Why do companies integrate products and services? Linking decision-makers' personality traits and decision-making logics

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Abstract

Purpose – Despite the increasing attention given to product-service integration (PSI), little is known about this innovation strategy from a key decision-maker's perspective. To address this gap, our study draws from personality psychology and decision-making (DM) logics theory to better understand why and how companies' decision-makers strategize for PSI.

Design/methodology/approach – Using an abductive, empirics-first approach, we identify the study's theoretical building blocks, followed by an exploratory quantitative analysis to generate new theory. We propose a fit-as-mediation conceptual framework suggesting that (1) specific personality traits [i.e. honesty-humility (H), emotionality (E), extraversion (X), agreeableness (A), conscientiousness (C) and openness to experience (O) (HEXACO)] make decision-makers more likely to include PSI in their company's strategy and (2) depending on their personality, they apply different DM logics (i.e. causation or effectuation) to do so. To empirically examine this, we use data from 289 SMEs' decision-makers.

Findings – We report several meaningful relationships among our key theoretical constructs. For instance, we find that conscientious decision-makers are more likely to develop a PSI strategy via causation, whereas extravert decision-makers are more likely to do so via both causation and effectuation.

Originality/value – This service study is the first to apply the well-established HEXACO Personality Inventory to companies' key decision-makers. Moreover, it contributes to the microfoundations of PSI strategy and DM logic theories.

Keywords Product-service integration, Microfoundations, HEXACO, Effectuation, Causation

Paper type Research paper

1. Introduction

The integration of products and services by companies, originally coined "servitization" (Vandermerwe and Rada, 1988; Nudurupati *et al.*, 2016), is an innovation strategy that shifts the focus from supplying basic products and services to integrated offerings that are jointly better capable of satisfying customer needs. By way of shortcut, we refer to it as product-service integration (PSI). This innovation trend is mirrored in academia, where research attention for PSI is increasing, becoming more diverse along the way (Rabetino *et al.*, 2021; Kowalkowski *et al.*, 2022).

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So far, the literature has primarily focused on why and how companies pursue PSI growth (Kowalkowski *et al.*, 2017b). However, to date, little attention is paid to the human dimension, specifically regarding the people actually making the decisions (Rabetino *et al.*, 2018; Chen and Wang, 2021). This black box is critical because key decision-makers generally have a large influence on companies' strategic vision and implementation (Felin and Foss, 2005; Hoang *et al.*, 2023). The microfoundations movement in strategic management and organization theory helps shed light on this issue by considering micro-level entities, such as the individuals who make up the organization, to explain higher-level phenomena, such as companies' innovation strategies (Felin *et al.*, 2015).

In part, prior PSI work already recognizes the importance of microfoundations (Valtakoski, 2017). For instance, it has been found that decision-makers' cognitions often prevent companies from extending into PSI (Gebauer *et al.*, 2005; Gebauer, 2009), and that their goal orientation affects service performance (Yen *et al.*, 2022). Not only the service orientation of companies' leadership but also that of their personnel makes a significant contribution to PSI performance (Gebauer *et al.*, 2010). Specifically, individual personality traits, such as being extravert, flexible, and eager to learn, partially explain why service employees are successful in their work (Ulaga and Loveland, 2014; Hu and Lin, 2021). However, such microfoundations studies are still far and between, and it remains unclear what psychological mechanisms underlie PSI strategy development (Rabetino *et al.*, 2017; Coreynen *et al.*, 2020b).

The aim of this study is to further develop the microfoundations perspective on PSI by linking a personality perspective to a decision-making (DM) lens. First, we use the well-established HEXACO Personality Inventory (Lee and Ashton, 2004) from Psychology to find how key decision-makers' distinct personality traits—Honesty-Humility (H), Emotionality (E), eXtraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O)—relate to PSI. Second, we draw from the field of Entrepreneurship to find how two contrasting DM logics—causation and effectuation (Sarasvathy, 2001)—relate to PSI. Third, we investigate different fits, specifically fit-as-mediation (Venkatraman, 1989), between personality traits and DM logics in relation to PSI. In this way, we further reveal the microfoundations of PSI by examining how those aspects work together. Specifically, we answer two research questions: (1) Do decision-makers' personality traits influence the extent to which their company's strategy includes PSI; and (2) if so, does that influence operate via specific DM logics? Following an abductive, empirics-first approach (Sætre and Van de Ven, 2021; Golder *et al.*, 2023), we perform an exploratory empirical analysis to answer these two questions, after which we develop theory to provide plausible explanations for the origins of PSI strategy from a microfoundations perspective.

For the empirical analysis, we use rich multi-level data of 289 key decision-makers (i.e. owners and/or CEOs) at the helm of small and medium-sized enterprises (SMEs) from a variety of sectors. Analyzing these data is both appropriate and relevant for the following reasons. First, key decision-makers have a large influence on SMEs' strategies, goals, and behaviors (Boone *et al.*, 1996; Rauch and Frese, 2000). Therefore, the company's strategy often reflects their personal choices (van Gelderen *et al.*, 2000; Powell *et al.*, 2011). Second, by considering companies from different sectors, the findings can be generalized to a wider set of industries, as is also called for in both PSI research (Kowalkowski *et al.*, 2017b; Rabetino *et al.*, 2018) and effectuation studies (Chandler *et al.*, 2011; Fisher, 2012).

So, this study contributes to the service literature, particularly on servitization and service business model innovation, by further investigating the microfoundations of PSI. Complementary to earlier work that used a motivational perspective for exploring why key decision-makers pursue PSI (Coreynen *et al.*, 2020b), the present study considers key decision-makers' personality traits and DM logics to find out *how* they develop such an innovation strategy. This study's findings unlock several opportunities for further research.

Furthermore, it raises awareness that strategy is determined not only by factors present at the level of the organization, but also by those rooted in the individual. This, amongst others, has implications for companies' own recruitment and promotion policies (Kohtamäki *et al.*, 2015; Hu and Lin, 2021). We return to these implications in further detail at the end of this article.

2. Methodology: abduction

In service research, the deductive causal explanation approach is very popular (see, e.g. Kohtamäki *et al.*, 2015), with a central role for *ex ante* formulated hypotheses that are quantitatively tested using multivariate statistics. To the extent that we develop theory inductively, we tend to use qualitative research methods, with hypotheses or propositions emerging *ex post*, after data analysis (Pratt *et al.*, 2020). In the current paper, we take a different route: abduction, and we do so quantitatively through an empirics-first approach (Golder *et al.*, 2023).

Abduction is a form of generative reasoning that begins with observing and confirming a phenomenon followed by generating and evaluating ideas that may explain that phenomenon for subsequent deductive testing and inductive constructing (Sætre and Van de Ven, 2021). It contributes to the advancement of science by allowing for discovery through the exploration of data to produce plausible explanations (Behfar and Okhuysen, 2018). The term "abduction" was originally coined by Peirce (1932), who said that "*Deduction, proves that something 'must' be; Induction shows that something actually 'is' operative; Abduction merely suggests that something 'may be'*." Our goal is thus to engage in exploratory quantitative abduction, not formulating hypotheses *ex ante* but providing insights *ex post*. We do not do so blindly, as we select the variables to be included in our exercise after a careful review of the literature, akin to deduction (Schurz, 2008). So, the abductive, empirics-first approach offers a third way, complementary to quantitative deduction and qualitative induction (Golder *et al.*, 2023), with the value added of being highly suitable to explore complexity (Eden and Nielsen, 2020).

Following prior studies in this tradition (e.g. Dikova *et al.*, 2017; Coreynen *et al.*, 2020b), we apply abduction in three steps: (1) identifying the study's theoretical building blocks through a careful review of the literature, ending up with a conceptual framework; (2) performing an exploratory quantitative analysis; and (3) generating new theory. So, we first review the literature on PSI to identify potentially relevant *ex ante* theoretical building blocks of *ex post* hypotheses through limited deduction, offering a preliminary conceptual framework for further investigation. Next, we execute a comprehensive quantitative analysis on the collected data as a form of exploratory induction to investigate the relationships among the selected elements. This is instrumental in identifying any precise relationships in terms of direction, nature, and size between any of the selected theoretical building blocks. Finally, based on a dialog between the empirical findings and the consulted literature, we refine the conceptual model and develop specific *ex post* hypotheses as input for further investigation by later studies.

3. Theoretical building blocks

3.1 PSI

Across sectors, there is a growing tendency for companies to shift their business focus toward integrated products and services, also referred to as "solutions" (Davies, 2004), "hybrid offerings" (Ulaga and Reinartz, 2011), and "product-service systems" (Beuren *et al.*, 2013). Key to this transition is the understanding that, to better serve customers, companies should innovate by attending to their specific and unique needs rather than merely updating and

selling standard products and services. For instance, companies can customize their offering depending on customers' wishes, make their products available for use (e.g. through leasing) or charge customers depending on their use of the product or service (Tukker, 2004; Witell and Löfgren, 2013). Among industrial manufacturers, this shift is commonly referred to as "service infusion" or "servitization", the latter considered a more fundamental change in company's business model (Kowalkowski *et al.*, 2017a; Raddats *et al.*, 2019). Besides large companies, SMEs are integrating products and services as well (Kwak and Kim, 2016; Ambroise *et al.*, 2017), from manufacturing and textile (e.g. Bellandi and Santini, 2019) to energy (e.g. Gebauer and Binz, 2019), agriculture (e.g. Baluch *et al.*, 2017), and even food (e.g. Boccia *et al.*, 2019).

The shift to PSI is often driven by competitive, marketing, and financial factors (Tukker, 2004; Baines *et al.*, 2009). Strategically, it is a way to differentiate from the competition (Ambroise *et al.*, 2017) and to counter commoditization, a process implying that an innovative product or technology starts to lose its unique value over time (Matthyssens and Vandenbempt, 2008). Marketing-wise, it influences customers' purchasing decisions positively (Chalal *et al.*, 2015) and strengthens customer loyalty (Rabetino *et al.*, 2017). And financially, it can lead to long-term performance benefits (Visnjic *et al.*, 2016) as well as higher income stability, particularly in times of crisis (Mele *et al.*, 2020; Rapaccini *et al.*, 2020).

Over the last three decades, research into PSI has evolved from exploring why companies pursue PSI growth to how they actually do so (Kowalkowski *et al.*, 2017b). More recently, studies have started focusing on the decision-maker to help further answer these questions. For instance, it has been found that decision-makers who are open to risk and recognize products' intangible features are more likely to develop a service-oriented business strategy (Gebauer, 2009). Also visionary leadership and strong managerial commitment are necessary for successfully delivering integrated products and services (Antioco *et al.*, 2008; Oliva *et al.*, 2012). Finally, from a motivational perspective, it has been found that the need to achieve drives decision-makers to pursue PSI, specifically to strengthen their company's market leadership position (Coreynen *et al.*, 2020b).

3.2 A personality traits perspective: HEXACO

For long, scholars have tried to explain business strategy from an individual perspective (e.g. McClelland and Winter, 1971; Schwenk, 1984, 1988). Within upper echelons theory, Hambrick and Mason's (1984) seminal article shows that managerial characteristics, such as demographics and tenure, help predict strategic choice and organizational performance (Anwar *et al.*, 2021). Besides these observable characteristics, people also bring other dimensions to an organization, such as cognitions, values, preferences, experiences, motives, and personalities (Felin *et al.*, 2012), which may all influence companies' ambitions and strategic choices (Boone *et al.*, 1996).

Personality traits are people's dispositions to exhibit a certain kind of behavior across different situations (Caprara and Cervone, 2000). They are enduring and show a degree of stability over time, particularly during adulthood (Roccas *et al.*, 2002). The HEXACO personality inventory offers a theoretically grounded and psychometrically validated measure of six major personality traits—Honesty-Humility (H), Emotionality (E), eXtraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O). As an improvement over the well-known Big Five (e.g. De Hoogh *et al.*, 2005; Neal *et al.*, 2012), HEXACO offers a very useful tool for understanding the cause and function of variation in people's personality (Lee and Ashton, 2004). Table 1 offers a summary of several distinct facets associated with each of the six traits (further details can be found in the source article).

In the field of entrepreneurship, a stream of research considers the influence of personality traits. For example, it has been found that the Big Five differentiate entrepreneurs from managers (Brandstätter, 2011), and that they mediate the effect of gender on people's tendency to become entrepreneurs (Zhang *et al.*, 2009). They have also been reported to influence entrepreneurial success and survival (Gorgievski and Stephan, 2016). Specifically conscientiousness has a positive effect on both business creation and performance (Zhao and Seibert, 2006; Zhao *et al.*, 2010).

In PSI research, too, studies have investigated the importance of personality traits, specifically among service personnel and customers. For instance, introversion, conscientiousness, and openness have all been associated with high service sales among salespeople at goods-dominant companies (Ulaga and Loveland, 2014). A revealing quote by one manager is that "*Product salespeople are from Mars, while services salespeople are from Venus*" (Ulaga and Reinartz, 2011, p. 13). Conversely, among service delivery personnel, extraversion (as opposed to introversion), conscientiousness, and agreeableness have been found to indirectly impact customer-oriented behavior (Lanjananda and Patterson, 2009; Lounsbury *et al.*, 2012; Hu and Lin, 2021). Finally, not only service personnel but also customers, specifically their willingness to participate in a company's innovation process, are indirectly affected by their personality profile, with positive associations having been revealed for extraversion and openness (Füller *et al.*, 2008; Vermehren *et al.*, 2022). The latter is important, because successful PSI not solely depends on the provider, but often on value co-creation with customers as well (Helkkula *et al.*, 2018).

However, personality studies in PSI research share two shortcomings. One, they focus mostly on the people selling and delivering services (e.g. Baines *et al.*, 2013; Ulaga and Loveland, 2014) rather than on those making strategic company decisions. Two, they primarily use qualitative research methods, specifically in the domain of servitization (Rabetino *et al.*, 2018), which does not allow for finding significant relations between constructs, controlling for alternative explanations, and generalizing over larger populations (van Witteloostuijn *et al.*, 2020).

3.3 A decision-making logic perspective: causation-effectuation

From a neoclassical economics' standpoint, decision-making is a rational process with the entrepreneur making decisions after diagnosing the market, setting goals, pursuing a cost-benefit analysis, and then procuring the necessary means (Pfeffer *et al.*, 2018; Hauser *et al.*, 2020). Management scholars now refer to behavior that fits within this perspective as using the "causation" logic (Hensel and Visser, 2020). Besides causation, Sarasvathy (2001) identified another decision-making (DM, for short) logic: effectuation. The theory of effectuation argues that decision-makers do not always have sufficient information to *a priori* recognize and evaluate opportunities and plan in advance accordingly (Ortega *et al.*, 2017).

Personality trait	Facets
Honesty-humility (H)	Sincerity, fairness, greed avoidance, modesty
Emotionality (E)	Fearfulness, anxiety, dependence, sentimentality
eXtraversion (X)	Expressiveness, social boldness, sociability, liveliness
Agreeableness (A)	Forgiveness, gentleness, flexibility, patience
Conscientiousness (C)	Organization, diligence, perfectionism, prudence
Openness to experience (O)	Esthetic appreciation, inquisitiveness, creativity, unconventionality

Source(s): Authors own work based on Lee and Ashton (2004)

Table 1.
HEXACO facets

Rather, they experiment with the means at their disposal and learn along the way. Therefore, effectuation is particularly suited for smaller companies, and for companies active in uncertain situations (Sarasvathy, 2009).

Ample prior innovation studies explain the differences between causation and effectuation (e.g. Berends *et al.*, 2014; Klenner *et al.*, 2022). Originally, Sarasvathy (2001, p. 245) offered the following definitions: "*Causation processes take a particular effect as given and focus on selecting between means to create that effect. Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means*." An illustrative example is the case of a culinary chef preparing a meal from the menu by shopping for ingredients in advance and following the recipe (i.e. causation) as opposed to an improvised meal with the ingredients that happen to be available in the fridge and pantry (i.e. effectuation). In business strategy, effectuation differs from causation in at least three aspects: (1) Decision-makers imagine possible courses of action based on the company's means rather than goals, (2) they focus on what they are able to lose rather than on expected returns, and (3) they stay open to unexpected contingencies rather than avoiding them (Wiltbank *et al.*, 2006).

Validated measures for both DM logics have been developed, with effectuation being split in different subdimensions according to the theory, namely experimentation (i.e. seeking alternatives based on trial-and-error), affordable loss (i.e. what can they afford to lose), flexibility (i.e. staying adjustable), and pre-commitments (i.e. engaging in alliances with customers, suppliers, and other companies in advance) (Chandler *et al.*, 2011). More recently, it has been found that the latter can be separated into two more subdimensions: pre-commitments intensity and pre-commitments advantages, the first referring to the number of engagements and the intensity with which they have been used and the second to the advantages they can offer (Vanderstraeten *et al.*, 2020).

After an initial focus on companies' founding process, studies have started to examine DM logics within existing firms, specifically SMEs (Berends *et al.*, 2014; Hauser *et al.*, 2020). They have been studied in relation to several aspects of innovation, including product development (Berends *et al.*, 2014; Ortega *et al.*, 2017), business model innovation (Brenk *et al.*, 2019; Harms *et al.*, 2021), servitization (Cui *et al.*, 2019), and innovation performance (Vanderstraeten *et al.*, 2020). However, the literature still disagrees regarding the nature of the DM construct and scale. On the one hand, causation and effectuation are considered opposite poles of the DM continuum (e.g. Brettel *et al.*, 2012). On the other hand, studies find that they are used interchangeably by entrepreneurs, thus being orthogonal in nature (Pfeffer *et al.*, 2018; Smolka *et al.*, 2018; Harms *et al.*, 2021). Regarding product development, for example, it has been reported that effectuation is dominant in the early stages and causation becomes more ruling later (Berends *et al.*, 2014).

Similar findings have been expressed in relation to PSI. For instance, companies "*may start to servitize unintentionally to reach the 'low hanging fruit that can be harvested very early on' and may only begin to consider servitization as a strategy and an investment opportunity after a certain number of services have been sold*" (Kastalli and Van Looy, 2013, p. 172), thus implying the transition from effectuation to causation. Alternatively, they can also move from causation to effectuation in order to better cope with the complexity and uncertainty of providing servitization solutions (Cui *et al.*, 2019). Specifically among SMEs, no general, predefined service transition process has been found (Kowalkowski *et al.*, 2013), to date, suggesting both causation and effectuation pathways.

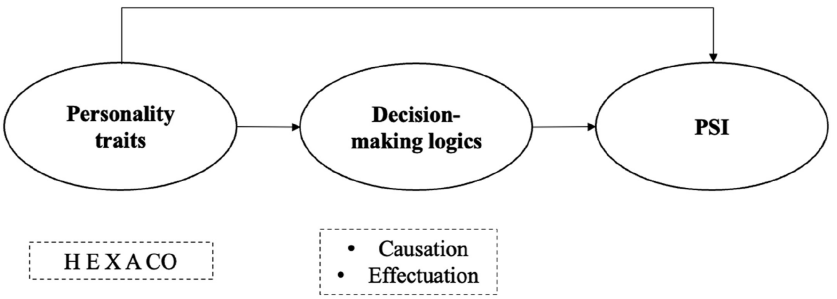
3.4 Conceptual framework

According to the microfoundations view, simply considering the relationship between decision-makers' personalities and innovation strategy is insufficient; there needs to be

mediation through action in the form of decision-making (Frese and Gielnik, 2014; Felin *et al.*, 2015; Hambrick and Crossland, 2018). Based on the above review of the literature, we present this study's overall conceptual framework (see Figure 1). To capture complexity, we consider how different combinations of factors, also known as "fits", lead to specific outcomes (Eden and Nielsen, 2020). Specifically, we use fit-as-mediation (Venkatraman, 1989) to examine whether different DM logics (i.e. causation and effectuation) serve as a significant intervening mechanism between distinct personality traits (i.e. HEXACO) as the antecedent variables and PSI strategy as the outcome variable. This allows us to find not only whether statistically significant and size-wise meaningful relationships exist among the chosen theoretical constructs, but also whether personality traits make decision-makers more likely to strategize for PSI by using different DM logics.

This type of configurational research has been done before, particularly related to the outer environment (i.e. the context) wherein companies are active. For instance, studies have looked into the industry conditions shaping companies' service type choices (Visnjic *et al.*, 2019) as well as market conditions driving companies' digital servitization strategies (Coreynen *et al.*, 2020a). Also, several successful fits between different business environments and PSI strategies have been identified (Ambroise *et al.*, 2017; Kohtamäki *et al.*, 2019a). However, companies' innovation strategies are not only the product of their environment, but also of decisions made by their business leaders (Au *et al.*, 2017; Lovallo and Sibony, 2018). When external stimuli are plenty—as is often the case—decision-makers inject a great deal of themselves into their decisions (Schmidt *et al.*, 2012; Hambrick and Crossland, 2018). With the current study, we take a company-internal perspective by unpacking companies' microfoundations, specifically decision-makers' personality traits and DM logics.

To complete the mediation triangle, we briefly discuss the relationship between personality traits and DM logics. Despite the growing body of literature on causation and effectuation, still relatively little is known about their antecedents (Chandler *et al.*, 2011; Smolka *et al.*, 2018). Among the numerous factors affecting decision-making, individual decision-makers' characteristics have recently been pinpointed as a research area deserving attention (Pfeffer *et al.*, 2018; Hensel and Visser, 2020). For instance, at the most basic level, it has been found that gender influences the mediated effect of causation and effectuation on new venture growth (Yang *et al.*, 2020). Also, distinct combinations of personality traits have been associated with different types of effectual decision-making during ventures' pre-launch phase (Hensel and Visser, 2020). In this study, we further explore the relationship between personality traits and DM logics in the context of PSI.



Source(s): Authors' own work

Figure 1.
Conceptual framework

4. Exploratory analysis

4.1 Data collection

For this study, we use data from the Ambition in Entrepreneurship (AiE) project. AiE is a professional consulting service developed by Antwerp Management School (AMS), the University of Antwerp (UA) and UNIZO (the Flemish association for local SMEs), funded by VLAIO (the Flemish government agency for innovation and entrepreneurship). The core of AiE is a consulting track with a professional consultant trained by the academic team of AMS and UA. Importantly, the intake procedure of AiE implies that only key decision-makers participate in the project. Given our focus on SMEs, close to 90% of the respondents are owner of the enterprise.

The consultant's final advice is based on several conversations with the company's key decision-maker (or, occasionally, team of decision-makers) that took place over the course of one to four months in combination with questionnaires that are each time completed by the decision-maker beforehand. One questionnaire focuses entirely on the company, such as its strategy (including PSI), way of decision-making (i.e. causation and/or effectuation), among many other business topics; another involves characteristics of the decision-maker(s), such as their personality type (e.g. HEXACO), basic characteristics (e.g. age, gender, and education), and more. Additional information about the company (e.g. foundation year, size, and sector) is obtained through Graydon Belgium (a credit-counseling services provider of secondary objective data). The data are matched based on several common identifiers, including the participants' names, e-mail addresses, and companies' VAT numbers. Further details about AiE can be found in the article by van Witteloostuijn *et al.* (2020).

Various practices and techniques are used to avoid issues related to common-method variance and social desirability bias (Chang *et al.*, 2010). First, participants are asked at the start of each questionnaire to answer the questions as honestly as possible, emphasizing that there are no right or wrong answers and that their answers will be treated with the highest level of confidentiality. Second, the data used for the analysis stem from different sources, namely two different questionnaires (with a delay of several weeks in-between) and secondary data from Graydon. Third, the participants are unaware of the subject of the current study, and some items are reverse-coded, reducing the likelihood of participants giving desirable or similar answers, respectively. More generally, the coaches explain to the participants that high-quality and fitting advice requires unbiased and honest information.

4.2 Measures

4.2.1 PSI strategy. Among a list of several business trends (e.g. globalization and digitalization), we ask companies' key decision-makers to rate on a five-point Likert agreement scale (from 1 = totally disagree, to 5 = totally agree) whether their venture has developed a strategy that includes the integration of products and services. This measure is the same as used in prior studies (Coreynen *et al.*, 2020a, b) and aligns well with earlier definitions of service integration and servitization (Vandermerwe and Rada, 1988; Kwak and Kim, 2016). Moreover, single-item measures are particularly useful for organizational psychology research (Matthews *et al.*, 2022), as is the case in the microfoundations of PSI. Thus, our focus is on the degree to which companies have included PSI in their strategy. So, whether products and services have actually been integrated is not what we examine here; we are interested in the degree of PSI strategizing by the decision-maker and the extent to which that thinking is codified in a strategy.

4.2.2 HEXACO. We use the HEXACO personality inventory (Lee and Ashton, 2004) to measure six individual personality traits: *Honesty-Humility* (H), *Emotionality* (E), *eXtraversion* (X), *Agreeableness* (A), *Conscientiousness* (C), and *Openness to Experience* (O). Per trait, we posit 10 statements that decision-makers have to rate on a five-point Likert

agreement scale (from 1 = "totally disagree", to 5 = "totally agree"), such as "I tend to be lenient in judging other people" (A_04), "People often call me a perfectionist" (C_07), and "I like people who have unconventional views" (O_09). About half of the statements are reverse-coded (rc), such as "I want people to know that I am an important person of high status" (H_10), "Even in an emergency I wouldn't feel like panicking" (E_03), and "I rarely express my opinions in group meetings" (X_04).

4.2.3 DM logics. We draw from Chandler *et al.* (2011) for the measures of causation and effectuation as used in recent studies (e.g. Ruiz-Jiménez *et al.*, 2020; Yang *et al.*, 2020; Harms *et al.*, 2021). Decision-makers rate 24 items on a five-point Likert agreement scale (from 1 = "totally disagree" to 5 = "totally agree"), such as "We had a clear and consistent vision for where we wanted to end up" (Item_06), "We experimented with different products, services, and/or business models" (Item_08), and "We allowed the business to evolve as opportunities emerged" (Item_15). Two statements are reverse-coded (rc), such as "The product/service that we now provide is mostly the same as what we first imagined" (Item_09).

4.2.4 Control variables. We use a combination of both individual-level and company-level control variables, similar to other studies (e.g. Smolka *et al.*, 2018; Coreynen *et al.*, 2020b; Yang *et al.*, 2020). At the level of the individual, we factually ask decision-makers about their age, gender, and highest completed level of education. *Age* is a discrete variable (e.g. 35 years), *Gender* a dichotomous variable (1 = "male", and 2 = "female"), and *Education* an ordinal variable (1 = "no education", 2 = "primary school", 3 = "secondary school", 4 = "bachelor's degree", 5 = "master's degree", and 6 = "doctoral degree").

At the level of the company, we control for company age, size, sector, and product-service orientation (PSO) through data from the AiE company questionnaire and secondary data from Graydon Belgium. *Company Age* is a discrete variable calculated by subtracting the company's foundation year from the year when the participant completed the questionnaire. *Size* is an ordinal variable based on the company's number of employees (1 = "1 to 4 employees"; 2 = "5 to 9 employees", 3 = "10 to 19 employees", 4 = "20 to 49 employees", 5 = "50 to 99 employees", and 6 = "100 to 249 employees"). For *Sector*, we created dummy variables based on NACE codes, namely for *Manufacturing*, *Construction*, *Wholesale and Retail Trade*, and *Professional, Scientific, and Technical activities*. Finally, PSO is an ordinal variable determined by the question "Which of the following descriptions best fits with your company?" (1 = "product-oriented"; 2 = "mostly product-oriented supported by additional services"; 3 = "both product and service oriented", 4 = "mostly service-oriented supported by additional products"; 5 = "service-oriented"). This measure is also used in other studies (Coreynen *et al.*, 2020a, b) to account for the diversity of product/service-oriented companies that exists in each sector (see Appendix A).

A remark is in order regarding the PSI and PSO measures. On the one hand, PSI captures whether the company has a strategy regarding the integration of products and services, in line with the innovation strategy philosophy of integrated offerings (Vandermerwe and Rada, 1988). On the other hand, PSO measures the relative importance of tangible products *vis-à-vis* intangible services in the company's offering (Alexiev *et al.*, 2018) without any reference to the integration issue. Take the example of a bicycle shop: If the shop sells both bicycles as a product and repair as a service, both associated with roughly similar turnover figures, this SME may rate a "3" on the PSO scale. However, if this shop does not offer both in an integrated product-service offering fashion, such as bicycle leasing, the score on PSI will be low (say, a "1").

4.3 Sample and method

Between October 2016 and the end of 2018, 532 decision-makers participated in AiE of whom 289 provided valid information on all the variables needed to conduct the current empirical

analysis. This drop in the number of observations can be explained by the fact that also teams of decision-makers active at the same company can participate in AiE and complete the individual personality questionnaire, whilst usually only one decision-maker (often the owner and/or CEO) completes the questionnaire about the company. The remaining data are missing completely at random ($p = 0.599$).

Table 2 shows the variables' descriptive statistics and their bivariate correlations. The average decision-maker in our sample is 43 years old, about two in three decision-makers have completed a higher education study, and about three in four are male. The average company in our sample was founded 17 years ago, three in four companies employ less than 10 employees (nearly all companies in our sample employ less than 50 employees), and almost three in four agree that they are either (mostly) product-oriented or offer both products and services equally (only one in four considers themselves service-oriented). Also, 33% of the companies in our sample are from wholesale and retail trade, 17% from manufacturing, 14% from construction, 11% from professional, scientific, and technical activities, and the remaining 25% are spread across a wide range of other sectors. Finally, we note significant but substantially lower bivariate correlations between *causation* and all six *effectuation* measures ($r = 0.14$ to 0.43, $p < 0.01$), confirming prior work that they are related, but imperfectly so (e.g. Smolka *et al.*, 2018; Harms *et al.*, 2021).

We perform structural equation modeling (SEM) using lavaan for R for the exploratory empirical analysis (Kline, 2015) (see Appendix B for the full R script). The latent variables for personality traits and DM logics are measured as reflective, meaning that the measured items are manifestations of the underlying construct (Costa, 2015). For example, a decision-maker who is highly conscientious is more likely to be called "a perfectionist", as measured by item C_07 (see above). Also, decision-makers applying causation are likely to have a vision for where they want to end up, as measured by Item_06. In other words, the measured items depend on (i.e. reflect) the latent variable (Bollen, 2011). This is in line with the perspective of the developers of these scales (Lee and Ashton, 2004; Chandler *et al.*, 2011). Prior work has also demonstrated the content (Lee and Ashton, 2004), criterion (Ashton and Lee, 2008), and construct validity (Henry *et al.*, 2022) of the HEXACO scales, and Chander *et al.* (2011) demonstrate all those types of validity for their DM logics scale. Therefore, we opted to model the latent variables only as a function for the theoretically associated items, which makes the path coefficients having a meaning similar to confirmatory factor analysis (see Appendix C and D for this output). Reliability is evident from the items having significant coefficients on the latent variables.

The relation between the items and the latent variables is theory-based rather than exploratory. That is, the SEM model only relates items to their theoretically-related latent construct. Subsequently, latent HEXACO dimensions are regressed on latent DM logics, and both sets are jointly regressed on PSI. Because we work with a maximum of 22 independent variables (including control variables), and since the required ratio of observations to the number of independent variables for obtaining generalizability is at least 5:1 (preferably 15:1; Hair *et al.*, 2009), our sample is appropriately large for the analysis.

4.4 Results

The Appendix reports the full SEM output, considering all DM logic dimensions simultaneously (specifically, Appendix C and D show the relation of the HEXACO and DM logics items to the latent variables, Appendix E the goodness-of-fit indices, and Appendix F the regressions results). Here, we report the path coefficients of the piecewise SEM (i.e. per dimension of DM logics) instead of the whole model (with all DM logics together), because the results of the piecewise SEM are less noisy (virtually all relations have slightly greater coefficients and slightly smaller standard errors) and can be interpreted more easily.

Table 2. Descriptive statistics and bivariate correlations

		Min	Max	Mean	SD
1	Product-Service Integration (PSI)	1	5	3.43	1.17
2	Honesty-Humility (H)	−1.93	1.37	−0.04	0.60
3	Emotionality (E)	−1.73	1.77	−0.03	0.61
4	eXtraversion (X)	−2.25	1.35	0.01	0.55
5	Agreeableness (A)	−2.00	1.80	−0.02	0.54
6	Conscientiousness (C)	−2.01	1.29	0.00	0.58
7	Openness to Experience (O)	−1.98	1.72	−0.01	0.63
8	Causation (Cau)	−2.13	1.87	0.05	0.87
9	Experimentation (Exp)	−1.85	2.15	0.01	0.93
10	Affordable Loss (Aff)	−2.51	1.49	0.04	0.99
11	Flexibility (Fle)	−2.95	1.05	0.03	0.62
12	Pre-Commitments Intensity (PCI)	−1.65	2.35	0.02	1.10
13	Pre-Commitments Advantages (PCA)	−1.92	2.08	−0.06	1.04
14	Age	20	70	42.97	9.05
15	Gender (Gen)	1	2	1.26	0.44
16	Education (Edu)	2	6	3.91	0.87
17	Company Age (C_Age)	0.08	90.90	17.42	13.44
18	Size	1	6	1.90	1.03
19	Product-Service Orientation (PSO)	1	5	2.94	1.15
20	NACE - C. Manufacturing (N_Man)	0	1	0.17	0.37
21	NACE - F. Construction (N_Con)	0	1	0.14	0.34
22	NACE - G. Wholesale and Retail Trade (N_Who)	0	1	0.33	0.47
23	NACE - M. Professional, Scientific and Technical Activities (N_Pro)	0	1	0.11	0.32

		1	2	3	4	5	6	7	8	9	10	11	12
1	PSI	1											
2	H	−0.01	1										
3	E	−0.08†	0.07	1									
4	X	0.18**	0.01	−0.17**	1								
5	A	0.02	0.31**	−0.16**	0.19**	1							

(*continued*)

Table 2.

		1	2	3	4	5	6	7	8	9	10	11	12
6	C	0.14**	0.14**	0.06	0.09†	−0.07	1						
7	O	−0.02	0.07	−0.03	0.13*	0.09†	0.02	1					
8	Cau	0.36**	−0.08†	−0.01	0.18**	−0.06	0.18**	0.03	1				
9	Exp	0.36**	0.01	−0.02	0.07	−0.03	0.07	0.11*	0.43**	1			
10	Aff	0.08†	0.06	−0.04	0.00	0.12*	0.13*	0.02	0.19**	0.14**	1		
11	Fle	0.22**	0.07	−0.05	0.16**	0.10†	0.10*	0.10*	0.19**	0.18**	0.33**	1	
12	PCI	0.03	−0.20**	−0.12*	0.08†	−0.03	0.05	0.04	0.14**	0.18**	0.10*	0.12*	1
13	PCA	0.28**	−0.12*	−0.02	0.27**	−0.04	0.05	0.17**	0.32**	0.26**	0.13*	0.14**	0.20**
14	Age	0.06	0.27**	−0.04	0.05	0.21**	0.12*	0.11*	0.01	0.11*	0.08†	0.07	−0.03
15	Gen	−0.02	0.24**	0.48**	0.00	−0.01	0.08†	0.01	−0.04	−0.06	0.01	−0.02	−0.15**
16	Edu	−0.15**	0.08†	−0.03	0.07	0.03	0.04	0.17**	0.01	−0.16**	0.13*	0.05	−0.02
17	C_Age	−0.05	0.18**	−0.02	−0.23**	−0.03	0.03	−0.06	−0.04	−0.03	0.00	−0.15**	0.00
18	Size	−0.02	−0.05	−0.03	0.03	−0.04	−0.11*	−0.01	0.07	0.01	−0.04	−0.11*	0.07
19	PSO	0.03	−0.14**	0.03	0.06	−0.01	0.02	0.08†	0.05	−0.01	0.11*	0.12*	0.11*
20	N_Man	−0.03	0.02	−0.05	−0.02	0.01	−0.07	0.10*	0.06	−0.03	−0.01	−0.01	−0.04
21	N_Con	−0.05	−0.03	−0.09†	0.08†	0.03	0.00	−0.05	−0.08†	−0.04	−0.05	−0.07	0.04
22	N_Who	0.10*	0.12*	0.09†	−0.07	−0.01	0.07	−0.13*	−0.02	0.02	−0.09†	−0.12*	−0.01
23	N_Pro	−0.15**	0.05	0.03	0.11*	0.05	0.01	0.17**	0.03	−0.12*	0.16**	0.09†	−0.02

		13	14	15	16	17	18	19	20	21	22	23
13	PCA	1										
14	Age	0.01	1									
15	Gen	−0.01	−0.07	1								
16	Edu	0.00	−0.03	0.13*	1							
17	C_Age	−0.06	0.16**	−0.06	−0.01	1						
18	Size	0.01	0.06	−0.21**	0.01	0.30**	1					
19	PSO	0.07	−0.13*	0.04	0.10*	−0.26**	0.02	1				
20	N_Man	0.02	0.03	−0.08†	0.02	0.10*	0.17**	−0.36**	1			
21	N_Con	−0.01	0.02	−0.15**	−0.16**	0.02	0.10*	−0.03	−0.18**	1		
22	N_Who	−0.05	0.05	0.17**	−0.08†	0.17**	−0.15**	−0.25**	−0.31**	−0.28**	1	
23	N_Pro	0.03	0.00	0.08†	0.30**	−0.19**	−0.10*	0.37**	−0.16**	−0.14**	−0.25**	1

Note(s): $N = 303$. Correlations significant at the 0.10 level (2-tailed) are marked by †, at the 0.05 level by *, and at the 0.01 level by **

Source(s): Authors' own work

Table 3 shows the direct effects of HEXACO and DM logics on PSI. We find that two personality traits have significant, positive associations with PSI: *eXtraversion* ($b = 0.64$, $p = 0.02$), followed by *Conscientiousness* ($b = 0.27$, $p = 0.05$) (see Model 1). The other four traits (i.e. *Honesty-Humility*, *Emotionality*, *Agreeableness*, and *Openness*) are negatively (albeit non-significantly) associated with PSI. Also, all DM logics individually have significant, positive associations with PSI, except for *Affordable Loss* ($b = 0.13$, $p = 0.17$) and *Pre-Commitments Intensity* ($b = -0.06$, $p = 0.57$) (see Models 2 to 7). When we consider all DM logics together, the negative association of *Pre-Commitments Intensity* with PSI becomes stronger and significant ($b = -0.16$, $p = 0.02$), while the positive associations of *Causation* ($b = 0.26$, $p = 0.03$), *Experimentation* ($b = 0.50$, $p = 0.01$), and *Pre-Commitments Advantages* ($b = 0.44$, $p = 0.00$) with PSI remain significant (see Model 8).

To come full circle mediation-wise, we report the associations of HEXACO with all DM logics. Table 4 shows the effects of all six personality traits as independent variables on one DM logic per model. We see that four traits have significant associations with specific DM logics: *Honesty-Humility* has a significant, negative association with *Pre-Commitments Advantages* ($b = -0.29$, $p = 0.05$), *eXtraversion* has a significant, positive association with both *Causation* ($b = 0.53$, $p = 0.02$) and *Pre-Commitments Advantages* ($b = 0.46$, $p = 0.00$), *Conscientiousness* has a significant, positive association with both *Causation* ($b = 0.27$, $p = 0.02$) and *Affordable Loss* ($b = 0.31$, $p = 0.02$), and *Openness* has a significant, positive association with *Pre-Commitments Advantages* ($b = 0.15$, $p = 0.02$). The remaining two traits, *Emotionality* and *Agreeableness*, are not significantly associated with any DM logic.

Next, Table 5 shows the indirect effects of all six personality traits on PSI via all DM logics. We find significant mediation results for three personality traits: *eXtraversion* has a significant indirect effect on PSI through both *Causation* ($b = 0.26$, $p = 0.05$) and *Pre-Commitments Advantages* ($b = 0.29$, $p = 0.02$), *Conscientiousness* has so only through *Causation* ($b = 0.13$, $p = 0.04$), and *Openness* through *Pre-Commitments Advantages* ($b = 0.09$, $p = 0.03$).

Figures 2–4 visualize the mediation results in more detail. The effect of *eXtraversion* on PSI decreases from a significant total effect ($b = 0.63$, $p = 0.02$) to a smaller direct effect ($b = 0.43$, $p = 0.13$) when *Causation* is included as mediator, and also to a smaller direct effect ($b = 0.40$, $p = 0.20$) via *Pre-Commitments Advantages*. The effect of *Conscientiousness* on PSI also decreases from a significant total effect ($b = 0.27$, $p = 0.05$) to a smaller direct effect ($b = 0.20$, $p = 0.18$) with *Causation* as mediator. Finally, although the direct effect of *Openness* on PSI is slightly negative ($b = -0.11$, $p = 0.31$), its effect on *Pre-Commitments Advantages* is positive ($b = 0.15$, $p = 0.02$), and so is the effect of *Pre-Commitments Advantages* on PSI ($b = 0.62$, $p = 0.00$), making the indirect effect positive ($b = 0.09$, $p = 0.03$). Because the direct and indirect effects cancel each other out, the total effect of *Openness* on PSI is very small ($b = -0.02$, $p = 0.81$). This type of result is referred to as "inconsistent mediation", whereby the mediator acts as a suppressor variable (MacKinnon *et al.*, 2007).

5. Theory generation

As the third and final step of the abductive, empirics-first approach, we develop new theory in the form of *ex post* hypotheses based on a dialog between the results of the empirical analysis and the consulted literature. We also discuss the findings by referring to illustrative examples of decision-makers whom we interviewed for prior case-based research, which inspired the design of the current study.

Regarding the first research question (i.e. whether decision-makers' personality traits influence the extent to which their company's strategy includes PSI), we find that two personality traits, namely *eXtraversion* ($p = 0.02$) and *Conscientiousness* ($p = 0.05$), are significantly associated with PSI. This finding extends prior work that already discussed the

Model	1	2	3	4	5	6	7	8
Outcome	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI
Control variables								
Age	0.008	0.008	0.003	0.008	0.006	0.009	0.009	0.001
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.924)
Gen	0.075	0.111	0.144	0.096	0.119	0.095	0.058	0.101
	(0.169)	(0.169)	(0.179)	(0.177)	(0.178)	(0.176)	(0.177)	(0.177)
Edu	−0.165*	−0.158*	−0.048	−0.171*	−0.167*	−0.152*	−0.135†	−0.053
	(0.069)	(0.069)	(0.090)	(0.076)	(0.074)	(0.076)	(0.076)	(0.076)
C_Age	−0.003	−0.002	−0.000	−0.003	−0.001	−0.002	−0.003	−0.001
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
Size	0.001	−0.025	0.001	0.002	0.031	−0.001	−0.005	0.025
	(0.070)	(0.070)	(0.065)	(0.074)	(0.073)	(0.075)	(0.075)	(0.075)
PSO	0.103	0.064	0.079	0.059	0.057	0.075	0.056	0.073
	(0.073)	(0.073)	(0.074)	(0.076)	(0.074)	(0.076)	(0.076)	(0.076)
N_Man	−0.017	−0.168	0.108	−0.108	−0.054	−0.101	−0.124	0.061
	(0.231)	(0.231)	(0.255)	(0.244)	(0.240)	(0.243)	(0.243)	(0.243)
N_Con	−0.305	−0.225	−0.035	−0.341	−0.220	−0.341	−0.358	0.109
	(0.227)	(0.227)	(0.224)	(0.225)	(0.224)	(0.226)	(0.226)	(0.226)
N_Who	0.149	0.143	0.226	0.164	0.247	0.155	0.121	0.320
	(0.182)	(0.182)	(0.198)	(0.188)	(0.187)	(0.179)	(0.179)	(0.179)
N_Pro	−0.626**	−0.627**	−0.321	−0.628**	−0.577*	−0.590*	−0.588*	−0.353
	(0.236)	(0.236)	(0.233)	(0.245)	(0.240)	(0.243)	(0.243)	(0.243)
HEXACO								
H	−0.031	−0.061	−0.098	−0.150	−0.170	−0.253	0.042	0.012
	(0.228)	(0.246)	(0.256)	(0.274)	(0.279)	(0.302)	(0.261)	(0.306)
E	−0.345	−0.329	−0.247	0.343	−0.328	−0.360	−0.407	−0.331
	(0.252)	(0.274)	(0.294)	(0.294)	(0.287)	(0.307)	(0.283)	(0.304)
X	0.636*	0.439	0.514†	0.708*	0.603†	0.719*	0.395	0.045
	(0.278)	(0.295)	(0.292)	(0.331)	(0.334)	(0.340)	(0.308)	(0.309)
A	−0.034	0.042	0.114	−0.053	−0.064	−0.005	0.020	0.171
	(0.138)	(0.159)	(0.173)	(0.203)	(0.194)	(0.204)	(0.181)	(0.182)
C	0.267†	0.202	0.221	0.301†	0.263†	0.367*	0.293†	0.133
	(0.138)	(0.151)	(0.144)	(0.163)	(0.158)	(0.165)	(0.151)	(0.165)
O	−0.023	−0.012	−0.129	−0.001	−0.019	0.009	−0.108	−0.178†
	(0.096)	(0.098)	(0.114)	(0.115)	(0.111)	(0.117)	(0.107)	(0.105)
DM logics								
Cau		0.486**						0.259*
		(0.104)						(0.119)
Exp			0.598*					0.500*
			(0.232)					(0.203)
Aff				0.134				−0.048
				(0.096)				(0.101)
Fle					0.399*			0.299†
					(0.189)			(0.166)
PCI						−0.060		−0.164*
						(0.105)		(0.070)
PCA							0.620**	0.444**
							(0.178)	(0.158)

Table 3.
Effects of HEXACO and DM logics on PSI

Note(s): $N = 289$ (except for Model 1 = 305). Robust standard errors in parentheses. Significance levels <0.10 marked by †, <0.05 by *, and <0.01 by **
Source(s): Authors' own work

Model Outcome	1 Cau	2 Exp	3 Aff	4 Fle	5 PCI	6 PCA
Control variables						
Age	0.002	0.011	0.005	0.008†	0.002	−0.000
	(0.005)	(0.008)	(0.006)	(0.004)	(0.013)	(0.004)
Gen	−0.036	−0.080	0.032	−0.052	−0.224	0.073
	(0.142)	(0.184)	(0.149)	(0.109)	(0.187)	(0.085)
Edu	0.011	−0.176*	0.130†	0.036	0.020	−0.030
	(0.059)	(0.080)	(0.069)	(0.055)	(0.093)	(0.042)
C_Age	−0.000	−0.003	0.005	−0.003	0.002	0.002
	(0.004)	(0.006)	(0.005)	(0.003)	(0.007)	(0.003)
Size	0.040	−0.015	−0.061	−0.100*	0.054	−0.001
	(0.049)	(0.078)	(0.055)	(0.049)	(0.075)	(0.034)
PSO	0.011	−0.014	0.075	0.035	0.100	0.026
	(0.052)	(0.069)	(0.061)	(0.044)	(0.073)	(0.037)
N_Man	0.137	−0.351	0.039	−0.123	0.028	0.041
	(0.186)	(0.238)	(0.189)	(0.140)	(0.222)	(0.116)
N_Con	−0.279†	−0.545*	−0.133	−0.357*	0.227	0.002
	(0.154)	(0.248)	(0.182)	(0.141)	(0.195)	(0.107)
N_Who	−0.010	−0.151	−0.202	−0.287*	0.223	0.024
	(0.133)	(0.194)	(0.161)	(0.117)	(0.206)	(0.087)
N_Pro	0.072	−0.459*	0.248	−0.045	0.013	−0.006
	(0.164)	(0.228)	(0.182)	(0.152)	(0.288)	(0.119)
Direct effects						
H	−0.218	−0.111	−0.203	0.027	−0.570†	−0.291*
	(0.205)	(0.266)	(0.245)	(0.180)	(0.309)	(0.145)
E	−0.017	−0.171	−0.090	−0.088	−0.086	0.038
	(0.224)	(0.350)	(0.266)	(0.183)	(0.368)	(0.143)
X	0.527*	0.380	−0.023	0.272	0.140	0.463**
	(0.233)	(0.302)	(0.229)	(0.178)	(0.254)	(0.176)
A	−0.113	−0.252	0.261	0.070	0.081	−0.077
	(0.143)	(0.198)	(0.170)	(0.118)	(0.146)	(0.080)
C	0.268*	0.175	0.306*	0.172†	0.227	0.072
	(0.118)	(0.165)	(0.129)	(0.098)	(0.177)	(0.078)
O	0.023	0.198†	−0.043	0.025	0.153	0.148*
	(0.081)	(0.106)	(0.088)	(0.068)	(0.109)	(0.063)

Note(s): $N = 289$. Robust standard errors in parentheses. Significance levels <0.10 marked by †, <0.05 by *, and <0.01 by **

Source(s): Authors' own work

Table 4. Effects of HEXACO on DM logics

effect of extraversion and conscientiousness on entrepreneurial outcomes (Frese and Gielnik, 2014) as well as their effect on service personnel showing more customer-oriented behavior (Lanjananda and Patterson, 2009). Moreover, the effect size of *eXtraversion* ($b = 0.64$) is substantially larger than that of *Conscientiousness* ($b = 0.27$), which means that extravert decision-makers are even more likely to strategize for PSI than conscientious decision-makers. This finding shows that personality relates to PSI somewhat differently for decision-makers than for service employees, who are considered successful in selling hybrid offerings when being introvert as opposed to extravert (Ulaga and Loveland, 2014). We observed this, for instance, when we interviewed a highly social decision-maker who continuously developed new services based on the company's portfolio of digital security products (Coreynen *et al.*, 2018). Another example pertains a couple of highly organized (and also social) entrepreneurs targeting the local podiatrist market by gradually expanding their service offering from producing insoles to also supporting podiatrists' broader needs

	H	E	X	A	C	O
Cau	−0.106	−0.008	0.256*	−0.055	0.130*	0.011
	(0.105)	(0.109)	(0.131)	(0.069)	(0.064)	(0.040)
Exp	−0.066	−0.102	0.227	−0.151	0.105	0.119
	(0.158)	(0.201)	(0.178)	(0.124)	(0.102)	(0.079)
Aff	−0.027	−0.012	−0.003	0.035	0.041	−0.006
	(0.038)	(0.037)	(0.031)	(0.034)	(0.034)	(0.013)
Fle	0.011	−0.035	0.108	0.028	0.069	0.010
	(0.071)	(0.027)	(0.021)	(0.013)	(0.031)	(0.020)
PCI	0.034	0.005	−0.008	−0.005	−0.014	−0.009
	(0.071)	(0.027)	(0.021)	(0.013)	(0.031)	(0.020)
PCA	−0.180	0.023	0.287*	−0.048	0.045	0.092*
	(0.097)	(0.088)	(0.118)	(0.050)	(0.050)	(0.043)

Table 5.
Indirect effects of HEXACO through DM logics on PSI

Note(s): $N = 289$. Standardized coefficients. Robust errors in parentheses. Significance levels <0.10 marked by †, <0.05 by *, and <0.01 by **
Source(s): Authors' own work

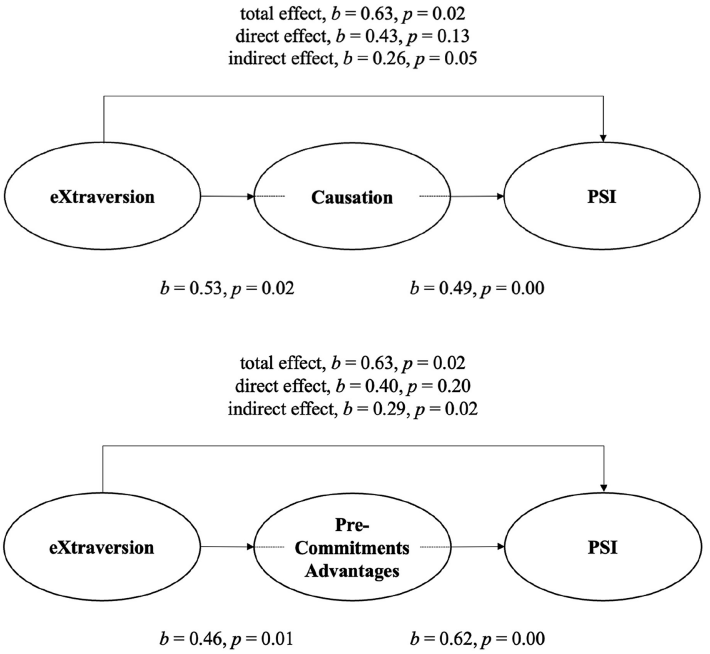
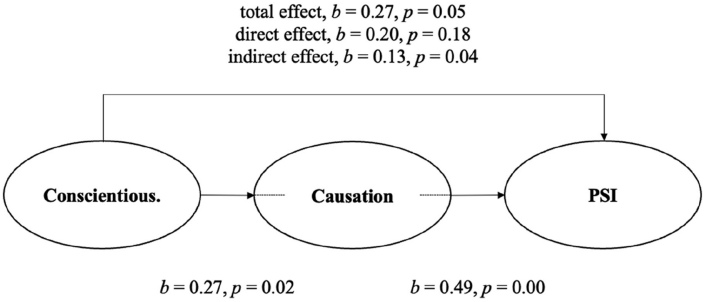


Figure 2.
Mediation results for extraversion

Source(s): Authors' own work

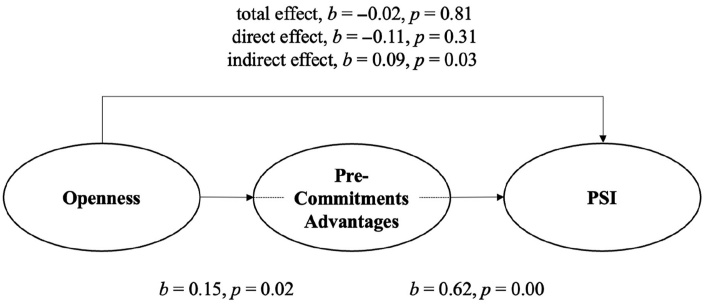
(Coreynen *et al.*, 2017, 2018). In summary, when key decision-makers are either expressive and social (i.e. extravert) or organized and diligent (i.e. conscientious), they are more likely to include PSI in their company's strategy. Based on these findings, we propose the following two-fold hypothesis:

H1a. Extraversion makes decision-makers more likely to include PSI in their company's strategy.



Source(s): Authors' own work

Figure 3.
Mediation results for conscientiousness



Source(s): Authors' own work

Figure 4.
Mediation results for openness

H1b. Conscientiousness makes decision-makers more likely to include PSI in their company's strategy.

These initial findings serve as a step-up for answering the second research question (i.e. whether the identified associations operate via specific decision-making logics). Based on the empirical analysis, we conclude that personality traits make decision-makers use different DM logics for the purpose of PSI. Here, the following results are critical. First, the empirical analysis confirms prior qualitative work (Cui *et al.*, 2019) reporting that PSI is indeed associated with both *Causation* ($b = 0.48$, $p = 0.00$) and effectuation DM logics, for instance, through *Experimentation* ($b = 0.60$, $p = 0.01$) and *Pre-Commitments Advantages* ($b = 0.62$, $p = 0.00$), revealing stronger effect sizes for the latter. This means that decision-makers who apply causation or effectuation are more likely to include PSI in their company's strategy. In contrast, those who do not (or who fail to apply any DM logic at all) are not likely to do so. This was also exhibited in the above-mentioned examples, where the decision-maker at the security company continuously experimented with creating new services, such as temporary security solutions for yearly events (e.g. music festivals), whereas the decision-makers of the insole company had a clear plan for the coming the years, including the construction of a new production facility for insoles and the development of an online platform for podiatrists to design and order insoles themselves.

Second, we find mediation between *eXtraversion* and PSI through both *Causation* ($b = 0.26$, $p = 0.05$) and effectuation DM logics (see Figure 2) and also between *Conscientiousness* and PSI through only *Causation* ($b = 0.13$, $p = 0.04$) (see Figure 3). This implies that, on the one hand, conscientious decision-makers prefer to strategize for PSI by

anchoring their decisions on specific goals and on what they expect to get in return (i.e. causation), as exhibited by the decision-makers at the insole company gradually expanding their reach into the local podiatrist market. On the other hand, extravert decision-makers are likely to apply both causation and effectuation DM logics to do so. Specifically, regarding effectuation, we see an indirect effect of *eXtraversion* on PSI via *Pre-Commitments Advantages* ($b = 0.29$, $p = 0.02$), meaning that extravert decision-makers are likely to pursue PSI by collaborating with others (e.g. suppliers and customers), as exhibited by the decision-maker of security company working together with a wide range of external IT providers to offer customers total security solutions. This finding thus complements prior work that also highlights the importance of networking and alignment with other companies (Kohtamäki *et al.*, 2013, 2019b). Following these findings, we propose a second two-fold hypothesis:

H2a. Extraversion makes decision-makers more likely to apply causation and effectuation to include PSI in their company's strategy.

H2b. Conscientiousness makes decision-makers more likely to apply causation to include PSI in their company's strategy.

Third, we find inconsistent mediation between *Openness* and PSI through *Pre-Commitments Advantages* (see Figure 4). The results show that decision-makers who are open to experience are not particularly more (or less) likely to develop a PSI strategy, yet they are more likely to leverage pre-commitments with other companies. This consequently leads them to being more likely to include PSI in their company's strategy. This is also observed by Kastalli and Van Looy (2013), who showed that some companies may start to servitize unintentionally and only develop a full PSI strategy later once a certain number of services have been sold. Therefore, as a third and final hypothesis, we propose:

H3. Openness makes decision-makers more likely to use advantages stemming from pre-commitments to include PSI in their company's strategy.

Finally, as a bycatch, we find that different personality traits are associated with distinct DM logics, which is in line with recent work (Hensel and Visser, 2020). Overall, *Honesty-Humility* and *Openness* only relate to specific effectuation subdimensions (e.g. *Pre-Commitments Advantages*), while *eXtraversion* and *Conscientiousness* are associated with both *Causation* and effectuation DM logics (e.g. *Affordable Loss*), and *Emotionality* and *Agreeableness* are not related with any DM logic at all (see Table 4 for the full results of the effect sizes). This means, for instance, that honest-humble decision-makers are less likely to leverage pre-commitments with other companies, whereas those who are open to experience are more likely to leverage them.

6. Conclusions

6.1 Theoretical contributions

This study contributes to the service literature, specifically on servitization and service business model innovation, by investigating the microfoundations of PSI through both a psychological and DM lens, as previously called for (Valtakoski, 2017; Rabetino *et al.*, 2018). Complementing earlier work that examined the motivational drivers of PSI (Coreynen *et al.*, 2020b), this study considers what personality traits make decision-makers more likely to include PSI in their company's strategy, and which DM mechanisms they are more likely to use to develop such an innovation strategy. Specifically, we offer two theoretical contributions.

First, this study applies insights from personality psychology to examine the relationship between personality traits of decision-makers and their companies' PSI strategy, thereby

adding to prior work that has used a personality perspective on service personnel and customers (e.g. Ulaga and Loveland, 2014; Vermehren *et al.*, 2022). Specifically, we find that extravert and conscientious decision-makers are more likely to include PSI in their company's strategy. Combining these insights with effectuation theory, we unveil several configurations of personality traits and DM logics fitting with PSI. Overall, we find evidence that decision-makers, depending on their personality, apply different DM logics to strategize for PSI. Based on this evidence, we offer several hypotheses as input for further research. As far as we know, this is one of the first configurational studies on PSI that takes a company-inward perspective, considering key decision-makers' personalities.

Second, this study also contributes to effectuation theory by examining DM logics' antecedents through a personality trait lens. We find additional evidence that personality traits, besides other basic individual characteristics (Yang *et al.*, 2020), influence decision-makers' preference for DM logics. Overall, returning to the roots of effectuation theory, this study supports Sarasvathy's (2001, p. 245) claim that "*both causation and effectuation are integral parts of human reasoning that can occur simultaneously, overlapping and intertwining over different contexts of decisions.*" Our findings show that this is particularly the case in the context of decision-makers strategizing for PSI.

6.2 Managerial implications

This study has implications for companies' recruitment and promotion policies (Kohtamäki *et al.*, 2015; Hu and Lin, 2021). When people can express their own personality in their work, they find it intrinsically rewarding and, therefore, perform better. Based on our findings, we suggest that when managers need to be appointed for new PSI jobs, companies may consider people who are conscientious, extravert, and open to new experiences. However, a too narrow focus on personality traits, whereby job candidates are considered solely based on their personality, should be avoided (Ones and Viswesvaran, 1996). For instance, the recent documentary "Persona: The Dark Truth Behind Personality Tests" (2021) showed that personality tests are often used early in the hiring process to filter out (i.e. discriminate against) applicants. Therefore, companies should consider personality traits with the utmost care in recruitment. For instance, personality tests can be used in combination with other tools, such as interviews, exercises, and seeking references, to also gain insights in people's motives, experience, and skills, among others.

This study also has implications for business schools, which should help raise awareness that companies' innovation strategies are determined not only by factors present at the level of the firm (e.g. the resource-based view) and environment in which they are active (e.g. Porter's five forces), but that they are also formed by factors rooted at the level of the individual. Our results show that personality traits and DM logics are two important pieces of the puzzle. Specifically, we find that key decision-makers, depending on their personality, may be more likely to include PSI in their strategy, and that they apply different DM logics to do so. Hence, in terms of decision-making, there is not one single pathway to service business model innovation; rather, there are multiple pathways, and decision-makers may take a different DM logic path depending on their personality. Business schools can educate students and executives (e.g. via strategic management and innovation programs) about decision-makers injecting their own personality into companies' strategic decisions and how they are made. Moreover, they can help them gain insights into their inner selves (e.g. using personality tests) to help them better understand who they are and how they make decisions.

6.3 Limitations and future research

At least three of our study's limitations point to promising avenues for future research. First, the single-item PSI measure that is used as the study's main dependent variable relates only

to whether decision-makers include PSI in their company's strategy, hence not considering specific service choices. In practice, there are many types of integrated solutions for customers, such as product-oriented services (focused on the continuous functioning of the product) and customer-oriented services (focused on supporting the customer's activities), addressing different customer needs (Visnjic *et al.*, 2016; Brax and Visintin, 2017). This empirical study serves as a step-up for future microfoundations research that could take this diversity into account by expanding the set of dependent variables, including different PSI types.

Second, our PSI measure also only relates to whether decision-makers have included PSI in their company's strategy, disclosing their strategic intensions, hence not uncovering how much they have actually implemented PSI in practice, and if so, for how long they have been following this strategy. Future studies should consider these (i.e. time and degree of implementation) to get more insights into whether decision-makers use the same DM logics over time (i.e. depending on the stage of servitization), and what role personality traits play in predicting PSI success. Such studies may find that evolving configurations of teams of decision-makers (with different personalities) and DM logics are necessary to create long-term PSI success.

Third, for the empirical analysis, we used AiE data that cover key decision-makers at the helm of SMEs and entrepreneurial enterprises in the Flemish region of Belgium. Although our sample covers a wide variety of sectors with both product- and service-oriented companies, we cannot generalize the results to larger companies nor to companies from other (e.g. non-Western) regions. Furthermore, the companies that participate in the AiE consulting track either apply voluntarily or they are contacted proactively by UNIZO, so there may be self-selection factors that distinguish them from the overall business population that we should keep in mind when interpreting the results.

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Appendix

The supplementary material for this article can be found online.

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