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RESEARCH ARTICLE

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From Value Sensitive Design to values absorption – building an instrument to analyze organizational capabilities for value-sensitive innovation

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ABSTRACT

Previous Responsible Innovation (RI) research has provided valuable insights on the value conflicts inherent to societally desirable innovation. By observing the responses of firms to these conflicts, Value-sensitive Absorptive Capacity (VAC) captures the organizational capabilities to become sensitive to these value conflicts and thus, innovate more responsibly. In this article, we construct a survey instrument to assess VAC, based on previous work by CSR and RI scholars. The construct and concurrent validity of the instrument were tested in an empirical study, including 109 employees of 30 food manufacturing firms. The results from the survey were then compared with the conceptual VAC dimensions. With this comparison, we do not only contribute to the substantiation of the VAC construct, but we also show how inductive and deductive approaches can be combined to build theory regarding RI in a transdisciplinary manner.

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Responsible innovation; corporate social responsibility; food industry; values & norms; organizational capabilities

The need for innovation to tackle grand societal challenges – such as climate change, the obesity epidemic, and the recent COVID-19 crisis – has been stressed by many scholars (e.g. Ferraro, Etzion, and Gehman 2015; Stilgoe, Owen, and Macnaghten 2013). The main problem with tackling these grand challenges is their evaluative nature. As Ferraro, Etzion, and Gehman (2015) describe; '[as] actors come to grips with grand challenges, they realize there is no one 'correct' label, or categorization that easily defines them […]. Different actors have different views about what the problem actually 'is' and therefore what constitutes an acceptable solution'. Take, for example, the obesity crisis where there is a plethora of opinions on what the best diet is, how much of the problem is caused by lack of exercise, and whether the current retail environment, the marketing strategies of food brands or the disbalance in agricultural subsidies should be targeted first (Roberto et al. 2015). This evaluative nature of grand challenges is,

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however, not included in traditional innovation theories. There are many innovation models describing how firms can handle the uncertainty and complexity of innovation, but they all assume that the problem that innovation targets is clear (Bessant 2013; Pisano 2015; Tidd 2001). However, how can a firm innovate if there is no consensus on the problem? Which capabilities does a firm require to make sense of this plurality of views?

With their introduction of the concept of Responsible Innovation (RI), Stilgoe, Owen, and Macnaghten (2013) initiated the discourse on how innovation as a process can lead to societally desirable and ethically acceptable outcomes (see also Von Schomberg 2013). A framework that supports this goal is Value Sensitive Design (VSD, Van den Hoven 2013). By analyzing the societal values underlying design decisions, this framework provides a structured manner to disentangle different views on a problem and its solution (Nissenbaum 2005; Van den Hoven 2013). Responding to the dynamic nature and evaluative nature of grand challenges, scholars have investigated how VSD can respond to conflicting values and changes in values (Dignum et al. 2015; van de Kaa et al. 2020; van de Poel 2015; Van de Poel 2018).

The limitation of this field, however, is the disconnect with the literature in business administration on commercial innovation management and Corporate Social Responsibility (CSR; Hemphill 2016; Valdivia and Guston 2015).[1] A possible cause for this disconnect might be that the RI discourse originally was mostly driven by a policy push and not a response to a market pull (Timmermans 2017). Since then several authors in the RI discourse have shown that the business literature has expressed a need for a new conceptualization of innovation (Brand and Blok 2019; Garst et al. 2017; Iatridis and Schroeder 2016; Lubberink et al. 2017; van de Poel et al. 2017). In this conceptualization, commercial innovation requires to be positioned as more than just a way to gain a competitive advantage and should see firms as catalyzers and diffusers of innovation for tackling grand challenges (Gutierrez-Gutierrez, Castillo, and Montiel 2020; Pinkse and Kolk 2010; Voegtlin and Scherer 2017). At the same time, this conceptualization needs to take into account the limitations of corporate responsibility as created by market dynamics (Blok and Lemmens 2015). Although these calls have been answered, VSD scholars recently observed that these answers led to the development of tools for RI in industry which are disconnected from business practices (Friedman et al. 2021). They thus emphasized the necessity to build upon existing frames of commercial innovation.

While some papers have conceptually explored the connections between RI and theories on commercial innovation management and CSR (Hemphill 2016; Stahl et al. 2017; Umbrello 2021; Umbrello and Gambelin 2021; Valdivia and Guston 2015), one element that is prominent in the business administration literature but missing from the RI literature is the notion of organizational capabilities. Commercial innovation is often not conducted by an isolated team of engineers but involves the entire organization (Pisano 2015). To be innovative, an organization needs to develop organizational capabilities for stimulating and managing innovation (Bessant 2013; Grant 1996; Teece 2009). While the original four dimensions of the framework by Owen, Stilgoe, and colleagues (Owen et al. 2013; Stilgoe, Owen, and Macnaghten 2013) indicate capabilities for innovation, Garst et al. (2019) conceptualized what organizational capabilities are currently used in commercial innovation to tackle grand challenges. Using the concept of 'values' as a bridge between RI and business administration literature (van de Poel et al. 2020), they developed the Value-sensitive Absorptive Capacity (VAC) framework with three organizational capabilities, building upon a study of multiple cases in the food

industry. This framework connected knowledge absorption – described by innovation management scholars (Zahra and George 2002) – with organizational values in business – defined by CSR scholars (Gehman, Treviño, and Garud 2013; Swanson 1999) – and integration of values in design – described by VSD scholars (Friedman, Kahn, and Borning 2002, 2013; Nissenbaum 2005; Van de Poel 2013; Van den Hoven 2013).

Although being inspired by previous work on RI and VSD, the VAC framework was created inductively and thus the integration in this literature is limited. Furthermore, a conceptual framework is only a first step in identifying the organizational capabilities of firms (Johnson et al. 2012). Translating this conceptual framework into an instrument that can be applied to multiple settings is valuable, both for researchers investigating RI in industry and for firms for self-assessment of their capabilities. By building this instrument on empirical data, its development will also support the further substantiation of the organizational capabilities, indicated by Garst et al. (2019) as required for RI in industry.

The contribution of this article is thus threefold. First, we strengthen the connection between the RI, CSR, and innovation management literature by showing their overlap and complementarities when discussing capabilities for innovation and value-sensitive practices (see Literature review). Second, we used insights from these three fields and the work of Garst et al. to develop our VAC survey instrument (see Method and Results section). The framing of our items is based on the highly accredited instrument by Jansen, Van Den Bosch, and Volberda (2005) to measure knowledge absorption capabilities. We initiate the validation of the instrument using statistical techniques, traditionally used in psychology and organizational science (Cronbach and Meehl 1955; El Akremi et al. 2018; Tracey and Tews 2005), and previously validated instruments (Paulraj, Chen, and Blome 2017). Third, we compare the inductively developed VAC framework of Garst et al. (2019) with our survey instrument (see Discussion and Conclusion sections). The differences found between the three capabilities of the VAC framework and the four variables of our survey provide not only a direction for further research on organizational capabilities of RI, but they also show how inductive and deductive approaches can be combined to build theory regarding RI in a transdisciplinary manner, as called for by Wickson and Carew (2014).

Literature review

As socially responsible behavior goes beyond the legal responsibilities of a firm (Carroll 1979), the firm cannot only rely on the legislative rules of society to determine what is socially responsible. Instead, the firm needs to navigate the normative rules and absorb societal values to find 'the right thing to do' (Geels 2004). In identifying the capabilities for this navigation and absorption, scholars in the separate fields of RI and CSR show overlap and complementarity in their thinking. In the following section, we first outline why societal values are important but difficult to absorb. Then we review the capabilities identified in the different fields to do so and how they are combined in the VAC framework (Garst et al. 2019).

Societal values and technological knowledge

Societal values represent what is seen as 'good for people and planet' and if an innovation needs to contribute to societal grand challenges, a responsible innovator would consider

these values (Voegtlin and Scherer 2017). Building on the definition of 'human values' by Schwartz and Bilsky (1987) and 'moral values' by Van de Poel and Royakkers (2011), we use the adjective 'societal' is used to indicate that the concepts or beliefs are present in society and that compliance to these values provides firms with moral legitimacy (Suchman 1995; Wartick and Cochran 1985). Societal values are thus the guidelines or criteria that constitute 'good' behavior in our society.[2]

While societal values are seen as an important input for socially responsible solutions for societal challenges, the business management literature seems to be oblivious to their relevance for commercial innovation. Over the last decennia, many studies have explored and operationalized technological knowledge from other firms and research institutes as the main input to innovation (Volberda, Foss, and Lyles 2010). This technological knowledge might provide a firm with options for innovation but does not tell a firm which of these options is the best solution for society (Nissenbaum 2005; Van den Hoven 2013). Scholars in CSR and RI have shown that decision-making in firms – including commercial innovation practices – is not based upon technical knowledge but on the normative evaluations of this knowledge (Nissenbaum 2005; Swanson 1999). Without paying attention to the societal values underlying new knowledge, firms will remain ignorant to the normative evaluations behind their innovative designs (Nissenbaum 2005). This ignorance of values can be especially detrimental in the case of grand challenges, as finding solutions for the complex and evaluative challenges requires an understanding of societal desirability and thus societal values (Ferraro, Etzion, and Gehman 2015). For example, developing a new low-caloric high-intensity sweetener can provide a technological solution for sugar replacement and lowering the energy-content of products but at the same time might ignore the societal calls for less sweetened products and making the ingredient declaration understandable for consumers. In bringing innovative solutions for grand challenges, scholars indicate that firms should thus not only focus on technical knowledge but also try to understand and challenge the normative assumptions underlying current products and systems (Swanson 1999; Voegtlin and Scherer 2017).

Capabilities for absorbing societal values

However, understanding these societal values and challenging their current translations and prioritizations is not easy. First, the translation of values can surface disagreements between stakeholders on how societal values should be specified, i.e. intra-value conflicts (Dignum et al. 2015). In these conflicts, some stakeholders might strongly oppose a specific design requirement, also referred to as placing a value dam (Davis and Nathan 2015; van de Poel 2015). A firm needs to have the capabilities to identify and respond to such conflicts between stakeholders. Second, inter-value conflicts are observed when two or more societal values are incompatible in one solution (Dignum et al. 2015; Van de Poel 2009). CSR scholars have observed that these inter-value conflicts shape preconceptions about values at an organizational level – e.g. food products cannot be tasty and healthy at the same time. If continuously reinforced, such preconceptions could lead to normative myopia within the firm and even an industry (Swanson 1999).

Both the CSR and RI literature provide insights on capabilities that could support a firm becoming sensitive to societal values and in handling value conflicts. Although for several of these capabilities empirical evidence exists, these studies have often

focused on one capability and do not position these capabilities as complementary. In the field of CSR and CS, the majority of values-related studies have focused on internal 'values-work' and organizational values, discussing the institutionalization of a societal value within an organization (Athanasopoulou and Selsky 2015; Gehman, Treviño, and Garud 2013; Hahn et al. 2014). Although indicated as crucial, the capabilities needed to engage about societal values with external stakeholders is only limitedly investigated in these fields (Hawn and Ioannou 2016; Purtik and Arenas 2017; Watson et al. 2017). For RI scholars, this external interaction is the key focal point, both in the highly cited framework of Stilgoe, Owen, and Macnaghten (2013) as well as in the studies on Value Sensitive Design (VSD) (Van den Hoven 2013). Although these scholars acknowledge that responsible innovation requires also internally focused processes by the innovator, such as normative reflection, the majority of the empirical work in this field focuses on external stakeholder engagement (for an exception, see Flipse 2012).

This lack of multi-capability frameworks and the disconnect between the CSR and RI literature on capabilities were previously identified by Garst et al. (2019). To fill this gap, they inductively derived a new capability-based concept, called Value-sensitive Absorptive Capacity (VAC). Being inspired by the multi-capability framework of Absorptive Capacity (AC) (Zahra and George 2002), the VAC framework of Garst et al. (2019) outlines the sensitivity of a firm towards a societal value in three dimensions. An overview of three dimensions can be found in Figure 1.

The first VAC dimension is Value Receptivity, defined as the firm's capability to understand a societal value. As indicated in the RI literature, an innovator – in our context, the firm – needs to first discover the values that are relevant for its innovation processes and outcomes and anticipate changes in these values over time. The second dimension is Value Articulation, which is defined as the firm's capability to communicate a societal value within its organization. The first practice in this dimension is the

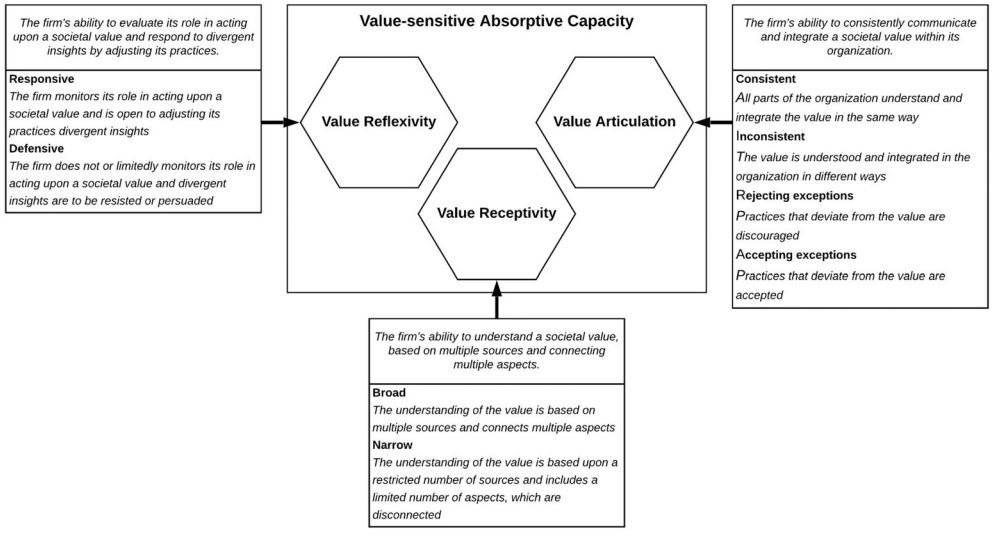

Figure 1. Overview of the Value-sensitive Absorptive Capacity (VAC) framework based on Garst et al. (2019).

specification of the societal value to design requirements for the firm's processes and products. The second practice of Value Articulation is the implementation of these design requirements, which varies in two ways between firms: (a) the consistency of communication on the value definition among different business practices; (b) balancing exceptions-to-the-rule related to the definition of the value. The third and last dimension of VAC is Value Reflexivity, defined as the firm's capability to evaluate its role in acting upon a societal value and respond to divergent insights by adjusting its practices. In this dimension a distinction can be made between responsive and defensive firms, in which responsiveness relates to (a) internal reflexivity on the role of the firm in acting upon a societal value; (b) the engagement with external stakeholders regarding societal values, and (c) adjustments to divergent views of these stakeholders.

On the other hand, the inductive approach of Garst et al. (2019) is only the first step in building a theory around a multidimensional construct like VAC. The next step in successful theory-building is defining clear and concise constructs and valid methods for measuring them (Johnson et al. 2012). In the study of Garst et al. (2019), the three dimensions of VAC are defined, but their boundaries require further refining to observe and measure the construct in other contexts. As indicated by Johnson et al. (2012, 64) 'The process of clarifying a multidimensional construct involves not only defining the construct but also specifying clear guidelines for identifying the appropriate indicators of the higher-order construct'.

Additionally, while being inspired by insights from CSR and RI literature, due to the inductive approach the VAC dimensions of Garst et al. (2019) are only limitedly connected to the existing literature on organizational capabilities. In our review of this literature, we observe several previously identified capabilities and business practices that could complement the VAC dimensions. Related to the identification of societal values, CSR scholars have previously identified practices for monitoring the external environment - such as environmental scanning and cue sensing – that support firms in acting upon societal issues (Ortiz-de-Mandojana and Bansal 2016; Wood 2010). RI scholars indicate that this monitoring should not only be passive but needs to entail proactive and inclusive deliberation with stakeholders (Stilgoe, Owen, and Macnaghten 2013). Furthermore, RI scholars have indicated that these external practices should be combined with an internal philosophical exploration of the new insights (Nissenbaum 2005). Such exploration might prevent means-end decoupling, as it allows the firm to evaluate the different definitions of a value in society (Crilly, Zollo, and Hansen 2012).

Previous studies of internal 'value work' show that consistent articulation of a value promotes the structural embeddedness of that value (Gehman, Treviño, and Garud 2013). Such consistency can support the firm in preventing intra-value conflicts that arise within its organization. For acting upon inter-value conflicts, balancing exceptions is essential. Although exceptions to the rule can lead to policy-practice decoupling (Crilly, Zollo, and Hansen 2012), they are sometimes required for the simultaneous pursuit of contradictory values and promoting continuous innovation (Flanagan, Howe, and Nissenbaum 2008; Hahn et al. 2016). As observed in the case study, firms that clearly labeled exceptions and only accepted them conditionally were able to maintain consistent articulation.

Finally, both RI and CSR scholars have investigated the capabilities of innovators and firms, in general, to reflect on their motives, assumptions, and behavior. In the RI

literature, the institutional and second-order reflexivity of innovators has been investigated (Schuurbiers 2010; Stilgoe, Owen, and Macnaghten 2013), and interventions have been conducted to study how this reflexivity can be stimulated in R&D departments (Fisher, Mahajan, and Mitcham 2006). In the business administration literature, the monitoring of externally determined standards has been indicated as a method to indirectly engage with stakeholders (Bessant 2013). However, CSR scholars have also stressed that over-reliance on such institutionalized knowledge can hamper a firm's active search for feedback from stakeholders (Zietsma et al. 2002). In asking for feedback from stakeholders, RI scholars stress the importance of deliberation practices that include also non-commercial stakeholders (Dignum et al. 2015; Stilgoe, Owen, and Macnaghten 2013), thereby going beyond the traditional and instrumental input-output model of the firm towards a stakeholder model of the firm with a clear normative approach (Donaldson and Preston 1995). Once the feedback is received, the firm requires to evaluate and adjust its practices, described previously as ongoing reconfigurations of values practices (Gehman, Treviño, and Garud 2013) and organizational adaptability through continuous innovation (Ortiz-de-Mandojana and Bansal 2016).

In the following section, we describe how we combine these previous insights on capabilities from CRS and RI scholars into survey items and how we test the validity of this multi-dimensional instrument.

Method[3]

The development of the VAC instrument consisted of four steps: (1) sampling a set of firms and collecting their data; (2) developing the survey instrument items for the three capabilities of VAC; (3) assessing the construct validity of the survey instrument; (4) assessing the concurrent validity of the model.

Sample and data collection

As indicated by previous work on societal values, the translation of societal values to design requirements for innovation is context-dependent (Nissenbaum 2005). To explore the VAC of firms, the survey instrument was thus specified for one specific societal value in one specific industry: health and the food manufacturing industry. Over the last three decades, the increase in the prevalence of non-communicable diseases (NCD) has increased the pressure on food firms to reformulate their products and innovate their product portfolio to support NCD prevention (Hawkes, Jewell, and Allen 2013). This context is thereby representative of how firms are requested to more extensively absorb a societal value (i.e. health) in particular business practices (i.e. product innovation) to respond to a grand challenge (i.e. NCD crisis).

The sample of this study was obtained by contacting 169 members of the Dutch trade organization of food manufacturing firms. These firms were contacted by email and phone, in the spring of 2018. The contact persons were asked to fill out one survey with general firm characteristics and have at least two employees responsible for product development fill in the employee survey. All data were collected through online questionnaires from May to August 2018; 109 employees, especially from R&D and Marketing & Sales, of 30 food manufacturing firms completed the questionnaires

(a 17.8% response rate at the firm level, for the sample, see Table 1). All collected data were analyzed using the SPSS software (IBM Corp. 2015) with the AMOS extension (Arbuckle 2014).

VAC item development and reduction

The survey instrument for the VAC dimensions was developed in two steps (results can be seen in Table A1 in Appendix). First, the survey items for each VAC dimension were designed, drawing upon existing instruments for measuring capabilities (e.g. Jansen, Van Den Bosch, and Volberda 2005) and the literature described in the previous section. Second, the survey items were adjusted to the context, using the interviews with managers in the food industry and publicly available corporate reports. For example, a differentiation was made between industry partners and non-commercial stakeholders. All items were scored by the respondents on a 5-point scale from 'Never' to 'Always'.

After cleaning up the survey results, six survey items were excluded from further analysis. Since more than 18% of the respondents answered these items with 'Not applicable', these six items were perceived as less suitable for this context. For the other 29 items, Exploratory Factor Analysis (EFA) was used to identify the dimensions for VAC. Factor analysis is a statistical technique that identifies clusters of items, which scores correlate highly with each other. Each cluster is called a factor and can be perceived as a latent variable, measuring a construct that cannot be measured directly. Our EFA resulted in four factors and through a rotation technique, each item was sorted to the factor for which they had the highest loading (i.e. the cluster with the highest correlation).[4] Four items were shown to correlate lower than 0.4 for each factor, showing that they did not contribute to the latent variables and were thus removed. In the end, the instrument contains 25 items divided over 4 factors.

As our latent variables are presumed to be organizational-level variables, we expect that the respondents of the same firm provide a similar score for a variable. We tested this by calculating the interrater agreement (IRA) for each of the factors, comparing the observed variance to the variance expected when respondents respond randomly (LeBreton and Senter 2008).[5]

Construct validity assessments

As VAC is a new construct, the validity of the instrument cannot be assessed by comparing it to an existing standard. Instead, the instrument needs to be compared to related but

Table 1. Characteristics of the sampled firms ($n = 30$) and the respondents ($n = 109$).

Firm size		No. of respondents		Geographical market	
0–50 employees	7	2 respondents	9	Netherlands	3
51–100 employees	5	3 respondents	6	Europe	14
101–200 employees	4	4 respondents	10	Global	13
201–500 employees	8	≥5 respondents	5		
>500 employees	6				
Department		No. persons supervised		Years in industry	
R&D	32	0 persons	42	<5 years	19
Marketing & Sales	47	1–5 persons	30	5–10 years	20
Other	30	6–10 persons	16	10–20 years	36
		>10 persons	21	>20 years	34

different constructs, referred to as construct validity (Cronbach and Meehl 1955). The construct validity was assessed in three ways. First, the reliability of the VAC instrument (i.e. whether the instrument consistently reflects the constructs that it is measuring (Field 2013)) was tested using the most common measure for scale reliability: Cronbach's alpha (Cronbach 1951). Each of the factors should show an alpha of at least 0.7 to be considered reliable (Field 2013).

Second, the convergent validity was determined by comparing the VAC variables to a related construct (construct *x*) for which already instruments have been developed (El Akremi et al. 2018; Tracey and Tews 2005). The correlations between the VAC variables and construct *x* should be significant using Cohen's (1988) standards. In our study, an adjusted version of the corporate motives for socially responsible behavior instrument by Paulraj, Chen, and Blome (2017) was selected to obtain the variables representing construct *x*. The results of this instrument in our sample resulted in two variables: a moral motive variable (MorMot) and an instrumental motive variable (InstrMot).[6] When a firm is driven by moral motives, its actions are determined by its perceived 'ethical duty to make a positive contribution to the environment and society and create a better world for the future' (Paulraj, Chen, and Blome 2017, 244). Therefore, the moral motive variable is expected to have a significant positive correlation with the VAC variables, as a firm driven by moral motives would be assumed to have heightened attention to the values in society. Additionally, with their focus on the self-interest of the firm, the instrumental motives are found to be limited in their ability to stimulate socially responsible practices (Garst et al. 2017; Paulraj, Chen, and Blome 2017). A weak correlation between the instrumental motive variable and the VAC variables should thus support the convergent validity. These expectations lead us to the following hypotheses:

Hypothesis 1a: The VAC variables show a strong and positive relation with the moral motive variable.

Hypothesis 1b: The VAC variables show a weak relation with the instrumental motive variable.

Third, the discriminant validity was determined by analyzing whether the VAC survey items and the survey items of the construct *x* do not load on each other's factors (El Akremi et al. 2018; Tracey and Tews 2005). To assess the discriminant validity, an EFA is combined with a Confirmatory Factor Analysis (CFA). In the EFA, the VAC items and construct *x* items are combined, and the analysis should result in separate factors for the VAC variables and construct *x*. The CFA also analyses the separation of the factors, but in this analysis, the expected factors are predefined as a model. The fit of the multiple-factor model to the data is compared to a single-factor model, assessing multiple model-fit indicators: Tucker-Lewis index (TLI, >0.9); comparative fit index (CFI, >0.9); the root mean square error of approximation (RMSEA, <0.08) (Marsh et al. 2011). To assess the discriminant validity of the VAC instrument, both the moral and instrumental motive variables were used. For each VAC variable the CFA was conducted twice – once with the moral motive items and once with the instrumental motive items – resulting in eight CFAs in total. Previous studies have shown that the motives of a firm do not completely determine its socially responsible behavior, other factors also enable and disable CSR-related capabilities (Brønn and Vidaver-Cohen

2009). Therefore, the survey items for both the moral and instrumental motives should not load on the factors of the VAC survey items. These expectations lead us to the following hypotheses:

Hypothesis 2a: The VAC variables are distinct from the moral motive variable.

Hypothesis 2b: The VAC variables are distinct from the instrumental motive variable.

Concurrent validity assessments

Besides the construct validity, another type of validity was analyzed: concurrent validity. Since we theorize that the VAC dimensions influence the innovation outcomes of a firm, a criterion-oriented validation procedure is also to explore the validity of the VAC scales (Cronbach and Meehl 1955). Preferably the predictive validity would be measured, but due to the exploratory nature of the VAC construct we were not able to establish how large the time-lag should be before the effects of VAC on the innovation outcomes would be expected. Thus, a concurrent validity procedure was used to establish the effect of VAC on the innovation outcomes of the firm (Cronbach and Meehl 1955). In this procedure, the correlations between the VAC variables and indicators for innovation outcomes were analyzed using a Pearson correlation (significant with $p < 0.05$), bootstrapped with 2000 samples for a more robust result.

To determine how value-sensitive the outcomes of the firms' product innovation were, the firms were assessed on how healthy the outcomes of their product innovation were. In food manufacturing firms, there are two types of product innovation: new product development and product reformulation. Therefore, for each firm the nutritional composition of was collected of (a) the three to five best-selling products; and (b) the three to five latest product introductions.[7] These compositions were compared with the scientifically validated criteria of the health label of the Dutch Choices Foundation (Roodenburg, Popkin, and Seidell 2011). The standardized differences between each criterion and the product composition were added up to achieve one Nutrition Score per product.[8] The Healthy Product Score was calculated at the firm level as an average of the RI Product Scores for that firm. As VAC is theorized to support the firm in absorbing the societal value into their innovation outcomes, a positive correlation is expected between the VAC variables and the Healthy Product Score. These expectations lead us to the following hypothesis:

Hypothesis 3: The VAC variables are positively correlated with the Healthy Product Score.

Results

VAC item reduction

The EFA identified a four-factor model, explaining 68.05% of the variance (see Table 2). The reliability analysis showed a Cronbach's Alpha score for each factor well above 0.7 (Field 2013). In the rest of this paper, we will refer to each of these four factors as the VAC variables: VAC1, VAC2, VAC3, and VAC4.

Regarding the extent to which the VAC variables reflect firm-level capabilities, all VAC variables showed IRA indices with a mean $R_{wg(J)}$ higher than 0.70 for the

Table 2. Results of the exploratory factor analysis and the reliability analyses of the VAC-related survey items.

VAC variables	Items[a] – In our firm …	Rotated factor loading[b]
VAC1 *(Eigenvalue = 1.08; Cronbach's α = 0.76)*	VAC1.1 … the meaning of 'healthiness' is reflected upon. (2)	0.840
	VAC1.2 … 'healthiness' is an important value. (1)	−0.686
	VAC1.3 … there are clear objectives for healthier product development. (8)	−0.477
VAC2 *(Eigenvalue = 2.01; Cronbach's α = 0.83)*	VAC2.1 … the meaning of 'healthiness' is discussed with non-commercial organizations. (4)	0.838
	VAC2.2 … the definition of specific societal health desires is discussed with non-commercial organizations. (19)	0.654
	VAC2.3 … when developing specifications for healthier product development, we discuss them with non-commercial organizations. (21)	0.564
	VAC2.4 … after market launch, the feedback of stakeholders on the health specifications of the product is monitored. (17)	0.563
VAC3 *(Eigenvalue = 5.64; Cronbach's α = 0.78)*	VAC3.1 … the definition of specific societal health desires is discussed with companies in the sector. (18)	1.022
	VAC3.2 … when developing specifications for healthier product development, we discuss them with companies in the sector. (20)	0.596
	VAC3.3 … the meaning of 'healthiness' is discussed with companies within the sector. (3)	0.481
VAC4 *(Eigenvalue = 1.47; Cronbach's α = 0 .73)*	VAC4.1 … all departments are consulted when drawing up specifications for healthier product development. (15)	0.741
	VAC4.2 … the results of healthier product development are shared between departments. (16)	0.596
	VAC4.3 … changes in societal health desires are easily shared between departments. (7)	0.498
	VAC4.4 … developments in nutritional standards and guidelines are being monitored. (5)	0.462
	VAC4.5 … prior to the market launch, a product is assessed on its health specifications. (14)	0.402
Deleted items	… new solutions for achieving health specifications are shared between product development teams. (12)	>18% missing
	… the feedback of companies in the sector on our healthier product developments falls on deaf ears. (24)	>18% missing
	… the feedback of non-commercial organizations on our healthier product developments falls on deaf ears. (25)	>18% missing
	… the same recipes or ingredients are used to comply with health specifications. (13)	>18% missing
	… during product development the health specifications are discussed with companies in the sector. (22)	>18% missing
	… during product development the health specifications are discussed with non-commercial organizations.(23)	>18% missing
	… for every product development we check whether the product can be made healthier. (10)	Insufficient loading
	… in order to achieve health specifications, we lower our standards for other product specifications (e.g. taste, price) (11)	Insufficient loading
	… there are disagreements regarding the definition of 'health'. (9)	Insufficient loading
	… we experience difficulties in translating societal health desires into product specifications. (6)	Insufficient loading

[a]Number in brackets is equal to numbering in Table A1 in Appendix.
[b]Results from pattern matrix.

rectangular null distribution indicating a strong agreement among respondents of the same firm (see Table 3). For the alternative null distribution with slight skew, both VAC2 and VAC3 show a mean $R_{wg(J)}$ of 0.64, which indicates moderate agreement between respondents of the same firm.

Table 3. Results of Inter-Rater Agreement for variables measured at employee level

Variable	$r_{wg(J)}$ upper limit[a]	$r_{wg(J)}$ lower limit[b]
VAC1	**0.90**	**0.82**
VAC2	**0.77**	**0.64**
VAC3	**0.79**	**0.64**
VAC4	**0.87**	**0.75**
MorMot	0.91	0.82
InstrMot	0.88	0.81

[a]As measured with rectangular null distribution.
[b]As measured with an alternative null distribution with slight skew.

Construct validity assessments

The results related to the convergent validity are shown in Table 4, which presents the correlations between the VAC variables, MorMot and InstrMot. The variable for MorMot shows positive, significant correlations with VAC1, VAC3, and VAC4, although the correlation with VAC3 is lower than 0.4 and thus considered a medium-strong relationship. VAC2 shows no significant relationship with MorMot. Regarding the positive relation with MorMot, *hypothesis 1a* can thus be accepted for VAC1, VAC3, and VAC4 but not for VAC2. For the variable InstrMot, the correlations with VAC1, VAC3, and VAC4 are significant but smaller than 0.3, which means a weak relationship between the variables. The correlation between InstrMot and VAC2 is not significant. Regarding the weak relation with InstrMot, *hypothesis 1b* can thus be accepted for all VAC variables.

To assess the discriminant validity of the VAC variables, the results of the EFA and CFA with MorMot are presented in Tables 5 and 6, respectively, and the results of the EFA and CFA with InstrMot are presented in Tables 7 and 8, respectively.

The EFA with the VAC variables and MorMot resulted in a five-factor model as expected, but the items MorMot4 and VAC4.5 did not load on the factors as predicted (see Table 5). MorMot4 loaded on the same factor as the VAC1 items and not on the factor of the MorMot items. VAC4.5 loaded on three factors of which the highest loading on the factors of the MorMot items. Removing VAC4.5 from the model resulted in item VAC4.4 being no longer correlated with the VAC4 factor. The CFA showed similar results (see Table 6). All proposed two-factor models had a better fit than the unitary one-factor models as the chi-square difference tests were significant. However,

Table 4. Correlations and descriptive statistics of the VAC variables, MorMot and InstrMot.

Variable	1	2	3	4	5	6
1. VAC1	–					
2. VAC2	0.22*	–				
3. VAC3	0.38**	0.55**	–			
4. VAC4	0.53**	0.30**	0.44**	–		
5. MorMot	**0.60****	**0.17**	**0.37****	**0.41****	–	
6. InstrMot	**0.27****	**0.02**	**0.28****	**0.24***	0.38**	–
Mean	3.88	3.19	2.89	3.83	4.19	4.12
Standard deviation	0.65	0.75	0.74	0.62	0.61	0.65
Min	2.00	1.00	1.00	2.40	2.00	2.00
Max	5.00	4.67	4.75	5.00	5.00	5.00
Missing	0	6	2	0	1	0

*Significant with $p < 0.05$ (Pearson correlation).
**Significant with $p < 0.01$ (Pearson correlation).

Table 5. Results of the exploratory factor analysis with VAC dimensions and Moral Motives.[a]

Variable	1	2	3	4	5
VAC3.1	.987				
VAC3.2	.614				
VAC3.3	.423		–.351		
MorMot1		.794			
MorMot2		.671			
MorMot3		.600			
VAC4.5		**.349**	**–.310**	**.327**	
VAC2.1			–.914		
VAC2.2			–.700		
VAC2.3			–.564		
VAC2.4			–.539	.387	
VAC4.1				.815	
VAC4.2				.681	
VAC4.3				.562	–.313
VAC4.4			–.363	.381	
VAC1.2					–.736
VAC1.1					–.604
MorMot4					**–.541**
VAC1.3					–.397

[a]Results from pattern matrix. Only factor loadings greater than 0.3 are presented. VAC1 = Value Receptivity; VAC2 = Non-commercial Value Reflexivity outside industry; VAC3 = Commercial Value Reflexivity; VAC4 = Value Articulation; Mot1 = Moral Motives.

Table 6. Results of the confirmatory factor analysis with each VAC dimension and Moral Motives.[a]

Model	X^2 (*df*)	ΔX^2 (*df*)	TLI	CFI	RMSEA
VAC1-MorMot unitary 1-factor	43.67 (14)		0.75	0.88	0.14
VAC1-MorMot discriminant 2-factor	23.95 (13)	**19.72**** (**1**)	**0.90**	**0.95**	**0.09**
VAC2-MorMot unitary 1-factor	97.26 (20)		0.46	0.70	0.19
VAC2-MorMot discriminant 2-factor	15.84 (19)	**81.41**** (**1**)	**1.02**	**1.00**	**<0.01**
VAC3-MorMot unitary 1-factor	85.75 (14)		0.21	0.61	0.22
VAC3-MorMot discriminant 2-factor	10.70 (13)	**75.05**** (**1**)	**1.03**	**1.00**	**<0.01**
VAC4-MorMot unitary 1-factor	94.13 (27)		0.52	0.71	0.15
VAC4-MorMot discriminant 2-factor	49.29 (26)	**44.84**** (**1**)	**0.83**	0.90	**0.09**

[a]TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation. ** $p < 0.01$ (two-tailed). Variables: VAC1 = Value Receptivity; VAC2 = Non-commercial Value Reflexivity outside industry; VAC3 = Commercial Value Reflexivity; VAC4 = Value Articulation; Mot1 = Moral Motives.

the TLI and RMSEA values indicated a mediocre fit for the two-factor VAC1-MorMot model (TLI < 0.90; RMSEA > 0.08) and the two-factor VAC4-MorMot model (RMSEA > 0.08). The two-factor models of VAC2-MorMot and of VAC3-MorMot show to be a good fit (TLI > 0.90; CFI > 0.90; RMSEA < 0.08). These results indicate that although the two-factor model is superior to the one-factor model, they do not justify a complete separation between VAC1 and MorMot and between VAC4 and MorMot. *Hypothesis 2a* is thus accepted for VAC2 and VAC3 but not for VAC1 and VAC4.

InstrMot and the VAC variables are, however, clearly distinct from each other. The EFA shows that the items for InstrMot all load on one factor and none of the VAC items load on this particular factor (see Table 7). This distinction between factors is confirmed by the CFA, as the two-factor models are all superior to the one-factor models and independently show good fit (CFI > 0.90; RMSEA < 0.08, see Table 8). Only the TLI-value for the two-factor VAC4-InstrMot model is slightly below 0.9, but with a considerable increase from 0.25 in the one-factor model to 0.88 in the two-factor model a sufficient fit of the two-factor model can be assumed (Marsh et al. 2011). *Hypothesis 2b* is thus accepted for all VAC variables.

Table 7. Results of the exploratory factor analysis with vac dimensions and instrumental motives.[a]

Variable	1	2	3	4	5
VAC3.1	1.022				
VAC3.2	.637				
VAC3.3	.496				
VAC4.1		.702			
VAC4.2		.615			
VAC4.3		.581			
VAC4.4		.547		–.320	
VAC2.4		.524		–.461	
VAC4.5		.483		–.348	
InstrMot1			**–.827**		
InstrMot2			**–.743**		
InstrMot3			**–.707**		
InstrMot4			**–.514**		
VAC2.1				–.794	
VAC2.2	.345			–.622	
VAC2.3				–.520	
VAC1.1					–.838
VAC1.2					–.622
VAC1.3					–.422

[a]Results from pattern matrix. Only factor loadings greater than 0.3 are presented. VAC1 = Value Receptivity; VAC2 = Value Reflexivity outside industry; VAC3 = Value Reflexivity within industry; VAC4 = Value Articulation; Mot2 = Instrumental Motives.

Table 8. Results of the confirmatory factor analysis with each VAC dimension and instrumental motives.[a]

Model	X^2 (*df*)	ΔX^2 (*df*)	TLI	CFI	RMSEA
VAC1-InstrMot unitary 1-factor	88.33 (14)		0.22	0.61	0.22
VAC1-InstrMot discriminant 2-factor	18.63 (13)	69.68** (1)	**0.94**	**0.97**	**0.06**
VAC2-InstrMot unitary 1-factor	120.87 (20)		0.29	0.61	0.22
VAC2-InstrMot discriminant 2-factor	29.18 (19)	91.68** (1)	**0.93**	**0.96**	**0.07**
VAC3-InstrMot unitary 1-factor	101.07 (14)		0.42	0.52	0.24
VAC3-InstrMot discriminant 2-factor	18.81 (13)	82.26** (1)	**0.93**	**0.97**	**0.06**
VAC4-InstrMot unitary 1-factor	120.61 (27)		**0.25**	0.55	0.18
VAC4-InstrMot discriminant 2-factor	40.02 (26)	80.59** (1)	**0.88**	**0.93**	**0.07**

[a]TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation. ** $p < 0.01$ (two-tailed). Variables: VAC1 = Value Receptivity; VAC2 = Value Reflexivity outside industry; VAC3 = Value Reflexivity within industry; VAC4 = Value Articulation; Mot2 = Instrumental Motives.

Concurrent validity

The results of the concurrent validity of the VAC variables can be found in Table 9, presenting how the VAC variables correlate with perceived Healthy Innovation performance at the respondent level and the Healthy Product Score at the firm level. Healthy Product Score showed to be positive, significant, and strongly correlated with VAC1 ($r = 0.52$, $p < 0.01$), VAC2 ($r = 0.46$, $p < 0.05$) and VAC4 ($r = 0.41$, $p < 0.05$). The correlation between the Healthy Product Score and VAC3 is not significant and weak ($r = 0.08$, $p > 0.05$). *Hypothesis 3* can thus be accepted for VAC1, VAC2, and VAC4, but not for VAC3.

Discussion and conclusion

For commercial innovation to provide solutions for the societal grand challenges, firms need to be able to handle the evaluative nature of these challenges (Ferraro, Etzion, and Gehman 2015). However, underlying these evaluations are societal values, which can

Table 9. Results of concurrent validity – descriptive statistics and correlations of performance indicators.

	Firm level RI performance score
VAC1	**0.52****
VAC2	**0.46***
VAC3	**0.08**
VAC4	**0.41***
Mean	−0.22
Standard deviation	1.36
Min	−4.51
Max	2.17
Missing	2

*Significant with $p < 0.05$ (Pearson correlation, bootstrapped with 2000 samples).
**Significant with $p < 0.01$ (Pearson correlation, bootstrapped with 2000 samples).

cause conflicts between stakeholders (Dignum et al. 2015; Manders-Huits 2011). The aim of this article is thus to provide an overview of the capabilities required by firms to absorb societal values by developing a survey instrument based upon the conceptual framework of Garst et al. (2019) called VAC. The results of our empirical study point towards adjustments of three dimensions suggested by Garst et al. The main adjustment to the framework is a clear distinction between internal and external communication capabilities, as suggested by Hawn and Ioannou (2016). In the following sections, we discuss the implications for each of the VAC dimensions, which lead to a reconstruction of the VAC framework (see Figure 2).

Internal value receptivity

The theoretical definition of Value Receptivity focused on the firm's understanding of a value in which a broader understanding is built upon multiple external sources and

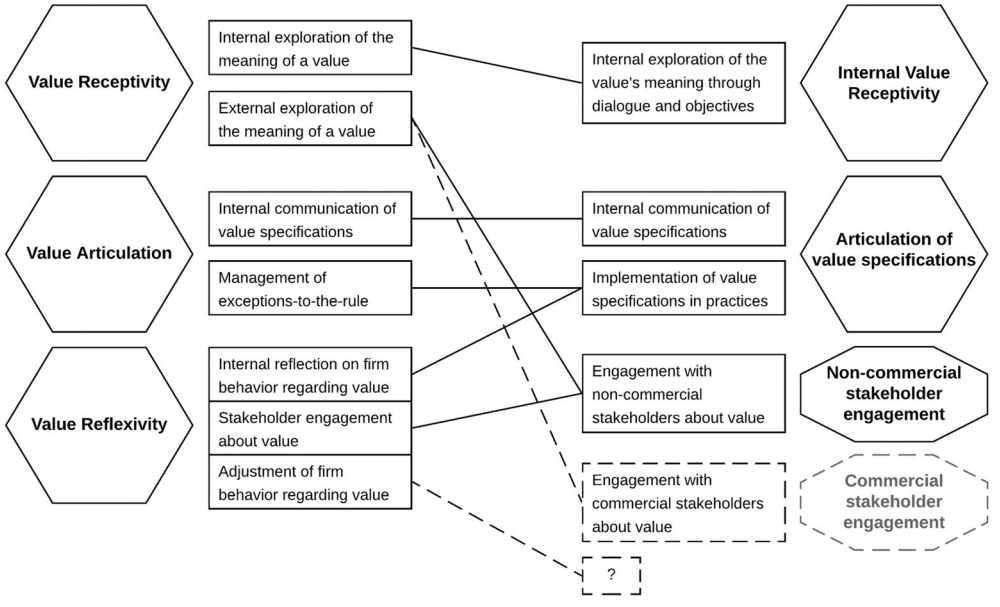

Figure 2. Value-sensitive Absorptive Capacity (VAC) conceptual framework versus survey instrument.

interconnected value aspects (Garst et al. 2019). When looking at the VAC variables in our results, the items of VAC1 resemble this dimension as they discuss the internal conversations on the meaning of 'health', similar to the internal philosophical exploration described by Nissenbaum (2005). This exploration of a value's meaning includes the item related to the development of objectives for this value. This practice can be seen as the next step in defining the value and signaling that the value is important to the organization (Bansal 2003). However, where Garst et al. (2019) conceptualized that external conversations on this definition were part of defining the meaning of a value, our results indicate that dialogue with external stakeholders represents separate dimensions (VAC2 and VAC3). We would thus suggest that Value Receptivity needs to be redefined as a firm's capability to define a value based on internal dialogue and objective setting.

The results of the construct validity assessments for VAC1 imply that this redefined Value Receptivity is related to moral behavior and less to self-interest, as VAC1 shows high convergence with the moral motives of the firm and no convergence with instrumental motives. Additionally, the dimension's positive correlation with the Healthy Product Score indicates that the capability represented by the dimension might lead to more responsible innovation outcomes. However, the discriminant validity assessment shows that although the dimension measure is distinct from the Instrumental Motives, the VAC1 items are not completely distinct from the Moral Motives variable used in this study. Looking closer at the results, the overlap between variables was caused by a motive item indicating the strategic priority to a moral value by higher management (MorMot4). Strategically prioritizing a societal value is a business practice resulting from moral motives but not a motive in itself (Bansal and Roth 2000). The overlap between the two variables might thus be attributed to a lack of discriminant validity of the Moral Motive survey items rather than of the VAC1 items.

Regarding its concurrent validity, the VAC1 variable is shown to be strongly correlated with the Healthy Product Score. Although further research needs to determine the direction of the causal relationship, the value receptivity capability as measured with this variable shows a positive relationship with the responsible outcomes of a firm's product innovation.

Articulation of value specifications

For Value Articulation, the conceptual definition emphasized the specification of values and the subsequent implementation of values through consistent communication and managing exceptions-to-the-rule (Garst et al. 2019). Items of the VAC4 variable seem to partly overlap with this dimension, in the sense that they emphasize inter-department communication on value specification (VAC4.1, VAC4.2, and VAC4.3). The items regarding active stakeholder engagement for specification do not load on this dimension (VAC2.2, VAC2.3, VAC3.1, and VAC3.2). Furthermore, the inclusion of the items on monitoring of external standards and guidelines (VAC4.4) and on evaluation of health specifications before market launch (VAC4.5) show that in this communication, the value specification is compared to external specifications and the specifications of new products being developed. However, the construct validity tests showed that these latter two items are highly correlated to each other and negatively influence the

discriminant validity of VAC4. Only if both VAC4.4 and VAC4.5 are removed, there is no overlap between Moral Motives and VAC4.

A reason for this separation with the first three items might be that items VAC4.4 and VAC4.5 discuss how the value specifications are used within the business activities. This use might be correlated with the other items – since the use of these specifications is dependent on the creation and communication of these specifications – but could indicate a separate capability. Based on these results, the Value Articulation dimension should be redefined to the capability of a firm to specify values and communicate these value specifications within the organization. Future research could further investigate whether the specification and communication of values could be considered a separate capability from the use of such value specifications.

Regarding its concurrent validity, the VAC4 variable is shown to be strongly correlated with the Healthy Product Score. Although further research needs to determine the direction of the causal relationship, the value articulation capability as measured with this variable shows a positive relationship with the responsible outcomes of a firm's product innovation.

Commercial and non-commercial value engagement

The transition from a conceptual model with three dimensions to an instrument with four capabilities is mainly related to the Value Reflexivity capability. The conceptual definition of this dimension was focused on two practices by the firm: (a) evaluating its role in acting upon a societal value; (b) responding to divergent insights by adjusting its practices. The results of the item reduction suggest several changes to this definition.

First, the EFA shows that the items regarding engagement with non-commercial organizations (VAC2) are not correlated with the items regarding engagement with industry partners (VAC3). This result suggests that there is not one overarching capability for external engagement, but that firms have separated capabilities for Non-commercial Value Engagement and Commercial Value Engagement. While Stilgoe, Owen, and Macnaghten (2013) do not make this distinction in discussing inclusive deliberation, the CSR literature has shown that this separation between stakeholders is common within firms (Donaldson and Preston 1995). The validity tests for VAC2 and VAC3 confirm this separation. The items on non-commercial engagement (VAC2) positively correlate with the moral motives and the Healthy Product Score, while the items on commercial engagement (VAC3) do not show significant correlations. The additional item for non-commercial engagement (VAC2.4) shows that the views of these stakeholders are also important after the product is launched.

Furthermore, the items regarding the response to feedback from external parties and possible adjustments of practices showed high non-response. A reason could be that these items were not framed clearly enough, although our test panel did not indicate any confusion regarding these items. Another reason could be that respondents found it difficult to pinpoint particular occasions in which their firm directly responded to feedback from external parties. This would confirm the idea that integrating feedback of external parties happens not on a standalone basis, but that adjustments of value specifications in an organization happen gradually over time (Gehman, Treviño, and Garud 2013). Therefore, a cross-sectional survey instrument might not be suitable to measure

this part of Value Reflexivity. A longitudinal process-based study might be more suitable to measure the organizational capability of firms to respond to changing views by adjusting their practices (Langley et al. 2013).

Based on these results, we thus suggest reshaping the Value Reflexivity dimension into two engagement capabilities: non-commercial engagement and commercial engagement. Both capabilities concern the firm's ability to deliberate with the specified stakeholders about the definition and specification of a value.

The results of the validity tests, however, make us question whether the capability of a firm to engage with commercial stakeholders is related to moral reasoning and would lead to more responsible product outcomes. A reason for this lack of convergent and concurrent validity could be that this commercial engagement often leads to sharing already institutionalized knowledge (Zietsma et al. 2002). Such knowledge brings less new insights on societal values and thus will not stimulate new value specifications or other value-related practices required for more responsible innovation (Garst et al. 2019; Gehman, Treviño, and Garud 2013). At the same time, our insights on Non-commercial Value Engagement suggest that for RI, the stakeholder engagement capabilities need to go beyond inter-firm relationships, which commercial innovation concepts have traditionally emphasized (Huizingh 2011; Long and Blok 2018).

An important footnote, however, is that the relevance of Commercial Value Engagement for RI might be dependent on the level of normative myopia present in the industry regarding the particular value (Swanson 1999). In the food industry, investigated in this study, the value 'health' might represent a value for which firms have come to a consensus on the value specifications, even though non-commercial stakeholders might disagree with these specifications. In scenarios where normative myopia is less present, commercial engagement on a value might show a positive correlation with responsible innovation outcomes.

Unfortunately, the survey items representing responses to conflicting views of stakeholders – item 9 on identifying intra-value conflicts, item 11 on compromising, item 12 on continued innovation, and item 13 on myopia – did not have sufficient loading and thus could not be connected to the VAC variables identified. It is not clear whether this is the result of the incomprehensible framing of the survey items or because VAC's focus on a single value instead of scenarios with multiple values. To make up for this limitation in the future development of the VAC instrument, scholars could look more closely at the research on subjective or collaborative decision-making techniques – e.g. Q-sort method, Delphi method, best-worst method, or the constant-sum approach (Flipse and Puylaert 2018; van de Kaa et al. 2020). These techniques, in combination with insights on organizational paradoxes (Hahn et al. 2018; Miron-Spektor et al. 2018), might inspire survey items that can classify responses to value conflicts.

Steps for further development of VAC

In exploring the capabilities required to absorb information on societal values in the innovation process, we developed a survey instrument based on the multidimensional construct of VAC (Garst et al. 2019). The results show that the dimensions of this framework might require redefining and providing clearer boundaries between them (see Figure 2).

Besides the suggestions for further research on each capability described above, we want to emphasize that this study is an initial step in further substantiating the VAC construct with empirical evidence. Like we did for the motives scale of Paulraj, Chen, and Blome (2017), the validity of our survey instrument requires further assessment, especially through studies with larger sample sizes and in other contexts (e.g. other industries and/or other societal values). Such developments would also allow the addition of elements that the current version was not able to pick up on, such as responses to value conflicts. Since the development of our instrument, scholars have further developed the knowledge on responses to value conflict and organizational paradoxes, which could inspire the development of new survey items (Flipse and Puylaert 2018; Hahn et al. 2018; Miron-Spektor et al. 2018; van de Kaa et al. 2020). Additionally, the connection between the VAC dimensions and the characteristics of agile management could be further explored, building on the recent work by Umbrello and Gambelin (2021). Finally, further investigation is required on whether the VAC dimensions might facilitate the key performance indicators for RI in industry, developed by the PRISMA project (Flipse and Yaghmaei 2018; Porcari et al. 2019). When such developments are based on both VSD and business administration literature, the VAC framework can strengthen the transdisciplinary bridge that RI aims to be.

Notes

1. In this paper, we use CSR to encompass the literature on CSR, corporate social performance, corporate sustainability, corporate citizenship, and related concepts. For the conceptual differences between these terms, see Garriga and Melé (2004) and Bansal and Song (2017).
2. Societal values are distinct from the concept 'social value', which describes the beneficial output of the firm's behavior on society as a whole (Gehman, Treviño, and Garud 2013), for example social impacts, social programs and social policies (Wood 1991).
3. For an extended version of methodology section, see Appendix Tables A1 and A2.
4. We used the maximum likelihood method with eigenvalues >1 and an oblique rotation with oblimin (Field 2013). To check the sampling size adequacy, we used the Kaiser-Meyer-Olkin measure, resulting in an adequate score of 0.793.
5. As our variables are multi-item, we used the $r_{wg(J)}$, looking for a mean >0.70 to indicate strong agreement or > 0.6 for moderate agreement on both the rectangular null distribution as well as the alternative null distribution. The IRA was conducted using a tool developed by Biemann, Cole, and Voelpel (2012).
6. As the scale from Paulraj, Chen, and Blome (2017) is an existing scale but needed to be adjusted to our context, the motive variables of this scale needed to be re-confirmed with a Confirmatory Factor Analysis (CFA). The results of the CFA indicated an alternative model with a slightly different structure than indicated by Paulraj et al. (TLI = 0.951; CFI = 0.972; RMSEA = 0.046; for details see Table A2 in Appendix). Two items concerning the needs of firm owners/shareholders were removed due to their low loadings. A possible reason for low correlations of these motive items is that the majority of the respondents in the Paulraj et al. study were members of executive management and thus more likely to experience pressure from owners/shareholders. In our study, the majority of respondents were lower level manager with no or limited contact with owners and shareholders, and thus these motive items were less relevant for this sample. Our final model with the two motive variables is aligned with the study of Garst et al. (2017), observing two type of motives for food product innovation – e.g. moral and instrumental motives.
7. Number depended on the portfolio size of the firm.

8. For example, Product 1 of Firm A contained 2.0 g/100g of Saturated Fatty Acids (SAFA) while the criterion for its product category is 1.1 g/100g, giving it an absolute score for SAFA of –0.9. After standardizing the SAFA score with the SAFA score of other products and repeating the procedure for other nutritional criteria, the standardized scores for all nutritional criteria were summed giving the product an RI Product Score of –0.779.

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Appendix

Table A1. Overview of survey items for Value-sensitive Absorptive Capacity (VAC).

Items – *In our firm …*	References to CSR/CS/RI literature
(1) … 'healthiness' is an important value.	Anticipation (Owen et al. 2013); Value selection (Swanson 1999); issue identification (Bansal 2003)
(2) … the meaning of 'healthiness' is reflected upon.	Anticipation (Owen et al. 2013); philosophical reflection (Nissenbaum 2005);
(3) … the meaning of 'healthiness' is discussed with companies within the sector.	Inclusive deliberation through stakeholder engagement (Owen et al. 2013); moral dialogue (Swanson 1999); sensing (Ortiz-de-Mandojana and Bansal 2016)
(4) … the meaning of 'healthiness' is discussed with non-commercial organizations.	Inclusive deliberation through stakeholder engagement (Owen et al. 2013); moral dialogue (Swanson 1999); sensing (Ortiz-de-Mandojana and Bansal 2016)
(5) … developments in nutritional standards and guidelines are being monitored.	Environmental scanning (Hahn et al. 2014; Wood 2010); external affairs management (Swanson 1999); monitoring of standards (Bessant 2013)
(6) … we experience difficulties in translating societal health desires into product specifications. (reversed-coded)	Value specification (Friedman, Kahn, and Borning 2002; Nissenbaum 2005; Van de Poel 2013)
(7) … changes in societal health desires are easily shared between departments.	Value retention through informal decision making (Swanson 1999)
(8) … there are clear objectives for healthier product development.	Value retention through formal decision making (Swanson 1999); code existence (Miska, Stahl, and Fuchs 2018)
(9) … there are disagreements regarding the definition of 'health'. (reversed coded)	Intra-value conflict (Dignum et al. 2015); opposite of structural embeddedness of societal values (Gehman, Treviño, and Garud 2013); opposite of code existence (Miska, Stahl, and Fuchs 2018)
(10) … for every product development we check whether the product can be made healthier.	Value enactment (Swanson 1999); structural embeddedness of societal values (Gehman, Treviño, and Garud 2013)

(*Continued*)

Table A1. Continued.

Items – *In our firm …*	References to CSR/CS/RI literature
(11) … in order to achieve health specifications, we lower our standards for other product specifications (e.g. taste, price).	Value enactment (Swanson 1999); simultaneous pursuit of contradictory values (Hahn et al. 2016); Value resolution by compromising (Flanagan, Howe, and Nissenbaum 2008; Nissenbaum 2005)
(12) … new solutions for achieving health specifications are shared between product development teams.	Value enactment (Swanson 1999); continuous innovation (Flanagan, Howe, and Nissenbaum 2008; Ortiz-de-Mandojana and Bansal 2016)
(13) … the same recipes or ingredients are used to comply with health specifications. (reversed coded)	Conformity with myopia (Swanson 1999); over-reliance on institutionalized knowledge (Zietsma et al. 2002); acting upon 'low hanging fruits' (Crane et al. 2014)
(14) … prior to the market launch, a product is assessed on its health specifications.	Value enactment (Swanson 1999); structural embeddedness of societal values (Gehman, Treviño, and Garud 2013); code enforcement (Miska, Stahl, and Fuchs 2018)
(15) … all departments are consulted when drawing up specifications for healthier product development.	Hierarchical expansion of value information (Swanson 1999)
(16) … the results of healthier product development are shared between departments.	Issue selling (Bansal 2003)
(17) … after market launch, the feedback of stakeholders on the health specifications of the product is monitored.	Value verification (Nissenbaum 2005)
(18) … the definition of specific societal health desires is discussed with companies in the sector.	Reflectivity on value specification through stakeholder engagement (Friedman, Kahn, and Borning 2002; Owen et al. 2013)
(19) … the definition of specific societal health desires is discussed with non-commercial organizations.	(same as above)
(20) … when developing specifications for healthier product development, we discuss them with companies in the sector.	(same as above)
(21) … when developing specifications for healthier product development, we discuss them with non-commercial organizations.	(same as above)
(22) … during product development the health specifications are discussed with companies in the sector.	Reflectivity on value resolution through stakeholder engagement (Nissenbaum 2005; Owen et al. 2013)
(23) … during product development the health specifications are discussed with non-commercial organizations.	(same as above)
(24) … the feedback of companies in the sector on our healthier product developments falls on deaf ears. (reversed-coded)	Opposite of ongoing reconfigurations of values practices (Gehman, Treviño, and Garud 2013)
(25) … the feedback of non-commercial organizations on our healthier product developments falls on deaf ears. (reversed-coded)	(same as above)

Table A2. Results of the CFA and the reliability analyses of the motive-related survey items.

Motive categories	Items – Our firm is developing healthier products …	Stand. factor loading
Original three-factor model	TLI = 0.910; CFI = 0.948; RMSEA = 0.062	
Instrumental motives	1. … because our shareholders/ investors/owners demand these improvements.	0.54
	2. … in order to protect or improve the reputation of the company.	0.62
	3. … in order to appease our shareholders/ investors/owners.	0.49
Relational Motives	4. … in order to increase our customer base.	0.69
	5. … in order to differentiate us from our competitors.	0.76
	6. … because it is a source of sustained competitive advantage.	0.75
Moral motives	7. … because we feel co-responsible for the health of our consumers.	0.81
	8. … because of genuine concern for public health.	0.69
	9. … because top management considers our impact on public health as a vital part of corporate strategy.	0.51

(*Continued*)

Table A2. Continued.

Motive categories	Items – Our firm is developing healthier products …	Stand. factor loading
	10. … because it is the right thing to do.	0.74
Garst et al. two-factor category model	TLI = 0.845; CFI = 0.904; RMSEA = 0.082	
Instrumental motives	1. … because our shareholders/ investors/owners demand these improvements.	0.31
	2. … in order to protect or improve the reputation of the company.	0.53
	3. … in order to appease our shareholders/ investors/owners.	0.30
	4. … in order to increase our customer base.	0.67
	5. … in order to differentiate us from our competitors.	0.76
	6. … because it is a source of sustained competitive advantage.	0.73
Moral motives	7. … because we feel co-responsible for the health of our consumers.	0.80
	8. … because of genuine concern for public health.	0.70
	9. … because top management considers our impact on public health as a vital part of corporate strategy.	0.50
	10. … because it is the right thing to do.	0.75
Final two-factor model	TLI = 0.951; CFI = 0.972; RMSEA = 0.046	
Instrumental motives	2. … in order to protect or improve the reputation of the company.	0.51
	4. … in order to increase our customer base.	0.68
	5. … in order to differentiate us from our competitors.	0.77
	6. … because it is a source of sustained competitive advantage.	0.74
Moral motives	7. … because we feel co-responsible for the health of our consumers.	0.80
	8. … because of genuine concern for public health.	0.70
	9. … because top management considers our impact on public health as a vital part of corporate strategy.	0.51
	10. … because it is the right thing to do.	0.74
Excluded items	1. … because our shareholders/ investors/owners demand these improvements.	
	3. … in order to appease our shareholders/ investors/owners.	