Containing the Not-Invented-Here Syndrome in external knowledge absorption and open innovation: The role of indirect countermeasures

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ABSTRACT

This paper builds new theory and provides supporting evidence to contain the Not-Invented-Here Syndrome (NIHS) – a persistent decision-making error arising from an attitude-based bias against external knowledge. Conceptually, we draw on the 4i framework of organizational learning to develop a novel process perspective on NIHS. This allows us not only to unpack how and where NIHS impedes organizational learning, but also to identify the key requirements for effective NIHS countermeasures. Importantly, countermeasures fall into two categories: those that seek to change the negative attitude directly (direct NIHS countermeasures) and those that seek to attenuate the behavioral impact of negative attitudes without addressing the attitudes as such (indirect NIHS countermeasures). While the evidence base on direct NIHS countermeasures has grown over the last decade, indirect NIHS countermeasures have received little research attention. To address this gap, we adopt a mixed methods research design composed of two complementary empirical studies – the first qualitative and the second quantitative. Study 1 explores the prevalence of distinct NIHS countermeasures in collaborative R&D practice. Based on 32 interviews and three focus group meetings with R&D employees, we find that a broad array of primarily direct NIHS countermeasures is employed in R&D practice. Study 2 addresses the scarcity of scholarly and managerial insights on indirect NIHS countermeasures by testing the effectiveness of perspective taking as a debiasing technique to contain negative attitudes at the level of the individual. Based on quantitative survey data from 565 global R&D projects, it provides empirical evidence not only for the prevalence and negative effects of NIHS on project success as mediated by external knowledge absorption, but also for the effectiveness of perspective taking as an exemplary indirect NIHS countermeasure.

1. Introduction

Triggered by the growing popularity of open innovation and crowdsourcing, the VDMA (Verband Deutscher Maschinen- und Anlagenbau e.V.) − one of the largest industrial associations in Europe representing over 3100 member companies in the German engineering industry–set out to explore how its members could benefit from emerging forms of collaborative innovation. To evaluate the benefits from a more open approach to innovation, the association engaged with member companies to identify six unsolved technical challenges that were posted to solution providers in the machinery industry. This open and collaborative process yielded nearly 20 novel proposals from a global pool of solution providers for each technical problem posted.

Many of the submitted proposals were well thought-out and provided feasible solutions to the identified problems. Much to the surprise of the VDMA team, not a single external solution proposal was adopted by its member organizations. Developers simply refused to integrate the external knowledge and insisted on developing their "own" in-house solutions instead (Lüttgens et al., 2014). Given this persistent rejection of external input, the association eventually had to shelve its strategic initiative and leave important technical opportunities unsolved.

The VDMA example above is not an isolated case. Indeed, the literature is replete with many reasons for why organizations struggle to internalize external knowledge, even when such input could have helped to solve the task at hand. These reasons include, but are not limited to, prohibitive absorption and transaction costs, intellectual

property concerns, technological incompatibilities, or excessive risks associated with unproven ideas. Such explanations, however, do not fully account for the systematic individual rejection of external knowledge by internal research and development (R&D) employees as illustrated in the VDMA example. It is against this backdrop that a psychological phenomenon widely known as the *Not-Invented-Here Syndrome* (NIHS) moves into the foreground. NIHS can be formally defined as an individual's negative attitude towards knowledge that originates from a different field of expertise, from another organizational entity, or from another geography, and thus, is considered "outside" or "external" to the group(s) or organization(s), in which the individual is embedded (Antons and Piller, 2015). Due to this attitude, internal R&D employees are inclined to reject external knowledge during inbound open innovation, even though it might be beneficial to the development task at hand; as it was the case in the opening example. As such, NIHS hampers organizational learning, as it prevents the organization from absorbing external knowledge (Garvin, 1993).

While examples of NIHS are frequently mentioned in open innovation research and practice (e.g., Laursen and Salter, 2006; Ter Wal et al., 2017), there is a notable scarcity of empirical evidence not only on its determinants and consequences (Agrawal et al., 2010; Kathoefer and Leker, 2012), but also – and arguably most importantly – on possible countermeasures. While several prior studies have proposed a range of NIHS countermeasures including integrating employees into decision making, restructuring teams and departments (Katz and Allen, 1982), rotating team members in and across projects (Kathoefer and Leker, 2012), introducing adequate incentive systems, fostering mutual trust and partnership, and intensifying contact to external knowledge providers (Gesing et al., 2015), empirical evidence on the usage and effectiveness of these and other remedies remains largely absent. Indeed, less than a handful of empirical, peer-reviewed studies have been published on this topic to date. These studies shed light on the effectiveness of counteracting NIHS by means of establishing an open climate in innovation units (Herzog and Leker, 2010), providing processional and creativity training to employees (Burcharth et al., 2014) and socializing new employees in a less in-group-centric manner (Burcharth and Fosfuri, 2015).

These pioneering studies have clearly demonstrated that empirical research can help not only to diagnose, quantify and explain NIHS, but also to test the effectiveness of possible countermeasures. However, the countermeasures so far examined empirically share the fact that they mostly seek to change the negative attitude underlying the NIHS *directly* either by reducing it over time or – arguably even better – by preventing it from emerging in the first place. As Antons and Piller (2015, p.207) put it, "changing someone's attitude is one way to reduce NIH. […] An alternative, perhaps less obvious way to overcome NIHS is to prevent the attitude from influencing behavior (instead of changing the attitude)". Here, a possible countermeasure will not affect the NIH attitude directly but will, instead, seek to contain its negative behavioral consequences; or put differently, it seeks to debias knowledge absorption behavior in presence of NIH attitudes (Soll et al., 2016). We hence refer to this category as indirect NIHS countermeasures. As psychological attitude research has shown, changing attitudes is costly and time-consuming (Petty et al., 1997). Indirect means of attenuating the attitude-behavior relationship instead of changing the NIHS attitude itself, thus, promise to be particularly effective and efficient at counteracting the negative effect of NIHS on external knowledge absorption and organizational learning. Simply put, all an effective indirect NIHS countermeasure based on debiasing principles needs to do is to reduce the extent to which an individual relies on its NIH attitude as an information processing heuristic in the process of absorbing external knowledge. However, in the current NIHS literature these indirect measures have not been investigated in any depth. Given both the potential and the lack of empirical evidence on the effectiveness of indirect NIHS countermeasures, we build theory and evidence to begin to answer two highly relevant, yet to date unexplored research questions (RQ):

- RQ 1: What direct and indirect NIHS countermeasures are used in R&D practice?
- RQ 2: What is the effectiveness of perspective taking as an indirect NIHS countermeasure in the context of collaborative R&D projects?

As for theory, we integrate insights from the seminal 4i framework of organizational learning (Crossan et al., 1999, 2011; Lawrence et al., 2005) and existing NIHS research. The 4i framework is particularly informative for our purposes, as it unpacks the interplay between cognition (e.g., attitudes, individual predispositions, and thoughts) and action (e.g., behavior, knowledge absorption, change) in knowledge assimilation as a defining characteristic of organizational learning. According to the 4i framework, learning is enacted across four socio-psychological processes (intuiting, interpreting, integrating, and institutionalizing) that connect individual and organizational levels in a feed-forward (from the individual to the organizational level) and feedback logic (from the organizational to the individual level). The value of this conceptual lens for NIHS research lies in enabling scholars to pinpoint the precise location and negative effects of NIHS in the process of learning from external knowledge inputs and to derive appropriate countermeasures. What emerges as a result is a novel process perspective that allows us not only to unpack how and where NIHS impedes organizational learning, but also to identify the key requirements for effective NIHS countermeasures. In particular, this process perspective highlights the cascading effect of NIHS in feed-forward sub-processes of organizational learning (from the individual level to the organizational level) that are critical for innovation and organizational renewal (Crossan et al., 1999, 2011; March, 1991). This cascading effect alerts scholars and practitioners alike that NIHS will tend to be most consequential in the earlier individual-level sub-processes of intuiting and interpreting. Overall, our process perspective enables us to respond to recent calls for strengthening the theoretical foundations of NIHS research (Antons and Piller, 2015).

As for empirical evidence, we employed a mixed methods research design (Venkatesh et al., 2013) based on two studies – the first qualitative with a focus on the prevalence of direct and indirect NIHS countermeasures in actual practice (RQ 1) and the second quantitative with a focus on the effectiveness of indirect NIHS countermeasures (RQ 2). Given their distinct analytical focus, both studies complement each other, with the first setting the stage for the second. Our qualitative Study 1 identifies NIHS countermeasures already used in managerial practice and maps them to the 4i framework of organizational learning. Even though a broad set of NIHS countermeasures is already applied in practice, we observe a notable dominance of direct as opposed to indirect countermeasures and of those that target NIHS in the later integrating and institutionalizing as opposed to the earlier and arguably more consequential intuiting and interpreting sub-processes. Our quantitative Study 2, in turn, focuses on indirect NIHS countermeasures seeking to debias individual NIH attitudes as a blind spot in scholarly research and managerial practice. In particular, it demonstrates empirically that perspective taking is an exemplary indirect NIHS countermeasure that leverages the power of debiasing to offset the negative effect of NIHS on project success as mediated by external knowledge absorption. Perhaps most notably, perspective taking elevates knowledge absorption behaviors of R&D professionals with NIHS to a level comparable to professionals not displaying NIHS. As such, our article expands the methodological repertoire to overcome NIHS with what we call indirect NIHS countermeasures designed to contain the negative consequences of NIH attitudes on external knowledge absorption in the critical intuiting and interpreting processes, rather than attempting the attempt the difficult task of long-term attitude change (Petty et al., 1997). In so doing, we also respond to West et al.'s (2014, p. 809) call for studies on how "the (mis)alignment of incentives and interests for open innovation (e.g. "not invented here") are created, identified and addressed by firms."

Below, we introduce our conceptual background and delineate our

hypotheses. We then turn to the description of the mixed methods design, our two empirical studies, and the overall discussion.

2. Literature review

2.1. NIHS

The literature with a dedicated focus on NIHS as a core phenomenon is still relatively limited in size (see Antons and Piller, 2015 for a comprehensive review). Foundational articles on NIHS were entirely centred on the phenomenon at hand (i.e., Clagett, 1967; Katz and Allen, 1982; Allen et al., 1988). Without building explicit theoretical foundations, these studies investigated antecedents and consequences of NIHS. Antecedents comprised, for example, insufficient opportunities for project members to participate in the innovation process (Clagett, 1967), long tenure within groups and decreased communication among R&D professionals (Katz and Allen, 1982). These studies also provided initial empirical evidence on the detrimental effect of NIHS on project performance (Clagett, 1967; Katz and Allen, 1982; Allen et al., 1988). Overall, they form the foundation for further conceptual development of NIHS.

Importantly, NIHS research increasingly draws on insights from individual level research from social psychology to theorize NIHS as an individual *attitude* towards external knowledge (i.e., Mehrwald, 1999; Lichtenthaler and Ernst, 2006; Burcharth et al., 2014; Burcharth and Fosfuri, 2015; Antons and Piller, 2015; Hussinger and Wastyn, 2016; Antons et al., 2017). An attitude can be defined broadly as a "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly and Chaiken, 1993, p.1). Research in social psychology indicates that negative attitudes, such as NIHS, arise from perceived "out group" differences (Ajzen, 2001; Bohner and Dickel, 2011; Olson and Fazio, 2009). In the context of NIHS, the object of the (negative) attitude is knowledge, or more specifically, external knowledge. When faced with external knowledge as in the case of our opening crowdsourcing example, an individual with an NIH attitude will be more likely to reject that knowledge regardless of the material value that it may offer. Thus, it is the attitude underlying NIHS that results in a decision bias that leads individuals to systematically underutilize or even refuse external knowledge in an irrational, economically suboptimal way (Antons and Piller, 2015).

Whenever NIHS is present among key decision-makers, it may impact entire project teams, departments, and even the organization as a whole, leading to a closed organizational mindset (Clagett, 1967; Hussinger and Wastyn, 2016; Katz and Allen, 1982). The result can be a breakdown of external knowledge absorption, defined as an entity's ability to recognize, assimilate and exploit knowledge from external sources, and a fragmented and constrained knowledge base that subsequently leads to poor decision-making with negative implications for the technological and commercial performance of the organization (Agrawal et al., 2010; Burcharth et al., 2014; Kathoefer and Leker, 2012; King et al., 2003). NIHS acts as a simplifying information-processing heuristic that reduces an individual's cognitive effort required for external knowledge absorption. As such, this heuristic also risks introducing a potentially strong negative bias in external knowledge absorption. Conceptualizing NIHS in this way has triggered considerable progress in NIHS research. Among others, it has contributed to: (1) more precise predictions with regards to possible antecedents and consequences of NIHS (Mehrwald, 1999; Lichtenthaler and Ernst, 2006; Antons and Piller, 2015), (2) the development of novel measurement approaches for NIHS including specialized implicit measures (Antons et al., 2017), and (3) the direct measurement and empirical examination of NIHS (instead of using, for example communication patterns as proxy measures) in order to quantify its consequences for organizations (Burcharth et al., 2014; Burcharth and Fosfuri, 2015; Hussinger and Wastyn, 2016).

Recently, NIHS research has begun to move to the next level of

theoretical development fuelled by efforts to integrate NIHS and its attitude structure into theories from organizational research (Burcharth and Fosfuri, 2015; Antons and Piller, 2015; Hussinger and Wastyn, 2016). Notably, Social Identity Theory (Tajfel and Turner, 1979) and the construct of organizational identification (Ashforth and Mael, 1989) played a central role in explaining and arguably predicting how intergroup conflict and different roles of organizational members may trigger NIH attitudes (Antons and Piller, 2015; Burcharth and Fosfuri, 2015; Hussinger and Wastyn, 2016). This enabled researchers to make notable progress with identifying the antecedents and boundary conditions of NIHS. Consider the example of an R&D employee assigned to incorporate into her development efforts a piece of technology developed by a foreign company. This might pose a threat to her engineering identity and, thereby, might give rise to a negative attitude towards the new technology. In her in-depth qualitative study of NASA's open innovation initiatives, Lifshitz-Assaf (2018) observed precisely this pattern. Some internal R&D professionals attempted to preserve their original professional identity and formed a strong NIH attitude. The end result was that external solutions were not absorbed by this group of professionals within NASA. Others in contrast, managed to refocus their professional identities and knowledge boundaries and successfully adapted to the new mode of collaborative R&D. This nicely illustrates how NIHS can emerge in response to perceived identity threats. Similarly grounded in Social Identity Theory, Hussinger and Wastyn (2016) found knowledge inputs originating from competitors as opposed to other external actors to be particularly likely to trigger internal resistance.

In addition to this ego-defensive function of NIHS, Antons and Piller (2015) identified four other functions that NIH attitudes may fulfil. The value-expressive function of NIHS attitudes clarifies self-concepts by rejecting knowledge that challenges individual values. The example of an environmentalist rejecting ideas based on potentially toxic material is intriguing in that regard. The social-adjustive function is similar to the ego-defensive function but focuses on the social group. NIH attitudes help individuals to protect the identity of the social group, for example the group of combustion drive engineers at a carmaker threatened by electrical engines, by rejecting external knowledge that triggered the collective identity threat. The knowledge function of NIH attitudes helps individuals striving for cognitive consistency to structure information that they receive. NIH attitudes may lead to selective processing of information so that beliefs are not challenged and only confirmation is sought. Finally, the utilitarian function of NIH attitudes helps to secure positive and avoid negative outcomes. Here, creating your own ideas might lead to positive self-perceptions ("I had this brilliant idea") and to defending them against external threats.

2.2. NIHS countermeasures

Importantly, these theoretical developments have led to a better understanding of the nature and root causes of NIHS. This has enabled NIHS researchers to go beyond merely proposing plausible NIHS countermeasures and to begin to empirically examine the effectiveness of specific NIHS countermeasures. Three main studies in this stream are summarized in Table 1.

As a case in point, Burcharth and Fosfuri (2015) drew on Social Identity Theory to identify institutionalized newcomer socialization practices. These practices were central to the formation not only of strong organizational identities among employees, but also of overly positive perceptions of knowledge originating from the in-group and NIH attitudes towards knowledge from the out-group. This downside of organizational identification was found to be particularly salient among Danish small and medium-sized enterprises with a less specialized internal knowledge base, where perceptions of rivalry and competition with outsiders and their knowledge tend to be more prevalent. These theoretically grounded insights into newcomer socialization and organizational identity formation as one of the root causes of NIH attitudes

Table 1
Empirical studies on NIHS countermeasures.

Study	Herzog and Leker (2010)	Burcharth et al. (2014)	Burcharth and Fosfuri (2015)
Focus	Effect of organizational culture on NIHS and risk taking	Effect of NIH and NSH attitudes on the adoption of inbound and outbound open innovation as moderated by training	Effect of institutionalized newcomer socialization on NIHS
NIHS Lens	Phenomenon-driven with a cultural perspective on NIHS	Social psychological research on attitudes	Social Identity Theory
Setting & Data	Individual-level data from 109 employees from three business units of a multinational chemical company	Firm-level data from 331 Danish manufacturing organizations	Firm-level data from 169 Danish SMEs
NIHS Measurement	Self-reported employee attitudes (5 items from Mehrwald, 1999) →direct, individual-level measure of NIHS	Third-person reported employee attitudes (3 items) →generalized, collective-level measure of NIHS	Third-person reported employee attitudes (2 items) →generalized, collective-level measure of NIHS
NIHS Countermeasure	Open innovation culture →*direct* NIHS countermeasure at *collective* level focusing on attitude change	1 Professional training 2 2. Training for innovation → *direct/indirect* NIHS countermeasure at *collective* level focusing on attitude change and behavioral implications	Adjustment of newcomer socialization practices in order to contain the negative effects of strong corporate identities →*direct* NIHS countermeasure at *collective* level focusing on attitude formation
Data Analysis	Analyses of variance	Ordinal regression analyses	Hierarchical regression analyses
Key Findings	Business units with an open innovation culture display are less affected by NIHS in comparison to business units with a closed innovation culture	1 NIHS negatively influences the adoption of inbound open innovation practices 2 2. Professional training and training for creativity and innovation reduce the effect of NIHS on the adoption of inbound OI practices	1 Institutionalized socialization practices are positively associated with the NIH syndrome 2 2. A highly specialized knowledge base of the firm attenuates the effect of socialization on NIHS

have far-reaching implications for the design of possible NIHS countermeasures. As newcomer socialisation practices are essential for the functioning of organizations, the answer is not to eliminate them, but instead to design them in a less in-group centric way that preserves newcomers' appreciation of – and openness to – outsiders and their knowledge inputs. Moreover, organizational training practices were found to contain NIH attitudes and their negative effect on inbound open innovation, but not on outbound innovation (Burcharth et al., 2014). This applied to both professional training in a broader sense and to creativity and innovation training in a more specific sense. Organizations can hence shape employee attitudes and their implications for information-processing not only when integrating newcomers, but also when developing them through training programs offered during their tenure. Herzog and Leker (2010) finally provide initial evidence for organizational culture as a third NIHS countermeasure at the collective level that arguably shapes – and is shaped by – the two mentioned above: newcomer socialisation and employee training practices. Comparing business units of a major chemical company, Herzog and Leker (2010) found that levels of NIHS were notably lower among employees working in business units with what they call an open innovation culture than their counterparts in business units with a closed innovation culture.

Jointly, these three pioneering empirical studies moved NIHS research into new territory and allowed it to begin to address the question of greatest practical relevance: how to contain NIHS and its negative behavioral consequences. These three studies share a focus on NIHS countermeasures located at the collective level. Newcomer socialisation and organizational culture were both shown to be directly associated with NIH attitudes at the level of the collective – be it the organization or the business unit. Hence, both are part of what we call *direct NIHS countermeasures* focusing on collective attitude formation and change. Employee training, in contrast, was found to have the twofold effect of containing both collective NIH attitudes at the organizational level (correlation between professional training and collective NIH attitudes: $r = -0.127$, $p < 0.05$) and their negative effect on inbound open innovation.

It becomes clear, however, that NIHS research has only just begun to develop theory and evidence on possible NIHS countermeasures. This applies in particular to those countermeasures that focus on containing the attitude-induced bias in external knowledge absorption rather than

on changing the NIH attitude per se (Antons and Piller, 2015). Such *indirect NIHS countermeasures* could be particularly promising given both the well-documented challenges associated with attitude change that, at best, will take time to materialize (Petty et al., 1997) and the mounting evidence from cognitive psychology and behavioral economics on the short-term effectiveness of a range of so-called debiasing techniques that attenuate the attitude-behavior link at the level of each individual (Soll et al., 2016). The identification and design of such debiasing techniques for NIHS, however, require a granular understanding of how precisely NIH attitudes bias the process of external knowledge absorption. We seek to address this important gap in our theorizing of NIHS below by developing a novel process perspective on NIHS.

3. Conceptual model and hypotheses

3.1. Towards a process perspective on NIHS

While Social Identity Theory appears well suited for explicating the antecedents and motivations underpinning NIHS, it might be less valuable for studies such as ours seeking to examine the behavioral consequences of NIHS and possible means to debias external knowledge absorption in the presence of NIH attitudes. What is needed instead is a theoretical lens that helps to unpack how NIHS takes effect in organizations to bias processes of external knowledge absorption across individual and collective levels. It is precisely such a granular process-centric understanding of the behavioral consequences of NIHS that is needed to identify the key requirements for NIHS countermeasures and to assess their effectiveness. It is against this backdrop that an integration of insights on the psychological foundations of NIH attitudes with theories of organizational learning appears particularly fruitful.

As the introductory crowdsourcing example demonstrates, NIHS can act as a major barrier to external knowledge absorption and organizational learning. A conceptual model of organizational learning that is both widely accepted in organization studies and highly consistent with the requirements outlined above is the influential 4i framework of organizational learning (Crossan et al., 1999, 2011; Lawrence et al., 2005). This framework describes organizational learning as a dynamic process spanning the individual, group, and organizational level. It is based on the premise that individual and collective cognition (e.g.,

attitudes, individual predispositions, and thoughts) and action (e.g., behavior, knowledge absorption, change) affect each other. In short, individual attitudes shape – and are themselves shaped by – the behaviour of organizational members. In the case of NIHS, the underlying attitude ("cognition" in terms of 4i) affects how individuals behave towards external knowledge ("action"). Action (for example, frequent rejections of external knowledge), in turn, influences cognition (e.g., by reinforcing a negative attitude towards frequently rejected external knowledge).[1] Similarly, individuals influence the collective by promoting or badmouthing external knowledge inputs. In turn, the collective influences the individual by exerting, for instance, social norms and practices. Individual cognition and action influence group cognition and action, and this collective cognition and action feeds back to the individual.

The different levels (e.g., individual, group, and organizational) are connected by four socio-psychological processes known as *intuiting, interpreting, integrating,* and *institutionalizing* (4i). Briefly put, *intuiting* is a purely individual process that involves the perception of learning possibilities. *Interpreting* is the process of creating meaning from these possibilities in light of the organizational context. It unfolds at the individual and group levels. *Integrating* builds on the shared understanding and results in coherent collective practice, connecting the group and organizational levels. *Institutionalizing* is a purely organizational process that involves the development of formalized routines and structures to embed individual and group learning into the organization. According to the 4i framework, organizational learning occurs through two distinct processes, either as a feed-forward process, from the individual to the organizational level (intuiting to institutionalizing), when new knowledge is assimilated, or as a feedback process from the organizational to the individual level (institutionalizing to intuiting), when formalized learning (e.g., organizational routines and formalized practices) influences cognition and action of groups and individuals within an organization.

As Schilling and Kluge (2009) put it, NIHS is an actional-personal barrier to organizational learning that is characterized by an attitude, related individual cognition, and resulting behavior. As the feed-forward process is based on individual organizational members' intuiting and perceiving of external knowledge and immanent organizational opportunities for innovation and renewal, it is especially vulnerable to NIHS. In the feed-forward process, this individual-level phenomenon may cascade up through the group level to the organizational level. As such, NIHS is able to impair and bias organizational learning during each of the four socio-psychological processes. Given our research focus on estimating and containing the effect of NIH attitudes on external knowledge absorption, we focus on the feed-forward process with NIH-induced biases cascading from individual level intuiting to collective level institutionalizing.

3.2. NIHS in the feed-forward process of organizational learning

3.2.1. NIHS in intuiting

Individual *intuiting* initiates the feed-forward process of organizational learning and functions on a purely individual level, shaped by individual experiences and cognition. Organizational members need to engage in entrepreneurial thinking, have an open mindset, and an orientation towards future possibilities (Crossan et al., 1999). These *intuiting* behaviors rely on perception and recognition of patterns and opportunities – individual-level processes highly susceptible to NIHS biases. Research on attitudes (e.g., Fazio, 1990; Eagly and Chaiken, 1998) and conceptualizations of NIHS (e.g., Antons et al., 2017; Burcharth et al., 2014) demonstrate that individuals' perceptions of

external stimuli are highly biased by their attitudes. This clearly relates to the knowledge function of NIHS attitudes (Antons and Piller, 2015), that is, the tendency to detect and remember congenial stimuli (stimuli that are congruent with their attitudes) more readily than uncongenial stimuli. This heavily interferes with *intuiting* behaviors, as it biases individuals to leave potentially new but uncongenial possibilities unnoticed (Antons et al., 2017).

This stage of the organizational learning process comprises exclusively learning of individual members of the organization, independently of their position. Here, each employee, from the lowest to the highest hierarchy, may be equally affected by NIHS. Once prevalent, NIHS implicitly influences each employee's ability to perceive useful new learning opportunities. An engineer, for example, may miss the opportunity to advance production efficiency with a novel technology. She scans the environment for possible improvements to her work (e.g., bonding alloys by welding). Holding a negative predisposition against gluing, however, the engineer may not even notice the potential of high-tech adhesives as new, improved bonding agents. Here, NIHS biases organizational learning by distorting *intuiting*; i.e., the ability of individuals to perceive new learning opportunities.

3.2.2. NIHS in interpreting

A similar, yet more explicit mechanism of NIHS influences organizational learning at the stage of *interpreting*. During this process, individuals and groups reflect on previously detected stimuli to make inferences about the learning possibilities. In this case, new stimuli need to be aligned with existing cognitive maps and the organizational environment (Crossan et al., 1999). The result will be a change in individual and group understanding and action. A NIH attitude might distort this (individual and collective) process, as it biases information-processing (Antons and Piller, 2015; Burcharth et al., 2014). Individuals tend to apply higher quality ratings to stimuli that are congenial (in line with their attitudes) in comparison to uncongenial stimuli (Bohner and Dickel, 2011), and may even completely reject uncongenial information (Eagly and Chaiken, 1993). This biases individual and group *interpreting* and hampers the development of a shared understanding. Even when new learning opportunities were identified, NIHS could hence influence individuals and groups to misjudge and discard them. Consider a colleague of our exemplary engineer who is not affected by NIHS and notices that other manufacturers increasingly rely on adhesives instead of welding to join metal parts. The colleague interprets the new bonding process in light of the current products and existing production processes. Given that bonding by adhesives turns out to be the more efficient technology, *interpreting* on the individual level is unbiased and effective, when the colleague comes to the conclusion that the new bonding process is a fruitful new opportunity for the company. Moreover, *interpreting* also connects the individual and group level. The colleague might propose the new technology to his or her group. However, if the group or powerful individuals within this group (Lawrence et al., 2005) are affected by NIHS towards the new bonding technology, although successfully identified and interpreted by an individual, the group may still disregard the technology based on NIHS-biased information processing.

3.2.3. NIHS in integrating

Beyond its biasing effects on *intuiting* and *interpreting,* which will cascade up from the individual to the organizational level, NIHS might also affect the later learning processes, even if the individual-level processes were biased. *Integrating* is a group level process that builds on a shared understanding and leads to coherent collective action in the form of a change in practices (Crossan et al., 1999). NIHS hampers *integrating* when, for example, one group implements a new idea, but the idea fails to spread to other groups (Katz and Allen, 1982). This is the case when groups refuse knowledge from other groups based on its origin and the attitudes triggered thereby. Taking the adhesives example, NIHS hampers organizational learning during *integrating,* when

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[1] This reasoning on the interplay of attitudes and behavior is in line with findings from research on attitude evolution (Bohner and Dickel, 2011; Eagly and Chaiken, 1993).

the new bonding technology fails to disseminate to (other) relevant organizational units. Even if some organizational groups, for example the local production group together with one engineering department, implement the new technology, other groups like production in other plants may still adhere to welding, hampering organizational change and development.

3.2.4. NIHS in institutionalizing

Institutionalizing of organizational learning describes the development of an organizational memory that is robust to changes in individual members. This is achieved through the use of information systems, development of appropriate structures, rules, and organizational routines, resulting in the collective preservation of learning outcomes (Crossan et al., 1999). *Institutionalizing* may be biased whenever managers or teams responsible for establishing these long-term changes are affected by NIHS (Antons and Piller, 2015). Here, the development of rules and routines might be altered or changes to organizational infrastructure impeded. NIHS harms *institutionalizing* especially in case of extensive strategic change. Consider that the top management team, learning about the potential of using adhesives as the standard bonding procedure, decides to start a strategic initiative to change the core production model from technologies using alloys to composite technologies. Whereas the current technologies, based on alloy processing, are currently institutionalized and therefore shape the cognitions and actions of the organizations' employees, the new composite technologies are sought to complement and partly even replace these technologies. Due to the ego-defensive function of NIHS and being afraid of losing influence and power, managers from the production sites along with sales management intervene and argue that the changes would demand too much from the workforce. This might result in postponing the plan to implement the change initiative. In sum, NIHS towards composites may heavily impair this strategic change, whenever groups and individuals hold on to the old and deprecate the new.

Table 2 summarizes this negative influence of NIHS on each of the four learning processes.

3.3. NIHS and its implications for knowledge absorption and project success

As developed above, NIHS has the potential to impair the feed-forward process of organizational learning across the sub-processes of *intuiting, interpreting, integrating*, and *institutionalizing* by biasing how individuals and groups perceive and process external learning stimuli (Eagly and Chaiken, 1998; Bohner and Dickel, 2011; Antons and Piller, 2015; Schilling and Kluge, 2009). As such, NIHS tends to bias individuals' perceptions of external stimuli in intuiting, leaving potentially new but uncongenial possibilities unnoticed (Antons et al., 2017). Given the interdependence of the four consecutive sub-processes of organizational learning, the biases introduced by NIHS are carried forward from one sub-process to the next and may even reinforce each other. We refer to this as the cascading effect of NIHS on organizational learning, which is likely to have substantial negative effects on individual level knowledge absorption.

These NIHS-based impediments to knowledge absorption, in turn, are likely to prove detrimental to the success of R&D projects, which might well fail to capture the potential benefits of external knowledge input in terms of improved new- and fit-to-market or time- and cost-to-market (Salge et al., 2013). We hence expect individual level NIH attitudes to bias external knowledge absorption and, subsequently, decrease R&D project success. Thus:

Hypothesis 1. *The negative effect of NIH attitudes among R&D professionals on R&D project success will be mediated by reduced levels of external knowledge absorption in collaborative R&D activities.*

3.4. Perspective taking as an exemplary indirect NIHS countermeasure

As highlighted by Crossan et al. (1999), individual experience and capabilities play a crucial role in reinforcing or attenuating the link between cognition and action, or – as applied to our context – between NIH attitudes and external knowledge absorption behavior. We argue that individual learning capabilities are able to reduce the detrimental effect of NIHS on organizational learning and project success (Burcharth et al., 2014). As such, individual learning capabilities serve

Table 2
How NIHS hampers the organizational learning process.

Learning (Sub-)Process	Level	NIHS Bias	Example
Intuiting	Individual	NIHS biases *perception of new learning stimuli* - identification of potentially relevant external knowledge is hampered	Consider an engineer, searching for a solution to a recent production problem. Having worked with alloys for her entire career, she is somewhat biased against composite technologies. As a consequence, searching for a solution, she does not even *notice* a potentially revolutionary new process and solution to her problem, as it is based on composite materials.
Interpreting	Individual & Group	NIHS biases *information processing* – although new learning opportunities were identified, they are evaluated in a biased, and economically suboptimal way	Consider the same engineer in a meeting with her team, brainstorming to find a solution for their problem. One colleague proposes to look into composite technology, as he recently read about the material properties, grasping the potential to solve the problem and even expand production efficiency. However, based on preconceived opinions about composites, the team quickly rejects the suggestion and continues to search for another solution.
Integrating	Group & Organizational	NIHS hampers *dissemination of newly adopted knowledge* from one organizational unit to other units	Consider that a different engineering team solved the problem with the new approach based on composite technologies. During the next meeting of the R&D department, they report on the developments and the future potential of the technology. However, based on biased preconceptions about composites, all other R&D teams refuse to apply the new approach.
Institutionalizing	Organizational	NIHS hampers *implementation of new knowledge* into robust and relatively permanent organizational memory systems	Consider the potential of composite technologies has been acknowledged by the CTO. She developed an implementation plan to incorporate the new composite technology into every applicable product. When discussing the plan at a meeting with the head of R&D, the negative preconceptions from R&D lead to intensive discussion resulting in alterations of the proposed new routines, processes, and changes to the organizational infrastructure.

Note. Although the examples begin on a relatively low employee level, the learning process from intuiting to institutionalizing is independent of hierarchy and is as likely to be biased by NIHS when beginning on a C-level (when for example the CTO, affected by NIHS, fails to perceive fruitful new learning opportunities).

as an indirect NIHS countermeasure to debias external knowledge absorption in the presence of NIHS. Compared to direct NIHS countermeasures that aim at changing the underlying attitude, these indirect measures aim at attenuating the behavioral consequences of the NIH attitude with particular emphasis on intuiting and interpreting as the initial and most critical sub-processes of organizational learning.

While prior research on NIHS countermeasures has established that competence-building programs might help to contain the NIHS effect, it also highlights that "future research endeavors should develop more fine-grained measures […] to substantiate the relationship" (Burcharth et al., 2014, p. 159) and investigate particular capabilities and competences (Antons and Piller, 2015). Here, we build on the rich and increasingly popular literature from cognitive psychology and behavioral economics on debiasing human behavior (Soll et al., 2016). Using specific cognitive strategies and techniques – i.e., individual capabilities – debiasing aims to remove distorting effects such as those induced by NIHS. Such cognitive strategies can be learnt and built, thereby fostering individual capabilities. Cognitive approaches or specific training in biases and decision-making are designed to trigger a more reflective mindset, leading to decisions that take into account alternative outcomes even in presence of negative attitudes against external knowledge (Larrick, 2004). These cognitive techniques are especially well suited for complex decisions in uncertain environments with ill-defined problems. Thus, cognitive debiasing approaches provide a promising way to counteract NIHS at the individual and group level of organizational learning, especially in decision environments, where optimal choice outcomes might be more difficult to identify.

Based on a systematic review of the debiasing literature, we focused on perspective taking as a particularly promising debiasing technique and a possible indirect NIHS countermeasure proposed by Antons and Piller (2015).[2] Perspective taking refers to the ability to put oneself in another person's shoes. Although conceptually bound to empathy, it should not be mistaken for empathy per se. Perspective taking is a cognitive process of taking another person's psychological point of view (Davis, 1983), and therefore a prerequisite for empathic reactions (Parker and Axtell, 2001). It is a proven strategy to counteract socio-cognitive and attitude-related biases (Parker et al., 2008; Galinsky and Moskowitz, 2000). Perspective taking increases the willingness to share critical knowledge with others (Flinchbaugh et al., 2016) and to engage in deep information processing to evaluate information from others more thoroughly and efficiently (Hoever et al., 2012). Increased information-processing capacities provide the cornerstone to facilitate feed-forward processes of organizational learning in helping individuals to identify new learning opportunities more readily (i.e., intuiting and interpreting).

There is considerable evidence that perspective taking is an effective approach for debiasing social cognition (Parker et al., 2008). Research shows that perspective takers evaluate outside groups more positively and express far fewer social biases such as stereotypes (Galinsky and Moskowitz, 2000). In addition to decreasing social biases, perspective taking influences information processing by facilitating the absorption of information that is inconsistent with biased beliefs (Todd et al., 2012). Moreover, perspective taking positively affects implicit

individual attitudes (Todd and Burgmer, 2013). This has important behavioral implications. Research on perspective taking found, for example, that perspective taking significantly increases cooperative behaviors within an organization. Internal customers started to cooperate more extensively and more efficiently with internal suppliers (who were external to the customer teams), when the customers applied a perspective taking approach (Parker and Axtell, 2001). Moreover, heterogeneous groups were found to benefit from their internal diversity in terms of greater group creativity and performance only when instructed to take the perspective of all team members (Hoever et al., 2012). We expect that perspective taking also increases external knowledge absorption especially when NIH attitudes are strong. As such, perspective taking will moderate the relationship between NIH attitudes and project success as mediated by external knowledge absorption. Hence:

Hypothesis 2. *Perspective taking will debias the negative relationship between NIH attitudes among R&D professionals and external knowledge absorption, such that the mediated, indirect effect of NIHS on project success will be weaker the higher the level of perspective taking.*

4. Mixed methods research design

Mixed methods research designs promise rich insights into under-explored phenomena by leveraging the complementary strengths of qualitative and quantitative approaches in the very same inquiry (Johnson and Onwuegbuzie, 2004). Insights that can only be extracted by comparing and contrasting the distinct studies contained in a mixed methods inquiry are known as meta-inferences (Venkatesh et al., 2013). Mixed methods studies tend to be particularly insightful when fragmented, inconclusive, or equivocal findings exist (Venkatesh et al., 2016). We argue that this also applies to NIHS. As Antons and Piller (2015) put it, the field is under-theorized with many studies mentioning NIHS without defining it or engaging deeply with the construct. The research stream on NIHS countermeasures in particular also tends to be fragmented with many studies merely proposing possible remedies (e.g., Gesing et al., 2015; Kathoefer and Leker, 2012) and only a few testing countermeasures empirically (e.g., Burcharth and Fosfuri, 2015; Burcharth et al., 2014; Herzog and Leker, 2010).

The interplay between qualitative and quantitative techniques in generating unique insights is highly context-specific and should be guided by the aim of the research endeavour at hand (Venkatesh et al., 2013). Our goal is to better understand how organizations can contain the bias induced by NIHS at various stages of the feed-forward processes of organizational learning. To this end, we conducted two consecutive studies with the findings from the qualitative Study 1 informing the quantitative Study 2. More specifically, Study 1 was designed to better understand the nature and prevalence of distinct direct and indirect NIHS countermeasures employed in actual practice and to map them against the four sub-processes of intuiting, interpreting, integrating and institutionalising (RQ 1). Our quantitative Study 2, then, was meant to provide empirical evidence on the effectiveness of indirect NIHS countermeasures in terms of attenuating the negative consequences of the NIHS, especially in the processes of individual intuiting and interpreting (RQ 2).

According to Venkatesh et al.'s (2013) classification, our mixed methods approach can therefore be seen as *developmental*, in that one study sequentially informs the second, and *completing* because the mixed methods approach is used to obtain a more complete picture of the studied phenomenon – here, NIHS countermeasures across the 4i sub-processes of organizational learning. Fig. 1 illustrates our mixed methods research design and the intended interplay between our two empirical studies.

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[2] We conducted a systematic review of the literature on debiasing. This resulted in a list of 23 techniques potentially helpful to attenuate the NIHS-behavior relationship. Appendix 1 lists those techniques. We used a set of four inclusion criteria that had to be met by the respective debiasing strategy to prove useful in the context of NIHS: (1) the ability to increase information processing, (2) a positive influence on attitude expression or stereotyping, (3) a high similarity of the underlying bias with NIHS, and (4) a trainable skill to promote individual learning and sustained debiasing. Perspective taking fulfilled all these criteria. In addition, prior research has shown that similar to NIHS in the organizational learning processes, perspective taking may also cascade up from the individual to collective decision making in organizations (Litchfield and Gentry, 2010).

Mixed-methods research question:
How can organizations overcome NIHS as an obstacle to organizational learning, especially in feed-forward processes of exploratory learning?

(1) stimulates   *(3) answer*   *(1) stimulates*

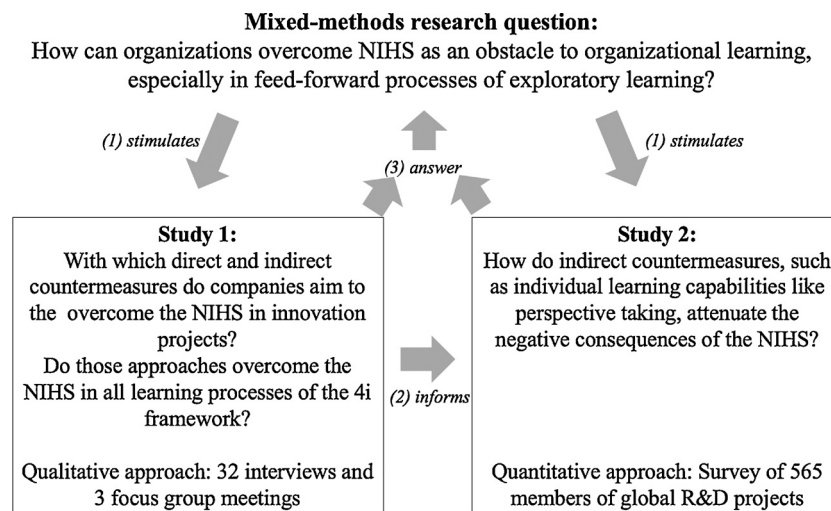| Study 1:	Study 2:
With which direct and indirect countermeasures do companies aim to the overcome the NIHS in innovation projects? Do those approaches overcome the NIHS in all learning processes of the 4i framework?	How do indirect countermeasures, such as individual learning capabilities like perspective taking, attenuate the negative consequences of the NIHS?
Qualitative approach: 32 interviews and 3 focus group meetings	Quantitative approach: Survey of 565 members of global R&D projects

(2) informs

Fig. 1. The mixed methods research design.

5. Study 1: mapping NIHS countermeasures in the field

5.1. Sample and data collection

To investigate our first research question regarding the direct and indirect NIHS countermeasures used in managerial practice (RQ 1), we collected rich qualitative data by means of three focus group meetings and 32 semi-structured interviews with R&D professionals. The focus group meetings were used to: (1) enrich our understanding of NIHS from the perspective of R&D professionals, (2) develop and refine our interview guide, (3) verify the practicability of NIHS countermeasures identified through the interview study, and (4) investigate short-comings of existing countermeasures and requirements of managers for new NIHS countermeasures. The first focus group meeting took place before and the other two after we conducted the interviews and were attended by the same set of participants as part of a publicly-funded research project on NIHS. Each focus group meeting lasted six hours including a 30-minute break. Focus group participants were senior R&D managers from six large German companies with extensive experience in cross-functional work settings. To document the focus group meetings, detailed notes of all discussions relevant in the context of NIHS were taken. Although meetings could not be directly recorded, an additional research assistant was assigned to take notes for the duration of each meeting. In this manner, we constructed a joint account of each meeting informed by the notes of several researchers, yielding more objective data to guide subsequent stages of data analysis.

As for the interviews, we developed a problem-centred, semi-structured interview guide (Flick, 2009). Questions were based on a list of proposed countermeasures identified in previous NIHS research (e.g., Burcharth et al., 2014; Gesing et al., 2015; Kathoefer and Leker, 2012; Katz and Allen, 1982) and our own findings from the first focus group. To explore our research questions, the final interview guide contained questions to identify: (1) symptoms of NIHS arising at different knowledge boundaries, (2) consequences of NIHS for individuals, projects, and companies, (3) solutions used by organizations to counteract problems caused by NIHS, and (4) shortcomings of existing counter-measures and managerial requirements for the selection and/or design of new strategies to counteract NIHS. To include R&D managers from a diverse set of organizations, interviews were conducted via telephone as well as in person. All interviews were recorded and fully transcribed. We continued to add new interviewees to our study until theoretical saturation was achieved. Charmaz (2014) describes that saturation is reached, when new data no longer provide new theoretical insights or reveal new relevant properties of the investigated constructs. We reached this point in our analysis, when we noticed that further

interviews yielded neither additional NIHS countermeasures, nor deeper insights into countermeasures already identified. The 32 interviews generated transcripts with an average of 9.5 full-text pages for a total of 305 pages.

Finally, in an effort to validate our emerging findings in the field, we presented and discussed our preliminary results with 20 European innovation executives from major organizations (such as Bayer, Vodafone, and 3 M) as part of an extensive full-day meeting. This provided further external validation of our findings.

5.2. Data analysis

After transcribing the interviews and focus group meetings, we based our qualitative data analysis on the sequential approach to coding and categorization by Miles and Huberman (1994). The first step of our data analysis comprised data reduction. For this, the first author of this paper selected all text paragraphs that seemed relevant to the general topic of NIHS. After initial marking of the relevant materials, we discarded unnecessary text elements. To ensure no potentially insightful data was dismissed, the discarded text was reinterpreted by two authors, with the research questions serving as a guideline. The second step involved a hybrid coding approach of all selected paragraphs, involving more inductive, open coding, and deductive coding with a priori codes (Saldana, 2013). Led by our research questions, the a priori codes comprised symptoms, consequences of NIHS, and potential countermeasures. This enabled us to structure the data according to our research questions but still be flexible enough to identify potentially relevant and novel findings. After coding the data individually by two authors, we compared the coding schemes and discussed the differences (i.e., different codes for the same text; no code from one author but a code from the other). Arriving at a consensus, we continued with the third step of our analysis. This comprised in-depth axial coding of the pre-coded paragraphs, with individual sentences as unit of analysis. These codes were more specific and helped to identify relationships and differences between individual instances. As an example, we applied the code *"staff rotation"* as sub-code for "countermeasure", to an instance in which management intended to counteract NIHS by switching members between different R&D teams. We assessed each counter-measure regarding: (1) the predominant target process of organizational learning as conceptualized in the 4i model, (2) its type of being a *direct* or *indirect* countermeasure, (3) its focus being either *specific* to a particular knowledge domain or a research project or *generic* in the sense of domain- or project-independent, and (4) its contribution to developing individual learning capabilities to mitigate NIHS. For this assessment, the first three authors individually assigned each

Table 3
Typology of Established Countermeasures to NIHS.

Name	Description	Exemplary Quote	Occurrence in Interviews	Target Process	Sub-Process	Focus	Capability Development
Staff rotation	Rotate project members to ensure a new team composition for each project. This inhibits development of detrimental group dynamics	"We try to rotate our engineers from project to project…"	9	Feedback	Integrating	specific	no
Outside Individuals	Engage outside experts in all project stages to include rigorous "reality checks". Give voice to all project members: integrate diverse perspectives and allow controversial opinions	"For some projects, we have someone experienced, but currently is not involved in the project take a critical look at it"	14		Interpreting Integrating	specific	no
Performance Management	Use incentives or authority to foster desired behavior	"As a last resort we give them the choice to be reasonable and do their job, or face the consequences…"	18		Integrating Institutionalizing	generic	no
Boundary Spanners	Appoint boundary-spanning individuals who mediate between project members and promote external knowledge	"When it comes to major changes over extended periods, an expert and intermediary gets the responsibility to promote the new technology among our development teams"	12		Interpreting Integrating	specific	no
Goal Setting	Allocate clear, mutually exclusive tasks and responsibilities for different project members.	"At the beginning of the project we make sure to jointly define our goals. […] and define each parties' roles and responsibilities"	25		Integrating Institutionalizing	generic	no
Contact	Increase exchange and contact between all project participants by frequent meetings or team trainings.	"…we are trying to work together more as a group, so we have many, many meetings"	32		Interpreting Integrating	specific	no
Social Learning	Foster social learning from colleagues, supervisors, or promoters of new ideas	"Sometimes, if colleagues complete a very successful project, management positions the team as role models for good collaboration"	7		All Processes	generic	slow
Checklists	Implement checklists and idea rankings to institutionalize behavior	"We have special selection processes when deciding which proposals get funding for further development, especially when externals are involved"	13		Interpreting Integration Institutionalizing	both	no
Information Control	Tailor information conveyance about external partners to account for biasing attitudes.	"When we want to promote a promising new idea, but know that the source is likely to trigger conflicting views, we are very cautious about the information we communicate, and tend to disclose some specifics at much later stages"	5		Interpreting Integrating	specific	no
Education	Teach all organizational members about the symptoms, consequences, and available countermeasures for NIH	"I think it is important to inform your team about NIHS and teach them to question themselves more often in situations involving externals"	8	Feed forward	Interpreting	generic	no
Open Innovation Practices	Integrate crowdsourcing, competitions, and prizes to open boundaries of the organization to encourage external knowledge exchange.	"Recently, we reached out to an open innovation intermediary to post one of our production problems. We intend to open up to more external input."	10		Integrating Institutionalizing	generic	no
Persuasive Attitude Change	Change attitudes by confronting team members with the value of external knowledge through media or campaigns, and by stimulating and maintaining success stories of working with external knowledge.	"Some of our developers are quite narrow-minded. My supervisor uses all sorts of arguments and examples trying to convince them to open up and change their mind-set"	24		Intuiting Interpreting	both	slow
Innovation Climate	Change innovation climate to promote openness, positive change, and new ideas	"We encourage our employees to try new things and reach out to seek for new ideas. You know, to develop a more open, startup mentality"	27		All Processes	generic	slow

countermeasure to one of the two target processes of feed forward and feedback as well as to one or more of the 4i sub-processes. Discussions among authors helped to establish consensus.

5.3. Findings

All of our 32 informants recall at least one instance of NIHS that led to negative consequences for their organization. One interviewee recalls: "*If you are a young engineer, relatively new from the university and present them new technologies, which they don't know, then it's just difficult to convince them that they are really good and should be used. There is more this attitude: We can't do that; we've never done it that way and it'll never work out*". The consequences comprise delay or cancellation of projects and result in additional expenses for the organization. As one interviewee revealed: "*The rejection had the consequence that we were clearly behind our shared project schedule. Mostly, the project gets delayed again or sometimes the projects are cancelled because of that [rejection].* As "*This happens quite often, to be honest*", each interviewee recalled several attempts to counteract NIHS.

Table 3 presents the 13 established countermeasures of NIHS ranging from staff rotation to innovation climate that we identified through our interviews and focus group meetings.

As we depict in Table 3, each countermeasure can be assigned to feedback or feed-forward processes and one or more of the 4i sub-processes of intuiting, interpreting, integrating, and institutionalizing. We also indicate whether the countermeasure is generic or specific to a knowledge domain or project, whether it is a direct or an indirect countermeasure, and whether it helps to develop durable learning capabilities or not. Staff rotation, for instance, may help to prevent detrimental group dynamics such as group think. It is, thus, a direct countermeasure preventing negative attitude development or aiming at changing negative attitudes. Staff rotation may help to decrease barriers between organizational groups, thus facilitating organizational learning especially during the process of integrating. The focus of staff rotation in reducing NIHS is more specific than generic, as it may only prevent NIHS under specific conditions that involve knowledge exchange between certain organizational groups or project teams. In comparison to the focus of more generic methods, the effect of staff rotation utilized in one setting may not translate to other settings, such as collaborative innovation from our VDMA case. Finally, staff rotation may not be able to induce any pronounced and lasting change in individuals' cognition and action. This method therefore does not help to develop the individual capabilities required for sustained organizational learning. Overall, our analysis yielded insights into the use of all 13 NIHS countermeasures in R&D practice (RQ 1).

5.3.1. Prevalence

First, our analyses revealed that only few of these 13 countermeasures are systematically employed in practice. Indeed, simple meetings to facilitate face-to-face contact and knowledge exchange between participating project members are the only NIHS countermeasures that are widely used among many participants and in many projects. Formal meetings and informal interactions amongst members provide a mechanism to become acquainted with each other, which tends to diminish perceived foreignness (Pettigrew and Tropp, 2006). Here, frequent contact serves as a mechanism to form more positive attitudes and reduce prejudice against external knowledge. However, these meetings are, in many cases, considered to be relatively superficial attempts to change behavior.

5.3.2. Focus

Second, the 13 countermeasures we identified address NIHS in different sub-processes of organizational learning. Changing the innovation climate of the organization, for instance, may affect all 4i sub-processes. Such a climate facilitates the search for new opportunities and ideas as part of intuiting. The parallel promotion of openness also

helps individuals and groups to interpret, integrate, and institutionalize new ideas more readily. Job rotation, in turn, aims at counteracting NIHS primarily during the process of *integrating* when it impedes learning between groups (Schilling and Kluge, 2009). Rotating group members on a regular basis inhibits the development of group resistances and facilitates knowledge exchange between groups. During the process of *institutionalizing*, NIHS can be circumvented by rigid goal-setting and assigning clear tasks and responsibilities, which helps to structure and formalize behaviors of organizational members. Overall, NIHS countermeasures are used primarily to prevent NIHS during *interpreting* and especially *integrating*. Fewer methods target *institutionalizing* and only three *intuiting*. This is critical given the cascading effect of NIHS on external knowledge absorption, where biases in earlier processes will shape all subsequent processes. Moreover, for the purposes of our research, the interviews revealed that only four of the 13 countermeasures were used to improve feed-forward sub-processes of organizational learning. The other countermeasures mainly relate to feedback processes of organizational learning. Among these, all qualified as direct NIHS countermeasures seeking to affect NIH attitudes directly. Of all 13 countermeasures, only incorporating outsiders, implementing project-specific boundary spanners, and actively managing information can be seen as indirect measures that seek to mitigate the negative behavioral consequences of NIH attitudes. These indirect measures, however, relate to learning processes in the feedback loop of organizational learning.

5.3.3. Applicability

Third, we also unearthed that the perceived applicability of each countermeasure is generic for some and highly domain-specific for others. Relying on boundary spanners to connect and mediate between different groups of an R&D project is an example of a specific NIHS countermeasure, as it may help to mitigate NIHS between affected groups during the project but may not be effective in future projects with differing project content and participants. A more generic countermeasure in contrast, such as a change of innovation climate to promote new ideas and learning, will help to contain NIHS across contexts.

5.3.4. Capability

Fourth, we detected considerable differences in the extent to which the 13 countermeasures contribute to developing individual capabilities to mitigate NIHS. In our view, sustainable approaches that prevent NIHS from materializing in the future either need to work as indirect means preventing NIHS attitudes from biasing behavior or need to trigger long-term changes in individual cognition and action. As a case in point, improving the innovation climate may alter cognition and action of individuals in the long turn, thereby fuelling capability development. However, climate change requires time and effort to implement, and does not serve as a short-term fix for NIHS.

Overall, these findings shed some light on the use of NIHS countermeasures in actual practice (RQ 1). We find 13 NIHS distinct countermeasures that were actively used by our interviewees. These differ largely in their prevalence, ranging from being used by five out of 32 interviewees to being used by all interviewees. Importantly, they also differ in their nature with a pronounced focus on feedback processes, later interpreting and integrating sub-processes and direct countermeasures to trigger an attitude change often without enabling individual learning. Inducing a change in the attitude towards external knowledge requires considerable resources and will take time to create any desired attitudinal effect (Petty et al., 1997). There is hence a clear lack of NIHS countermeasures that are effective in the short run and support individual capability development. This holds true especially for individual level intuiting, where NIHS is likely to be particularly prevalent and detrimental due to the cascading effect described above. Individual level debiasing approaches from the literature on cognitive psychology and behavioral economics, among which especially perspective taking, meet these requirements. Despite not yet being widely

used in practice, they promise to be effective at debiasing NIH attitudes already at the critical intuiting stage of organizational learning.

6. Study 2: examining the effectiveness of perspective taking

6.1. Sample and data collection

To test our hypotheses and examine whether perspective taking truly reduces the NIHS effect, we conducted a complementary quantitative study located in the context of R&D projects. In 2016, we contacted a random sample of 5000 R&D professionals that had submitted technical solutions to problems that had remained unsolved internally via a leading open innovation intermediary. Personalized emails were sent to all study participants inviting them to take part in an online survey about their R&D project experiences. In that email, we did not make any connection to the leading open innovation intermediary and asked participants about their experience in general R&D and collaborative projects. As a reward, all participants were entered into a draw to win 1 of 50 gift cards with a value of 20 USD. In addition, participants were eligible to receive a personal benchmark report. We received useable data for 565 global R&D projects. This corresponds to a response rate of 12 percent after accounting for non-deliveries.[3] As we explain in more detail further below, for each of the 565 R&D projects, we collected quantitative data especially on NIH attitudes, external knowledge absorption, and project performance as well as on our individual learning capability and debiasing technique perspective taking. Using descriptive and inferential statistical techniques, we sought to examine the effectiveness of as an exemplary indirect NIHS countermeasure in global R&D (RQ 2).

As part of the online questionnaire, participants were asked to think about a recent project, in which they had worked together with an external partner. Participants then had to describe the nature of the project and the project partner in one sentence. All subsequent questions in the online questionnaire referred to this selected project and project partner. Typical projects included the development of new products, services, or processes requiring a certain degree of external technological input. The average project involved 13 project members and was characterized by medium to high complexity.

6.2. Measurement

Unless stated otherwise, all constructs were measured using a 7-point Likert scale with item response scales ranging from 1 ("strongly disagree") to 7 ("strongly agree").

6.2.1. NIHS

We measured NIHS using a semantic differential scale. Semantic differentials are established measures to evaluate the degree of favorability of attitude objects (Ajzen, 2001; Karpinski et al., 2005). They are especially effective to overcome acquiescence bias leading to the tendency to respond positively to Likert-type questions (Friborg et al.,

2006). In contrast to Likert-scales, semantic differentials do not impose the direction in which the respondent needs to answer. Individuals with a negative attitude towards an attitude object, for example, might have problems responding to an item that is framed positively, as this negation constitutes a counterintuitive response (Friborg et al., 2006). Semantic differentials provide respondents with an opportunity to choose both the direction and intensity of their response. This makes semantic differentials particularly suitable for measuring attitudes (Chin et al., 2008).

Our semantic differential scale is based on six word pairings (positive-negative, relevant-irrelevant, trustworthy-untrustworthy, detailed-superficial, high quality-low quality, convincing-unconvincing), that followed a short question: *"Please indicate how you would evaluate the information (data, suggestions, technical know-how, guidance,…) you received from the project partner in general".* To develop the word pairings, we were inspired by previous studies on NIHS and their description of the phenomenon (e.g., Antons and Piller, 2015; Antons et al., 2017; Burcharth et al., 2014; Mehrwald, 1999), as well as measures of other attitudes (Karpinski et al., 2005) and stereotypes (Huetten et al., 2019). We chose word pairings that reflect appropriate attribute dimensions of knowledge content. We conducted several checks for convergent validity.[4]

The differentials yielded values from -3 to $+3$, with positive values indicating higher levels of NIHS, and negative values corresponding to more positive attitudes towards knowledge from the project partner. We later transformed the scale to a 7-point Likert scale (values of -3 corresponding to 1; values of $+3$ corresponding to 7) for ease of interpretation of the scale. To compute the actual NIHS values of the survey participants, we calculated the average of the six items (Cronbach's $\alpha = 0.94$). The items of the scale are attached (see Appendix 2).

6.2.2. Knowledge absorption

In order to capture the full range of behaviors that result in absorption of external knowledge, we built upon the scale developed by Antons et al. (2017) and extended it based on findings from our interviews. The scale comprised six items (1. *"I readily adopted the knowledge (data, suggestions, technical know-how, guidance, …) provided by the external project partner."* 2. *"I successfully integrated the knowledge provided by the partner into my task."* 3. *"I went out of my way to implement the project partner's ideas."* 4. *"I adapted my way of working following the partner's recommendations."* 5. *"I tried to gain as much knowledge as possible from the partner's expertise."* 6. *"I made sure to thoroughly understand everything the partner explained to me."*) that followed a short introductory question: *"To what extent do you agree with the following statements regarding the specific project and input from the external project partner?".* Items 3 and 4 were not part of the original scale. We added them to account more strongly for all sub-processes of the 4i framework. As such, the new items are explicitly related to integrating and institutionalizing. Knowledge absorption was then computed as the

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[3] In order to check for potential non-respondent bias, we pursued three avenues. First, we followed standard practice (Armstrong and Overton, 1977) and compared early and late respondents on key variables of our model. We found no differences between early and late respondents for our dependent, independent, mediator, and moderator variables. Second, we compared the demographics of our sample to the entire population of professionals registered at the leading open innovation intermediary. We found that our sample is broadly representative with regards to distributions of education, age, and gender. Only with regards to professional experience, we found a difference (our sample possesses on average 22.5 years compared to 26.9 years of the population). However, this still is in a similar range. Third, we compared demographics of our sample to other samples of published studies on R&D projects. This revealed that our sample is similar in terms of age (Leenders and Wierenga, 2002), team size (Siebdrat et al., 2014), as well as tenure and gender (Schmidt et al., 2009).

[4] The NIH attitude scale underwent a thorough scale development process. Here, we relied on attitudes towards special knowledge domains (management and mechanical engineering) to develop the scale (Antons et al., 2017). First, we followed Antons et al. (2017) and applied an Implicit Association Test to check for convergence with our scale. Second, we used a feeling thermometer (Greenwald et al., 1998) as an explicit attitude scale ("Please indicate your general level of warmth or coolness towards the following knowledge domain:" 7-point scale from "very cold" to "very warm"). Third, we used a scale to evaluate preferences for knowledge domains (7-item Likert-scale). The second and the third measure were used twice for the two different knowledge domains. We, then, computed the differences between the respective values and correlated them with our semantic differential scale. Correlations of r = .44 with the Implicit Association Test as well as r = .59 and r = .63 with the other explicit attitude scales point to a satisfactory convergent validity of the NIHS scale as an attitude measure.

simple mean across these six items (Cronbach's α = 0.76).

6.2.3. Project success

We applied a four-item scale used by Dvir and Lechler (2004) and based on Pinto (1986). Here, project success is conceptualized as consisting of overall project efficiency *("the project had come in on schedule", "the project had come in on budget")* and project effectiveness as reflected by customer satisfaction *("the clients were satisfied with the process by which this project was completed", "the clients are satisfied with the results of the project")* (Cronbach's α = 0.80). For ongoing projects, the items were reformulated to measure predicted project efficiency (e.g., *"the project is likely to come in on schedule/budget"*) and customer satisfaction (e.g., *"the clients are likely to be satisfied with the results of the project"*). In line with the originating article, we computed project success as the mean of these four items (Cronbach's α = 0.69).

6.2.4. Perspective taking

We included a four-item perspective taking measure into our questionnaire. The items were based on the scale by Grant and Berry (2011) and aim to measure an individual's tendency to consider the project partner's perspective during the project *(During the project, …" …I frequently tried to take the project partner's perspective", "…I often imagined how the project partner is feeling", "…I made an effort to see the world through the project partner's eyes", "…I regularly sought to understand the project partner's viewpoints")*. Again, we computed the mean across these items to generate our measure of perspective taking (Cronbach's α = 0.83).

6.2.5. Control variables

The control variables comprised individual, project, and firm-level variables. Individual level control variables included the respondent's age, total work experience, gender, and education (undergraduate or similar, graduate, doctorate). We included experience because tenured professionals seem to be more prone to NIHS (Katz and Allen, 1982). The reasoning for including education is that education will be a stronger part of the self-image the higher the level of education, which in turn might foster negative attitudes (Antons and Piller, 2015). Project-level control variables consisted of project size (number of members involved in the project) as smaller teams might be more prone to effects of cohesion, project leadership (own company or partner) since projects led by external partners might be more exposed to NIHS, project status (ongoing or completed), project type (development of new offerings or improvement of existing offerings), project content (product, process, service), and project complexity as R&D professionals will be less inclined to draw on external input the lower the level of complexity. (Ahmad et al., 2013). Finally, at the firm-level, we controlled for industry type.

6.3. Findings

Table 4 displays descriptive statistics for all variables. On average, participants ´reported relatively low NIHS attitudes indicating a generally open mindset towards external partners' knowledge (mean of 2.23, SD of 1.1). Compared to other studies on NIHS, the mean in our study is relatively low. Kathoefer and Leker, 2012 report a mean of 3.3. (SD 8.83) on a 7-point scale. Burcharth et al. (2014) document an average of 2.8 (SD 0.94) on a 7-point scale. Antons et al. (2017) report a mean of 33.9 (SD 12.5) on a 1 to 100 slider scale. Our average, however, is remarkable consistent with the average of the open innovation culture sub-sample in Herzog and Leker (2010). They report an average of 2.42 (SD 0.94) on a 7-point scale. For their closed innovation sample, they report a mean of 3.7 (SD 1.07). This similarity is by no means surprising, as our sample contains collaborative R&D projects that already involve an external partner. That is, we are essentially studying open innovation projects, where we expect NIHS attitudes to be considerably lower than in innovation projects more generally. That said, we are investigating a conservative sample where NIHS should be less of an issue. However, we also observe very high values of NIHS. Overall, 56 projects in our sample exhibit NIHS levels well above the scale value of 4 (neutral attitude). Two projects, for instance, report the maximum NIHS of 7. Eight additional projects report very high NIHS values between 6 and 6.5.

As for the correlations, NIHS is strongly negatively related to knowledge absorption behavior (r = −0.37) and perceived project success (r = −.28). The individual learning capability perspective taking has a mean of 5.24 on a seven-point Likert-scale (SD .99). Perspective taking is positively correlated to external knowledge absorption (r = .30). With regards to project success, perspective taking shows a moderately strong correlation (r = .19).

To test our hypotheses, we used the popular PROCESS macro developed for SPSS (Hayes, 2017). PROCESS is based on ordinary least squares regression-based path analyses and has been designed explicitly to analyse causal mechanisms and their contingencies. As such, it allows to model conditional mediation processes, that is, moderated mediation as we posit in Hypothesis 2. The full set of control variables are included in all analyses. We standardized all continuous independent variables prior to our analyses. Checking for multicollinearity, we found average variance inflation factors of 1.83 for Model 3 (all single factors below 5.3) and of 1.88 for Model 6 (all single factors below 5.4), which is well below the common threshold of 10. Moreover, we used a condition number test, which had values of 22.4 for Model 3 and 28.4 for Model 6, with the industry dummies exhibiting the highest values. Together, these tests imply that multicollinearity is not a serious concern in our analyses. To account for potential heteroscedasticity, we run all analyses with robust standard errors.

Table 5 displays the results from the moderated mediation regression models that explain variance in knowledge absorption behavior and project success, respectively. Model 3 in Table 5 reveals that NIH attitudes are negatively associated with external knowledge absorption (b = −0.338, p < 0.01). This analysis also allows us to quantify the size of the NIHS effect in our sample of global R&D projects. Specifically, we found that external knowledge absorption decreases by 6.12 percent (or 0.338 points) for every one standard deviation increase in NIHS (1.097 points or 15.67 percent). As indicated in Model 6, lower

Table 4
Descriptive Statistics.

Variable		Mean	S.D.	Min	Max	1.	2.	3.	4.	5.	6.	7.	8.
1.	Age	46.81	12.85	0	85	1							
2.	Total Work Experience	22.54	12.44	0	65	0.89	1						
3.	Project Size	13.22	15.15	1	125	0.04	0.06	1					
4.	Project Complexity	5.26	1.07	1	7	0.05	0.07	0.18	1				
5.	NIH Attitude	2.23	1.10	1	7	0.00	−0.01	0.04	−0.07	1			
6.	Knowledge Acquisition	5.52	0.89	1	7	0.02	0.01	−0.07	0.20	−0.37	1		
7.	Perspective Taking	5.24	0.99	1	7	0.04	0.05	0.05	0.18	−0.09	0.30	1	
8.	Project Success	5.35	1.03	1	7	−0.06	−0.03	−0.02	0.12	−0.28	0.27	0.19	1.00

Notes: N = 565. Dummy variables not included. All correlations > 0.08 are significant on at least a 5% level.

Table 5
Moderated Mediation Analysis.

Dependent Variable	Knowledge Absorption			Project Success		
Model No.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	−.606** (.286)	−.505* (.266)	−.563* (.318)	5.136*** (.304)	5.220*** (.292)	5.334*** (.314)
Control Variables						
Age	.067 (.090)	.091 (.084)	.078 (.065)	−.226** (.092)	−.245** (.096)	−.246*** (.075)
Gender	−.011 (.112)	−.056 (.104)	−.082 (.114)	−.086 (.119)	−.123 (.114)	−.111 (.123)
Total Work Experience	−.052 (.096)	−.076 (.089)	−.081 (.073)	.166* (.098)	.186* (.102)	.184** (.092)
Education Dummies	INCLUDED	INCLUDED	INCLUDED	INCLUDED	INCLUDED*	INCLUDED*
Project Size	−10.505* (5.806)	−8.616 (5.405)	−10.192** (5.218)	−1.292 (5.928)	−2.868 (6.182)	.661 (6.402)
Project Complexity	.212*** (.041)	.186*** (.038)	.136*** (.036)	.110*** (.042)	.132*** (.044)	.068 (.045)
Project Content Dummies	INCLUDED	INCLUDED	INCLUDED	INCLUDED	INCLUDED	INCLUDED
Project Status Dummies	INCLUDED***	INCLUDED	INCLUDED***	INCLUDED**	INCLUDED***	INCLUDED***
Project Type Dummies	INCLUDED	INCLUDED*	INCLUDED**	INCLUDED	INCLUDED	INCLUDED
Project Leadership Dummies	INCLUDED	INCLUDED	INCLUDED	INCLUDED	INCLUDED	INCLUDED
Industry Dummies	INCLUDED	INCLUDED	INCLUDED	INCLUDED	INCLUDED	INCLUDED
Main Effect						
Not-Invented-Here Attitude		−.364*** (.039)	−.338*** (.046)		−.303*** (.043)	−.221*** (.050)
Moderator and Interaction Effect						
Perspective Taking			.256*** (.041)			
NIH X Perspektive Taking			.090*** (.032)			
Mediator						
Knowledge Absorption						.227*** (.053)
N	565	565	565	565	565	565
F	3.219***	9.243***	10.412***	2.259***	5.633***	6.736***
Adjusted R-Squared	.052	.180	.281	.030	.110	.170

Notes: Moderated mediation analysis explaining project success by NIHS mediated by knowledge absorption with moderator perspective taking.
Robust standard errors in parentheses. For Model 3, average VIF = 1.83, all single factors below 5.3; for Model 6, average VIF = 1.88, all single factors below 5.4.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

external knowledge absorption is associated with lower project success (b = 0.227, p < 0.01). Using a bootstrap test with 10,000 replications (Shrout and Bolger, 2002), we find a significant indirect effect (b = −0.077; CI[−0.123; −0.038]). Together, this supports our Hypothesis 1 that knowledge absorption mediates the negative relationship of NIHS and project success.

With regards to perspective taking as an individual learning capability and debiasing mechanism, we found in Model 3 that *perspective taking* is directly linked to increases in knowledge absorption behaviors (b = 0.256, p < 0.01). Importantly, the interaction term between NIHS and perspective taking is positive and statistically significant in Model 3 (b = 0.090, p < 0.01). Fig. 2 plots the interaction effect of

Fig. 2. Interaction effect of NIHS and Perspective Taking.

perspective taking and NIHS attitudes. Compared to low perspective takers, we find that having a strong perspective taking capability is associated with a less negative relationship between NIHS and knowledge absorption.

Finally, we investigate the conditional indirect effects of high and low perspective taking to test whether the individual learning capability of perspective taking moderates the mediation established earlier. We find that the conditional indirect effect of having a low perspective taking capability (b = −0.097; CI[−0.152; −0.047]) is more negative than the conditional indirect effect of being a strong perspective taker (b = −0.056; CI[−0.101; −0.023]). As such, we uncover that perspective taking is linked to attenuating the indirect effect of NIHS. Using the index of moderated mediation (Hayes, 2015), we find that this effect is significant (index = 0.020; CI[.0004; .0389]). This supports our Hypothesis 2, which states that perspective taking will attenuate the negative indirect effect of NIHS.

6.4. Robustness checks

We conducted a number of robustness checks. Here, we replicated our analyses using alternative model specifications and estimators. We ran four different model specifications. (1) We tested whether our results are robust for excluding the control variable. (2) As small teams might have a stronger team cohesion and, thus, might develop a stronger identification, we replicated our analyses based on a subsample composed of R&D projects with less than five team members.
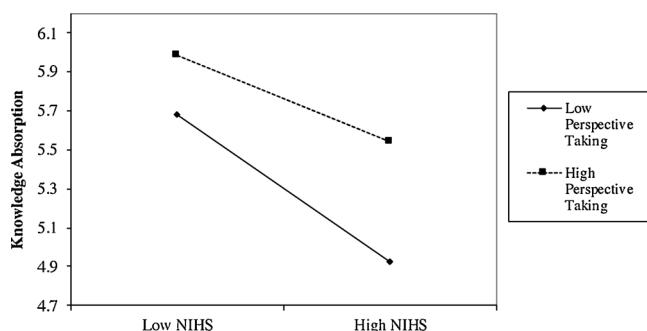
(3) For less complex projects, people are arguably more likely to perceive themselves as experts and consider external knowledge as not desirable (Antons and Piller, 2015). We, therefore, replicated our analyses for teams with less than average project complexity. (4) As we extended the original scale to measure knowledge absorption by Antons et al. (2017) adding two items, we replicated our analyses with the original 4-item scale (both scales exhibited a correlation of r = .906). Regarding the estimator, we used a Tobit regression to re-estimate Models 3 and 6 reported in Table 5. These additional analyses yielded highly consistent results, reflecting the robustness of our findings.

7. Discussion

Open innovation and crowdsourcing rely on knowledge sharing across organizational boundaries to fuel organizational learning and performance. The objective evaluation of external knowledge is therefore a critical and complex managerial challenge (West et al., 2014). The 4i framework of organizational learning allowed us to develop a novel process perspective on NIHS that deepens understanding of how NIHS impedes the various sub-processes of organizational learning. Our theorizing points to the cascading effect of NIHS on organizational learning, suggesting that NIHS tends to be most critical for overall knowledge absorption in the feed-forward processes of intuiting and interpreting. This allows us to derive key requirements for effective NIHS countermeasures, namely to help contain biases especially during the initial individual-level intuiting and interpreting sub-processes. Ideally this is done in a way that is context independent, such that it can be applied across distinct external knowledge domains, as adapting a countermeasure to each and every knowledge domain would be impractical.

Our qualitative Study 1 showed that NIHS is a real managerial challenge for collaborative R&D and that a broad set of potential countermeasures are already employed in practice. Importantly, Study 1 revealed that established countermeasures are not designed to address NIHS at the initial intuiting and interpreting steps of the feed-forward process. This is important, because this is precisely where the negative effects of NIHS on external knowledge absorption and organizational learning are likely to be most detrimental. In our quantitative Study 2, we examined a new category of indirect NIHS countermeasures known as debiasing that addresses precisely this blind spot by containing the behavioral consequences of negative attitudes at the level of the individual. Our evidence from 565 global R&D projects indicated not only that NIHS is widely prevalent and highly detrimental to external knowledge absorption and overall project performance, but also that debiasing techniques – namely perspective taking – can indeed contain the negative effect of NIHS on external knowledge absorption. As learnable and trainable individual capabilities, debiasing techniques have the potential to attenuate NIHS in a broad range of contexts and circumstances. These methods are not only highly versatile but also comparatively inexpensive, increasing their managerial relevance and appeal.

7.1. Research implications

We see at least four contributions of this study to NIHS research. First, we advance the conceptual understanding of NIHS. Different studies have emphasized that NIHS is an under-theorized phenomenon despite its growing popularity and recent theoretical developments (e.g., Agrawal et al., 2010; Antons and Piller, 2015; Antons et al., 2016; Burcharth and Fosfuri, 2015). Our effort to integrate insights on NIHS and organizational learning more deeply has contributed to what we suggest is a novel process perspective on NIHS – one that pinpoints precisely where NIHS can take effect to impede organizational learning. This process perspective not only contributes to a more granular understanding of NIHS and its detrimental effects on external knowledge absorption and open innovation, but also strengthens the knowledge

base required for the design of effective countermeasures. Our process perspective clearly identifies how NIHS has the potential to impede the four sub-processes of organizational learning ranging from individuals' intuiting and interpreting of external knowledge inputs to their integration and institutionalization in organization-level activities, structures, and processes (Crossan et al., 1999, 2011). Importantly, any external knowledge filtered out in the initial intuiting and interpreting sub-processes will not be available for any of the subsequent sub-processes. We refer to this as the cascading effect of NIHS on external knowledge absorption and organizational learning. This has far reaching implications for the selection and design of effective NIHS countermeasures. As such, we contribute to both broadening and strengthening the theoretical foundations for research on NIHS in general and possible countermeasures in particular.

Second, our study adds to the growing evidence base on the detrimental effects of NIHS for external knowledge absorption (e.g., Antons and Piller, 2015; Burcharth et al., 2014). We reveal that external knowledge absorption decreases by 6.12 percent for every one-point increase in NIHS on the seven-point NIHS scale. As we demonstrate, reduced knowledge absorption behavior is associated with reduced project success. Simply put, R&D professionals not willing to absorb external knowledge will impair organizational learning especially at the initial intuiting and interpreting stages. As a result, relevant knowledge will not be assimilated and utilized (Antons and Piller, 2015). On a project and organizational level, under- or even non-utilization of external knowledge will undermine performance, as the introductory VDMA open innovation project and the quotes from our Study 1 illustrate. Our empirical results in Study 2 show that this is not a singular or isolated effect. These results can be judged as being rather conservative in the sense that Study 2 only involved collaborative research projects with external partners. Given these effects, the question of how to overcome NIHS and its negative consequences moves into focus.

Third, the vast majority of previous NIHS research has proposed several measures to overcome NIHS without testing their effectiveness empirically. These countermeasures include integrating employees into decision-making, restructuring teams and departments, rotating team members in and across projects, introducing adequate incentive systems, fostering mutual trust and partnership, and intensifying contact to external knowledge providers (Antons and Piller, 2015; Kathoefer and Leker, 2012; Katz and Allen, 1982). We built upon these efforts and pioneering empirical studies on NIHS countermeasures (Herzog and Leker, 2010; Burcharth et al., 2014; Burcharth and Fosfuri, 2015) to map NIHS countermeasures used in actual practice (Study 1) and test the effectiveness of perspective taking as a particularly promising exemplary indirect NIHS countermeasure largely underexplored in NIHS research and practice (Study 2). As such, our study showcases indirect NIHS countermeasures based on debiasing as a new category of NIHS countermeasures that can be applied to contain the behavioral implications of NIHS rather than changing the negative attitude itself.

Finally, our empirical analyses show that perspective taking helps to counteract NIHS by enhancing project members' willingness to absorb external knowledge even when exhibiting strong NIHS attitudes. Perhaps most notably, perspective taking elevates knowledge absorption behaviors of professionals with NIHS to a level comparable to professionals not displaying NIHS. This approach is consistent with prior theoretical work that alludes to the potential of perspective taking (Parker et al., 2008; Litchfield and Gentry, 2010). First, taking the perspective of the provider of the external knowledge influences the attitude activation processes directly, therefore attenuating the effect of attitudes on knowledge absorption. Second, perspective taking facilitates the knowledge elaboration and absorption processes (Hoever et al., 2012; Todd et al., 2011). Apart from containing possible NIHS attitudes, perspective taking also leads to a more careful evaluation of external knowledge. Adopting a second point of view requires the evaluator to consider a broader set of information and triggers a more holistic representation. Perspective taking stimulates sustained

organizational learning and helps to develop competitive advantage (Boland and Tenkasi, 1995). As a basic human capability, perspective taking can be applied by every employee of every organization. However, it is of special relevance to individuals in managerial positions, as prior research finds they lack perspective taking motivation (Galinsky et al., 2006). For individuals in highly influential positions, such predispositions may have severe consequences for organizational learning. It hence is important to motivate organizational members across levels and functions to engage in perspective taking.

7.2. Managerial implications

This paper contributes to managerial practice by providing evidence-based recommendations on how to counteract NIHS tendencies in organizations. Our two studies reveal a broad set of established NIHS countermeasures and perspective taking as an exemplar for a novel category of indirect NIHS countermeasures (Antons and Piller, 2015). These countermeasures differ substantially in terms of their focus of attention. Established direct countermeasures focus on altering the NIHS attitude gradually over time, while indirect countermeasures focus on containing the detrimental effect of NIHS, once it has emerged in an organization. At least initially, it appears tempting to focus entirely on established countermeasures, which are not only well-established, but also target the root cause, i.e., the negative attitudes themselves. That said, most of these countermeasures will be relatively costly and complex to implement with the intended attitude change taking time to materialize (Petty et al., 1997). When resources are limited and quick fixes needed, the debiasing approaches identified and validated in this study will be of particular appeal. Perspective taking was shown to exhibit a strong debiasing effect and might be the most sensible candidate for explicit piloting in an organizational setting.

A relatively simple way to explore and encourage *perspective taking* is to turn this debiasing technique into an organizational routine that is activated whenever faced with external knowledge. This can be encouraged by a set of straightforward questions such as: (1) How was the external knowledge or specific solution developed? (2) What could be its main selling point from the perspective of the solution provider? (3) Why did the external actor decide to share the respective piece of knowledge? (4) Why did they consider it to be potentially valuable? Moreover, team building workshops hold the potential to develop perspective taking skills, especially if the group is diverse in terms of the professional or functional background of its members (Hoever et al., 2012). Here, members might be asked to provide input to each other and to reflect upon it from the perspective of another member. Another methodology supporting perspective taking is using the 'Six Thinking Hats' approach, a methodology that requires team members to take on different roles during evaluations, group discussions, and decision-making (DeBono, 1999). Moreover, decision-making checklists are a well-known mechanism to create awareness of decision biases and enhance decision-making (Kahneman et al., 2011). Importantly, managers can use such a checklist to institutionalize the use of different perspectives in the team or organizational settings.

7.3. Limitations and future research

Both empirical studies are not free of limitations. Methodologically, our sample in Study 2 may be subject to a possible selection bias, as participants were free to select the project they reported on. Projects with neutral or negative outcomes may, therefore, be underrepresented in our sample. This is also reflected in the generally positive attitudes towards the project partners. Moreover, as a result of the correlational nature of Study 2, no actual debiasing manipulation could be tested, as we only measured respondents' general tendency to take the project partners' perspective during the project. To further validate our results, future work based on experimental methods would help to enhance the evidence base for perspective taking. Here, it appears plausible to

assume that the effectiveness of perspective taking varies as a function of the specific characteristics of the project, the problem it faces, or the organization it is embedded in. Future research should investigate these boundary conditions and replicate our findings under controlled conditions ideally as part of field experiments. A final methodological limitation may be the fact that we measured project success with a relative scale instead of an absolute measure. Although the scale was validated by previous studies, we cannot infer how NIHS or knowledge absorption relate to objective project outcomes such as excessive costs or project delays.

Conceptually, the novel process perspective on NIHS relies on several simplifying assumptions that could be relaxed in future theorizing. Most notably, we made a deliberate decision to focus our manuscript on the role of NIHS in feed-forward processes. That said, we acknowledge that NIHS can also affect feedback processes (e.g., when staff members devalue managerial knowledge and resist top management's change initiatives). However, the specific nature of the NIHS and the countermeasures to overcome it will tend to be quite different. We hence consider exploring NIHS in feedback processes as an important opportunity for future conceptual and empirical work. Moreover, we assume that feed-forward processes of organizational learning based on external knowledge unfold within a single focal organization. That said, the four sub-processes of organizational learning might also unfold across organizational boundaries in part at the level of a broader innovation network or ecosystem. This is likely to introduce a whole new set of challenges in knowledge absorption and arguably also additional types of NIHS. We hence call for future research to add a network or ecosystem perspective to our theorizing.

Perspective taking is also unlikely to exhaust the full set of indirect NIH countermeasures available to counteract NIHS. Indeed, Appendix 1 lists 23 debiasing techniques alone. As such, our paper marks the beginning of a potentially broader research stream on debiasing strategies to counteract NIHS. NIHS researchers and interested practitioners are invited to continue to investigate and develop additional countermeasures that seek to shape the behavioral consequences of basic psychological processes such as NIHS attitudes. For example, perspective *giving* is the natural counterpart to perspective *taking* (Bruneau and Saxe, 2012). It is the active effort of individuals to communicate their viewpoint, i.e., to share their perspective with someone else. Encouraging others to give their perspective facilitates this behavior best. Future research should investigate if, how, and to what extent the communication skills of external partners affect the evaluation of external knowledge.

Finally, focusing on social cognitive countermeasures to NIHS might be limited. Our conceptual analysis of NIHS as impeding organizational learning and our mapping of countermeasures to the 4i framework might also stimulate other scholars to think about different solutions to NIHS. Scholars interested in overcoming NIHS might therefore wish to review the 4i framework, the immanent organizational levels described therein (individual, group, organization), and our list of NIHS countermeasures presented in Table 3. This might lead future research to identify, develop, and empirically test other techniques to address NIHS on all levels of the organizational hierarchy and in all socio-psychological processes of organizational learning, including intuiting, interpreting, integrating, and institutionalizing.

8. Conclusions

Given the growing importance of knowledge sharing across boundaries, the challenge is to better understand how to overcome NIHS and its negative consequences. We propose a novel process perspective on NIHS grounded the 4i framework of organizational learning that contributes to strengthening the conceptual foundations for NIHS research and to deepening our understanding of the precise nature and location of the external knowledge absorption biases induced by NIH attitudes. Two essential meta-inferences emerged from our theorizing

and empirical studies. First, given its cascading effect, NIHS is particularly detrimental in early individual level intuiting and interpreting processes of organizational learning. Surprisingly however, this has not been the focus of attention among NIHS researchers and practitioners, even though a broad set of NIHS countermeasures have been examined in research and practice. Second, debiasing techniques – in particular perspective taking – promise to do precisely the job needed – namely to contain the behavioral consequences of individual attitudes, or as demonstrated in our specific case the negative effect of NIH attitudes on external knowledge absorption. We hope this will encourage further conceptual and empirical work on how to contain NIHS and related attitude-induced biases.

Acknowledgements

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.respol.2019.103822.

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