent should the solution business be viewed as a marketing instrument rather than a development path for the company? What are the relevant signals to send under varying environmental, customer and supplier conditions? What other credibility signals might there be for solutions? Which of the capabilities associated with solution providers benefits most from the signaling spill-over effect? How can feedback channels between customers and providers be used to increase the effectiveness of solution signaling – perhaps through B2B social media?

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Appendix

Experiment I

Vignettes

Company A: Component manufacturer; price US\$ 50,000; five reference projects on website

Company B: Component manufacturer; price US\$ 45,000; five reference projects on website

Company C: Component manufacturer; price US\$ 50,000; no reference projects on website

Company D: Component manufacturer; price US\$ 45,000; no reference projects on website

Company E: Solution provider; price US\$ 50,000; five reference projects on website

Company F: Solution provider; price US\$ 45,000; five reference projects on website

Company G: Solution provider; price US\$ 50,000; no reference projects on website

Company H: Solution provider; price US\$ 45,000; no reference projects on website

Introduction text

Imagine the company you are working for is setting up a new production line. You are responsible for all procurement processes concerning pneumatics and compressed air.

Your current task is to purchase a **compressor** for compressed air supply. You have identified eight potential suppliers that meet the specified technical requirements. Your firm has not previously purchased equipment from any of these suppliers.

The price range of the compressors is 45,000-50,000 US\$.

Please read the following profiles carefully and answer to the questions

Exemplary vignette (company E)

Company E is a solution provider. In addition to providing air compressor components for industrial usage and the related basic product life cycle services, it also offers integrated solutions for air supply. The firm has invested in advanced service capabilities, including pre-

emptive monitoring, efficiency audits, and client training to ensure the functional performance of its solutions.

The compressor that meets your technical requirements costs **50,000 US\$**. For non-solution customers, all services provided by Company E are charged separately.

Company E's website showcases **five prior reference projects** from both solution and non-solution customers. Many of these customers are recognized as major players in their respective industries and the reference cases reflect buying situations similar to yours.

Experiment II

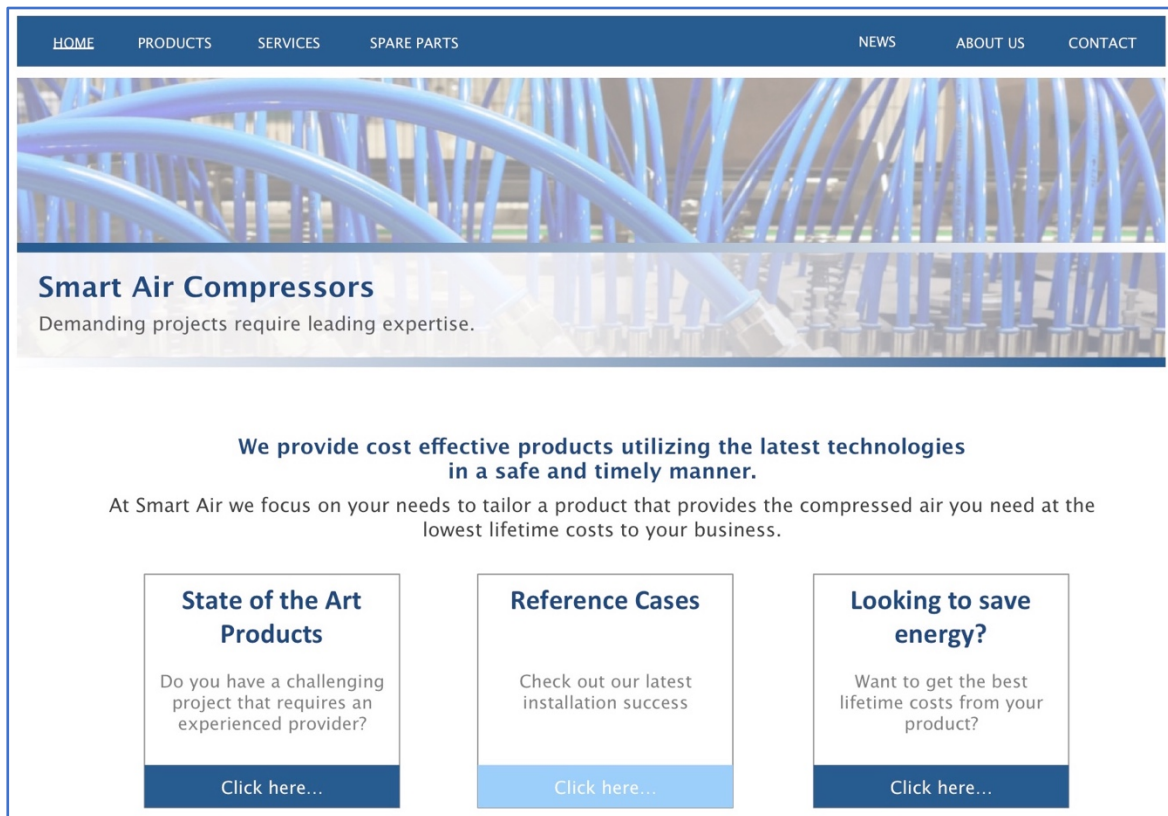


Figure 1: Website Mockup Component Condition

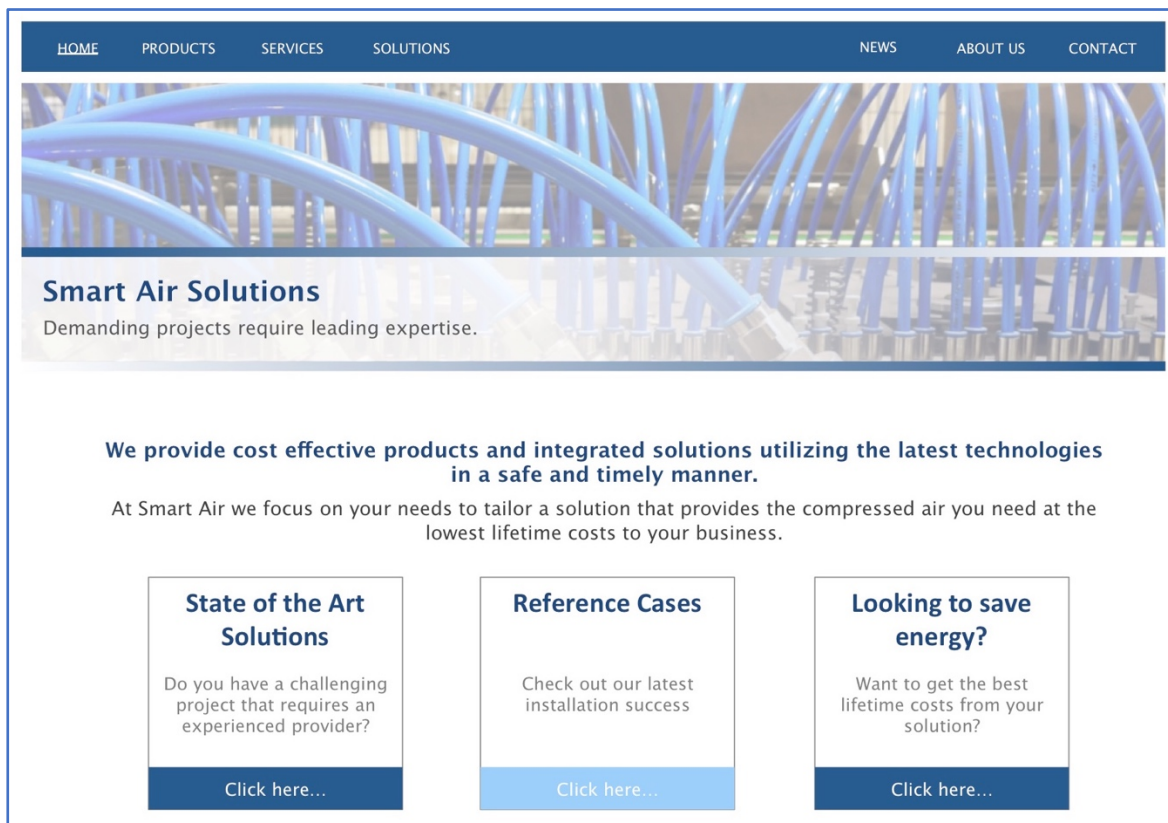


Figure 2: Website Mockup Solution Condition

Measures

Risk Perceptions (adapted from Stone & Grønhaug, 1993)

Performance Risk

- If I were to purchase this compressor, I would be concerned that the compressor does not provide the level of benefits that I expect.
- As I consider the purchase of this compressor, I worry whether it will really “perform” according to expectations.
- The thought of purchasing this compressor makes me wonder how reliable the product really is.

Financial Risk

- If I bought this compressor for myself, I would be concerned that the financial investment I make is unwise.
- Purchasing this compressor could involve important financial losses.
- If I bought this compressor for myself, I would be concerned that I am not getting my money’s worth.

Time Risk

- Purchasing this compressor could lead to an inefficient use of my time.
- Purchasing this compressor could involve important time losses.
- Purchasing this compressor concerns me because it could create even more time pressures on me that I don’t need.

All items measured on a 7-point rating, “I absolutely disagree” to “I absolutely agree”.

Risk Propensity (adapted from Meertens & Lion, 2008)

- Safety first! (rev)
- I prefer to avoid risks. (rev)
- I take risks regularly.

- I really dislike not knowing what is going to happen. (rev)
- I usually view risks as a challenge.

These items measured on a 7-point rating, “I totally disagree” to “I totally agree”.

A sixth item “I view myself as a...” was rated from “risk avoider” to “risk seeker” on a 7-point scale.

Dependent Variable

Purchase intention (Rossiter & Bergkvist, 2009, based on Juster, 1966)

- If you were going to purchase a compressor, how likely would you be to buy from that company?

Single item measured on a 7-point rating, “no chance or almost no chance” to “certain or practically certain”.

Factor Correlations (squared correlations in bold)				
	(I)	(II)	(III)	AVE
(I) Performance Risk	.83			.69
(II) Financial Risk	.64	.74		.55
(III) Time Risk	.52	.68	.84	.71

Table 1: Study II Factor Correlations

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