Mitigating not-invented-here syndrome in consultant knowledge transfer by developing appropriate implementation guidelines

Nikola Suzic, Petar Vrgović, Cipriano Forza and Mikela Chatzimichailidou

Abstract

Purpose – *This study aims to propose a framework for the development of implementation guidelines (IGs) that can help consultants mitigate not-invented-here (NIH) syndrome during a consultant intervention as a specific type of knowledge transfer.*

Design/methodology/approach – *The authors adopted a design science research approach for proposing an NIH-mitigating IG development framework. Inspired by findings and rich primary data from two consultant interventions, the authors, through theory building, ground five core principles in the general theory of NIH attitude functions. Finally, the authors revisit two consultant interventions to identify and describe mechanisms that led to the enactment of the principles.*

Findings – *The proposed framework provides five principles for developing NIH-mitigating IGs. The present research proposes that successful knowledge transfer and the mitigation of NIH syndrome as a prerequisite for this success are conditioned by adequately developed IGs.*

Originality/value – *The originality and value of the present research lie in the proposed NIH-mitigating IG development framework containing a set of principles for IG development as a proactive rather than reactive approach to NIH mitigation. To the best of the authors' knowledge, this is the first research to address the problematics of mitigating NIH syndrome in consultant knowledge transfer by focusing on developing appropriate IGs. By developing and implementing IGs based on the proposed framework, a more successful transfer of knowledge from consultants to clients should take place, thus, increasing the value that clients receive from consultancy.*

Keywords *Design science research, Implementation guidelines, Not-invented-here syndrome, Knowledge transfer, Consultant intervention, Consulting intervention, Participation*

Paper type *Research paper*

Nikola Suzic is based at the Department of Industrial Engineering, University of Trento, Trento, Italy.
Petar Vrgović is based at the Department of Industrial Engineering and Management, Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia.
Cipriano Forza is based at the Department of Management and Engineering, Universita degli Studi di Padova, Padova, Italy.
Mikela Chatzimichailidou is based at the Department of Transport, Rail Systems, Arup Group Ltd, London, UK.

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1. Introduction

The present research would like to contribute to the established theoretical stream of knowledge transfer. Knowledge transfer is an important area of knowledge management that is seen as a basis for competitive advantage in companies (Argote and Ingram, 2000; Goh, 2002). Specifically, the need for an organization to successfully transfer and absorb external knowledge has been clearly recognized in exploring innovative products and business opportunities (Laursen and Salter, 2006; Lichtenthaler, 2011). Knowledge transfer can be defined as "an area of knowledge management concerned with the movement of knowledge across the boundaries created by specialised knowledge domains" (Liyanage *et al.*, 2009, p. 122, based on Carlile and Rebentisch, 2003). In other words, "the conveyance of knowledge from one place, person or ownership [knowledge provider] to another [knowledge receiver]" is achieved (Liyanage *et al.*, 2009, p. 122). For knowledge transfer to be successful, the receiver must accumulate or assimilate new knowledge (Liyanage *et al.*, 2009).

Consultant intervention [1] is a specific type of knowledge transfer between the consultant (knowledge provider) and the client (knowledge recipient) (based on Jones *et al.*, 2023; Kilmann and Mitroff, 1979; Pellegrinelli, 1997). Consultants (academic researchers, independent consultants or consultant companies) are hired by clients to transfer knowledge from their expertise domain (Ko, 2010). In fact, a management consultant can be defined as "an independent professional advisory service assisting managers and organizations to achieve organizational purposes and objectives by solving management and business problems, identifying and seizing new opportunities, enhancing learning and implementing changes" (Kubr, 2002, p. 10). As such, consultants play a significant role in the innovation success of companies [e.g. in organizational innovation (Simao and Franco, 2018) and open innovation (Oliva *et al.*, 2022)].

Consultants can use various knowledge transfer tools (i.e. artifacts) to enact knowledge transfer (Engeström, 1999; Korbi and Chouki, 2017). Implementation guidelines (IGs) are one type of these tools usually provided by experts in the relevant field. IGs are a result of the design science research – DSR (van Aken, 2004; van Aken *et al.*, 2016; Dresch *et al.*, 2019; Hevner *et al.*, 2004) and are developed to transfer accumulated knowledge from a specific research field into practice (Suzić *et al.*, 2018a, 2018b). Since IGs are a written set of information and instructions for a specific concept implementation, they are not necessarily effective on their own (Bokinge and Malmqvist, 2012); they need to be properly used during the consultant intervention in an organizational setting and through human-to-human interaction to transfer knowledge (Figure 1). The characteristics of the IGs define the settings for the consultant intervention. Thus, although "[a] key component of IGs is how they are enacted" (Coughlan and Coghlan, 2008, p. 49), the final impact of the consultant intervention not only depends on the consultant's behavior during the intervention but is also conditioned by the characteristics of the IGs used.

Consultant interventions are not done in a vacuum, instead they "are set within existing frames of reference, beliefs, commitments and action patterns of their client organisations" (Pellegrinelli, 2002, p. 351). Moreover, achieving successful knowledge transfer is not easy (Argote and Ingram, 2000) and results vary between contexts and organizations (Argote, 1999; Szulanski, 1996). The literature on knowledge transfer also recognizes that "[t]he nature of the relationship between the knowledge recipients and the source of knowledge [knowledge provider] can sometimes be a barrier to effective knowledge transfer" (Goh, 2002, p. 27).

In fact, the research in social psychology shows that during the interaction with external entities and objects (in consultant intervention: consultant and IGs) attitudes of individuals (i.e. clients) "often affect decision making and lead to biased behavior" (Antons and Piller, 2015, p. 194 based on Ajzen, 2001; Bohner and Wänke, 2002). The most frequently mentioned bias in knowledge transfer that influences individual decision-making is the not-invented-here (NIH) syndrome first recorded by Clagett (1967). NIH syndrome is defined as "a bias triggered by the negatively shaped attitude of an individual toward knowledge that has to cross a contextual (disciplinary), spatial or organizational (functional) boundary,

Figure 1 Consultant intervention as a type of knowledge transfer

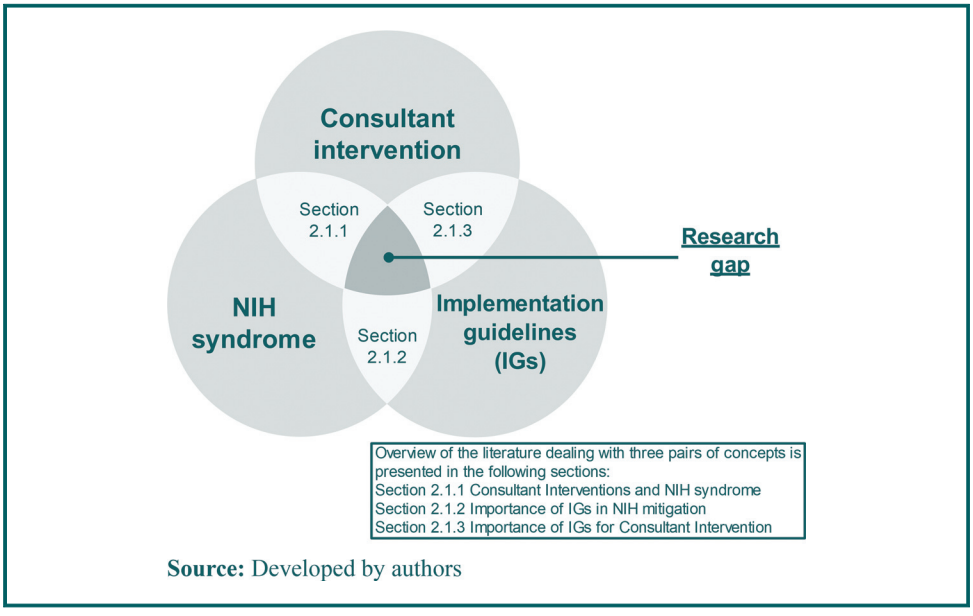
Source: Developed by authors

resulting in either its suboptimal utilization or its rejection as behavioral consequences of this attitude bias" (Antons and Piller, 2015, p. 197, based on Clagett, 1967; Kathoefer and Leker, 2012; Katz and Allen, 1982; Lichtenthaler and Ernst, 2006). Accordingly, the independent management consultant is seen as contextually, organizationally and sometimes spatially distinct from the client.

The relevance of the consultant intervention, NIH syndrome and IGs as separate research streams is confirmed by the attention researchers have given them. However, what has been reported above suggests that considering the three streams jointly we could get theoretical advancements important for practice. More specifically, we argue that the issue of NIH appearance hindering knowledge transfer from consultants to clients (i.e. consultant intervention) and the means how to do it (i.e. IGs) is relevant equally to independent consultants, consulting companies and academic researchers doing consultant interventions, client organizations and finally to the policymakers who are promoting knowledge transfer from research institutions to industry.

The research gap we are targeting, therefore, is positioned on the intersection of consultant intervention, NIH and IGs bodies of research (Figure 2). To better understand the need for researching this intersection, we can consider the limitations of the investigations that adopt each single stream's point of view. On the one hand, there is the knowledge transfer and consultant intervention literature that recognizes the importance of NIH mitigation for the effectiveness of knowledge transfer (Amann *et al.*, 2022; Antons *et al.*, 2017; Antons and Piller, 2015; Barakat *et al.*, 2022; Clagett, 1967; Kathoefer and Leker, 2012; Katz and Allen, 1982; Marzi *et al.*, 2023). However, the knowledge transfer stream of research overlooks IGs as potential tools for mitigating NIH in client companies, focusing instead on the consultant–client interaction to mitigate NIH. Albeit, some authors have recognized the importance of various artifacts for knowledge transfer (Engeström, 1999; Korbi and Chouki, 2017). On the other hand, IGs are tools developed to transfer accumulated knowledge from a specific research field into practice (Suzić *et al.*, 2018a, 2018b), so designed for knowledge transfer through consultant interventions. IGs research stream calls for IGs with specific characteristics (Coughlan and Coghlan, 2008; Ortiz *et al.*, 1999; Rouhani *et al.*, 2015), and for IGs to contain

Figure 2 Research gap



Source: Developed by authors

certain building blocks and clearly defined and presented implementation instructions (Suzić *et al.*, 2018a, 2018b). However, these characteristics and building blocks do not consider the possibility of NIH appearance as a consequence of IGs developed in a certain way. So, the IGs research stream aimed to support consultant interventions does not focus on NIH mitigation during the use of IGs, even though there are some articles mentioning resistance to change as a possible hindrance factor that can arise during the consultant intervention (Kudsk *et al.*, 2013). Thus, the disconnectedness of the three research fields is somewhat puzzling, since IGs are tools developed for consultant interventions, which in turn have a goal to transfer knowledge to the clients without the appearance of NIH.

A review we conducted on the relevant bodies of research showed that three main concepts (i.e. consultant intervention, NIH syndrome and IGs), although recognized as highly relevant and with rich research streams, have not been studied in ensemble and remain virtually disconnected (Figure 2). Nevertheless, we are convinced that it has little meaning to develop IGs without thinking about the possibility of rejection of the transferred knowledge (i.e. NIH). Vice versa, it has little meaning dealing with the NIH mitigation if IGs are developed in a way to lead to NIH appearance. Specifically, a theory on how to develop appropriate IGs that would mitigate NIH during the consultant intervention is missing.

Accordingly, we set the objective of the present research as follows:

> *To conceptualize, through theoretical core propositions, a framework that will enable subject matter experts (researchers and/or consultants) to develop implementation guidelines (IGs) that are, by their design, capable of mitigating NIH syndrome during the consultant intervention, thus, enabling successful consultant-client knowledge transfer.*

In the present research, we fulfill the stated objective by conceptualizing an *NIH-mitigating IG development framework*. Besides the *five principles for the development of NIH-mitigating IGs*, the framework provides operationalization of the principles, as well as an exemplification of the consultant's behavior, which should support knowledge transfer by preventing NIH syndrome. We suggest that IG developers should be guided by these principles when developing IGs to effectively mitigate NIH syndrome during a consultant intervention.

We follow a DSR approach (van Aken, 2004; van Aken *et al.*, 2016; Hevner *et al.*, 2004) – that is comprised of exploratory [2] and explanatory [3] parts (Holmström *et al.*, 2009). Specifically, the exploratory phase has been covered in previous research reported by Suzic and Forza (2023) where specific IGs have been developed and tested in the course of two consultant interventions. Based on rich primary data from these consultant interventions, we proceed with the explanatory research part and through theory building propose our framework. The research conducted is qualitative with the use of abductive [4] and deductive [5] reasoning (Mantere and Ketokivi, 2013). Thus, while using collected empirical evidence to abductively theorize different models for IGs development, we deductively derive our mid-range theory in the form of NIH-mitigating IG development framework from general theory of NIH attitude functions (Antons and Piller, 2015). Finally, we conduct a mapping exercise (drawing on Whetten's concept of mental tests – Whetten (1989) [6]) by revisiting the unpublished primary data from two consultant interventions to identify and describe the mechanisms that support enactment of the NIH-mitigating principles for IG development.

The contributions of the present study are manyfold. Specifically, we propose that the NIH-mitigating IG development framework:

- can enable subject matter experts to develop IGs that are, by their design, capable of mitigating NIH syndrome during the consultant intervention;
- proposes a proactive rather than reactive approach to NIH mitigation;

- represents an operationalization of the NIH attitude functions framework – essentially being the first framework to systematically address the issue of inappropriate development of IGs; and
- changes the current understanding of NIH syndrome appearance in consultant intervention by tracking the source of consultancy-induced NIH syndrome back to the development of the IGs.

Finally, through in-depth analysis of two consultant interventions (primary empirical data), the present study identifies and describes mechanisms that lead to NIH mitigation, supporting in this way the future development of DSR artifacts for knowledge transfer that can prevent appearance of NIH in consultant interventions.

The remainder of this article is organized into four sections. Section 2 positions the research within the relevant literature on consultant intervention (as a type of knowledge transfer), NIH syndrome and IGs. Section 3 provides information on research design and the methods used in the research. Section 4 proposes NIH-mitigating IG development framework. Finally, in Section 5, the main contributions of the research are discussed, the research limitations are addressed and possibilities for future research are proposed.

2. Research focus and the relevant bodies of research

The present section's goal is twofold. First, we make an effort to communicate the research focus, especially exhibiting how the present research differs from the available literature on NIH mitigation. Second, we review three relevant bodies of research (i.e. consultant intervention, NIH syndrome and IGs) which create our research gap (Figure 2) in an effort to make some initial connections between these mostly disconnected bodies of research.

2.1 Research focus

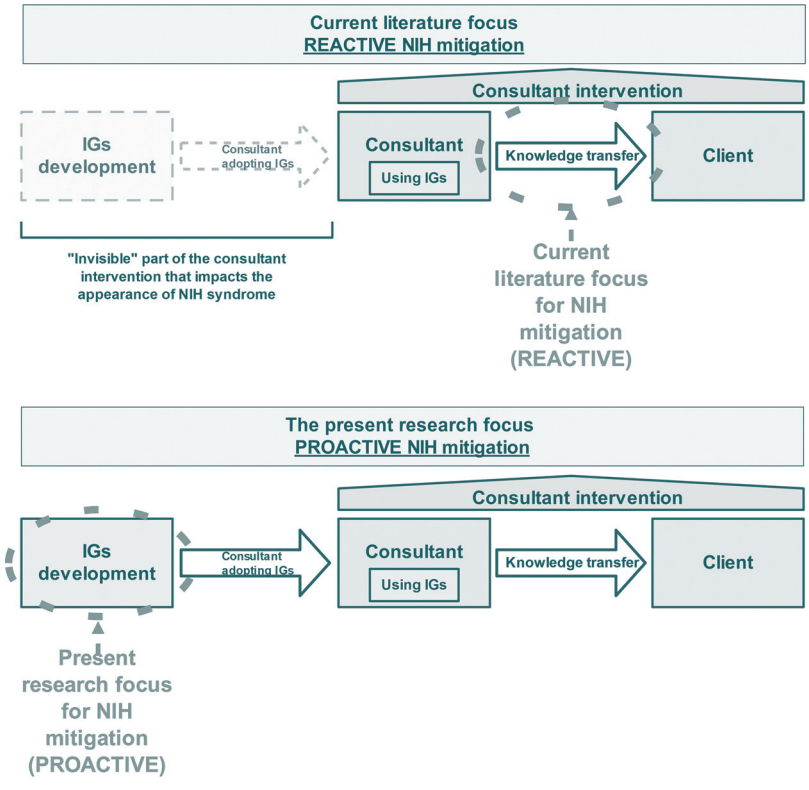
It is important to emphasize that the available NIH literature focuses on NIH mitigation during the consultant intervention (Antons and Piller, 2015; Clagett, 1967; Kathoefer and Leker, 2012; Katz and Allen, 1982; Lichtenthaler and Ernst, 2006) – Figure 3. This means that, although many times implicit, the literature proposes a reactive NIH mitigation (the upper part of Figure 3) – that is mitigation of NIH when the consultant is already in the company. Thus, we can say that in this view IGs development stays invisible and is practically neglected for the purposes of NIH mitigation.

The present research diverges from the available literature on NIH mitigation by shifting the focus from the consultant–client interaction to the development of the IGs themselves (the lower part of Figure 3). We argue that the first instance in which NIH syndrome can be mitigated in a consultant intervention is during the development of the IGs (Figure 3). In this way, we focus on applying a proactive approach to NIH mitigation. The rest of the research should be seen with this proactive approach to NIH mitigation in mind.

2.2 Literature review of the relevant bodies of research

The research gap as well as the main contribution of present research is positioned at the intersection of the three key concepts on which we built the theoretical basis: consultant intervention, NIH syndrome and IGs. The literature review showed that papers collectively addressing all three key concepts are missing. Thus, to set the theoretical background stage and position our research, in the present section, we review the available literature (Rowley and Slack, 2004; Seuring and Gold, 2012; Tranfield *et al.*, 2003) that is focused on pairs of the key concepts, namely:

Figure 3 Present research proactive NIH mitigation focus



Source: Developed by authors

- consultant intervention and NIH syndrome;
- NIH syndrome and IGs; and
- consultant intervention and IGs (Figure 2).

Thus, in the present research, we focused on the intersection of these three notions, but before making the valuable propositions that encompass all three of them, we will first discuss them in pairs and create initial links with the third one.

2.2.1 Consultant interventions and NIH syndrome. Management consultancy is an important research field with an impact on small and large businesses alike (Da Costa *et al.*, 2022; Hu *et al.*, 2019; Jones *et al.*, 2023). Cerruti *et al.* (2019), in an extensive review of management consulting literature, clustered the research field into three main areas: the consultant–client (C–C) relationship, drivers of management consultancy success and clients' demands, together with their perception of the consultant's role. In the present research, we are interested in the dynamics and aftermath of this C–C complex interaction (Karantinou and Hogg, 2001), observing how the activities that they carry out together result in organizational change. The complexity of the C–C relationship is exacerbated by the fact that it involves actors at different levels – both at an individual, personal level, where the consultant personally influences the client as a knowledge broker or a standards setter (Canato and Giangreco, 2011), and at the organizational level, where the consulting company and the client company engage in a mutual project to enact organizational change (Pellegrin-Boucher, 2006).

At its core, the C–C relationship is a transmission between a "knowledge provider" and a "knowledge receiver" (Avakian *et al.*, 2010). In the broadest sense, knowledge is transmitted from a source to a recipient (Weaver and Shannon, 1964), and, according to basic communication theory, as long as there is no significant "noise" in the system, the transmission will be successful. However, this theory does not consider the effect of the transmission – there is no interest in what the recipient does with the received knowledge after the transmission has been labeled successful. When humans communicate, myriad factors influence the final result of the transaction (Thomas and Carroll, 1981), and in the present research, we are especially interested in how the receiver evaluates the knowledge that was transferred, because this evaluation will surely influence the potential use of that knowledge. Research in the fields of innovation management, consultancy and human resource management has examined numerous cases in which human subjects have evaluated newly received knowledge as inferior to their own, not because they found that knowledge to be of questionable inherent value but merely because they considered the source of that knowledge as "external" and, thus, discredited the whole transaction process (Burcharth and Fosfuri, 2015).

This perception of "external" knowledge may lead to NIH syndrome, which was first elaborated by Clagett (1967). He witnessed frequent miscommunication and a lack of understanding between the product and development departments and other business units in a company and suspected that employees frequently build invisible barriers to fend off knowledge that they perceive as threatening to their current status quo. Thus, NIH syndrome was first recorded in knowledge transfer inside one organization.

Notably, the knowledge transfer literature recognizes the importance of NIH syndrome mitigation for successful knowledge transfer to occur. For example, Katz and Allen (1982) conducted an empirical study of the influence of NIH syndrome in stable project teams' communication with external sources of knowledge. Lichtenthaler *et al.* (2010) introduce an NIH-related concept of not-sold-here (NSH) that helps explain the varying degrees of activity in external knowledge exploitation. Buenstorf and Geissler (2012) research NIH in relation to technology transfer and patent licensing. Kathoefer and Leker (2012, p. 658) examine "the influence of the research discipline, the scientific output, the attitude towards basic science and the project experience on NIH by analyzing a sample of 166 Austrian professors from the fields of physics and engineering." Dabrowska and Savitskaya (2014) identify NIH as one of the key challenges in managing open innovation that have cultural roots. Arp and Lemański (2016, p. 257) study the negative impact that NIH has on "the mobility of ideas between multinational corporation (MNC) headquarters and subsidiaries." Building on their pivotal study on NIH in knowledge transfer (Antons and Piller, 2015) – which we present in detail later on – Antons *et al.* (2017) proceed with the development of measurements for NIH repeating that NIH "has been called one of the largest obstacles in innovation management." Weissenberger-Eibl and Hampel (2021) conducted a recategorizational intervention on the basis of the common in-group identity model to change employees' attitudes toward external knowledge. Amann *et al.* (2022) conducted a study to understand NIH and NSH in corporate innovation hubs on the absorption of external knowledge and toward sharing of internal knowledge externally. Barakat *et al.* (2022) research the effect of NIH on the absorption of knowledge generated by subsidiaries of multinational corporations. Finally, Marzi *et al.* (2023) study NIH in the context of willingness or reluctance to adopt open innovation in SMEs.

However, the knowledge transfer literature, in general, and consultant intervention literature, in particular (Jones *et al.*, 2023; Kilmann and Mitroff, 1979; Pellegrinelli, 1997, 2002; Ward *et al.*, 2009), do not deal with the IGs development. Thus, the link between the knowledge transfer and NIH syndrome on the one side and IGs on the other side is missing in the available literature.

Notably, NIH syndrome is not a phenomenon reserved to management consultancy and consultant interventions. For example, the critical effect of the externality of knowledge has

been reported in research on open innovation where "a company commercializes both its own ideas as well as innovations from other firms [external knowledge]" (Chesbrough, 2003, p. 37) to remain competitive (Cricelli *et al.*, 2023). Thus, in open innovation, like in consultant intervention, external knowledge is used to innovate products or processes. However, still many open innovation endeavors fail (Cricelli *et al.*, 2023; Dabić *et al.*, 2023). Specifically, Cricelli *et al.* (2023) conducted a broad analysis of the literature aimed to prevent the failure of open innovation initiatives. They conclude that, among causes related to the organizational culture, NIH syndrome is the main one leading to the failure of open innovation initiatives. Furthermore, Dabić *et al.* (2023, p. 6) argue that NIH has a "high potential to impact open innovation adoption negatively." Thus, the transfer of external knowledge is generally prone to NIH syndrome appearance.

Recently, in an effort to deeply understand NIH syndrome, Antons and Piller (2015) performed a comprehensive review of the NIH literature and identified three dimensions of knowledge externality that could lead to NIH syndrome: contextual, organizational and spatial (Table 1). Contextual externality considers the discipline from which the knowledge originates. Organizational externality considers the case where knowledge transferred from different organizations is seen as external. Finally, spatial externality refers to the geographic distance between the knowledge source and the receiver. Antons and Piller suggested that these three dimensions of knowledge externality create eight types of knowledge transfer, where "Type 1" is knowledge transfer that is completely internal, and "Type 8" is knowledge transfer that is completely external (i.e. knowledge is perceived as external in all three dimensions).

Interestingly, the consultant intervention falls into some of the least advantageous knowledge transfer types – Type 7 and Type 8 (Table 1). In Type 7 knowledge transfer, a consultant contextually comes from another discipline – for example, management – while the client might be from an engineering background. Even when a consultant comes from the same discipline as the client (e.g. they all have an engineering background), a consultant can be seen as coming from a different discipline by virtue of being a "consultant." In terms of organizational boundaries, the consultant is clearly not part of the company, so the consultant's knowledge is external. In Type 7, the spatial boundary is not active if the consultant is present in the company during the consultant intervention. As for the Type 8, external knowledge penetrates the client organization with even more difficulty because of high resistance in the client organization when all three boundaries act on the knowledge transfer process. Specifically, in Type 8, a consultant is also regarded as external from a spatial dimension point of view (e.g. doing the consultancy remotely).

2.2.2 Importance of IGs in NIH mitigation. The knowledge transfer is done with the use of knowledge transfer tools. According to Korbi and Chouki (2017, p. 1277) "to reduce

Table 1 Types of knowledge transfer based on dimensions of knowledge externality leading to NIH syndrome

Types of knowledge transfer	*Type of boundary*		
	Organizational (functional)	*Spatial (geographical)*	*Contextual (disciplinary)*
Type 1	Internal	Internal	Internal
Type 2	Internal	External	Internal
Type 3	External	Internal	Internal
Type 4	External	External	Internal
Type 5	Internal	Internal	External
Type 6	Internal	External	External
Type 7*	External	Internal	External
Type 8*	External	External	External

Note: *Consultant interventions (as the focus of the present research) fall under Type 7 and Type 8 knowledge transfer, where in Type 8 the consultant's knowledge is perceived as external in all three dimensions of externality
Source: Developed by authors based on Antons and Piller (2015)

knowledge-transfer difficulties, actors can resort to mediation through tools that facilitate discussion, learning, managing activities and innovation." Furthermore, Korbi and Chouki (2017), building on Engeström (1999), refer to knowledge transfer tools as artifacts. Mariano and Awazu (2016), in their effort to systemize the knowledge on artifacts in the field of knowledge management, specify that artifacts have been labeled differently by different knowledge management researchers.

For the purposes of the research design clarity, in the present research, we see artifacts (including IGs) as a result of the DSR approach (van Aken, 2004; van Aken *et al.*, 2016; Dresch *et al.*, 2019; Hevner *et al.*, 2004). Implementation guidelines IGs are a type of artifact used for knowledge transfer. These are artifacts that are developed to transfer accumulated knowledge from a specific research field into practice (Suzić *et al.*, 2018a, 2018b). They present an important output of scientific research and consultant activity because they enable structured knowledge transfer from consultants (academic researchers, independent consultants or consultant companies) to industry.

The IGs research stream defines how effective IGs should look like (Suzić *et al.*, 2018a). For example, researchers argue that IGs should be normative (Coughlan and Coghlan, 2008; Rouhani *et al.*, 2015), actionable (Coughlan and Coghlan, 2008; Ortiz *et al.*, 1999; Rouhani *et al.*, 2015) and generalizable (Coughlan and Coghlan, 2008; Ortiz *et al.*, 1999; Rouhani *et al.*, 2015). Furthermore, the research identified properties for development of the effective IGs, namely, the holistic guidelines, the context-dependent and the detailed and user-friendly properties (Suzić *et al.*, 2018a). Further on, Suzić *et al.* (2018a) identified IG building blocks in the available IGs (e.g. concept overviews and definitions, implementation instructions, required resources, as-is analysis tools, etc.). Notably, most of the IGs provide a premade sequence of the concept implementation, providing in detail the order in which various initiatives (i.e. enablers) should be implemented (e.g. Blecker and Abdelkafi, 2006) – for research that derails from this sequence prescription look at Hernandez *et al.* (2003), and Suzic and Forza (2023). Suzić *et al.* (2018a) refer to this trend as the use of sequential logic, while Caldwell and Dyer (2020) call this approach a programmatic approach, where solutions for a concept implementation are premade without the client's participation. Some IGs point out hindrance factors to look out for when conducting the consultant intervention (e.g. Hanafy and ElMaraghy, 2015; Ismail *et al.*, 2007; Kudsk *et al.*, 2013). However, from these hindrance factors, only resistance to change could be implicitly connected to NIH syndrome (Kudsk *et al.*, 2013). Notably, the relevant IG literature does not identify NIH as a specific hindrance factor that should be taken into consideration when developing IGs (based on Suzić *et al.*, 2018a). However, in the discussion of their literature review in IG field, Suzić *et al.* (2018a, p. 866) point out that the "future developed [. . .] [implementation guidelines] should help managers to prevent the negative effects of the hindrance factors and in explaining both their negative effects and possible ways to prevent them." In their later research Suzic and Forza (2023, p. 554) move closer to the notion on NIH syndrome pointing out the opportunity regarding "the behavioural-related issue that arises with the use of the proposed [implementation guidelines]" and possibility to use IGs for "reducing the resistance to change that is present to varying extents in all individuals and organizations." However, once again, the authors failed to frame their IG research in terms of general NIH theory.

IGs as a tool used for a consultant intervention, are artifacts that can enable or limit the consultant in conducting a successful intervention in a company (Caldwell and Dyer, 2020; Suzic and Forza, 2023). This is because, depending on how they are developed and used, IGs can enable and support knowledge transfer during a consultant intervention, or they can hamper it (Caldwell and Dyer, 2020), resulting in NIH syndrome (Antons and Piller, 2015). In other words, IGs are the foundation upon which the consultant's work with the client is built.

The NIH research stream implies that to mitigate NIH syndrome during a consultant intervention, the client should not have the impression that a solution was coined elsewhere (Antons and Piller, 2015; Clagett, 1967). Rather, the highly desired future improvement should stem from rich and meaningful cooperation between the two sides.

As already stated, a management consultant can be defined as "an independent professional advisory service" (Kubr, 2002, p. 10). As such, the consultant's act of introducing a new concept to a company may come with a serious challenge: the consultant's advice could be rejected because it proposes premade solutions that were written elsewhere, effectively resulting in NIH syndrome within the company.

Caldwell and Dyer (2020, p. 943), for example, recorded that "the [clients' of a consultant intervention experienced] tensions between the prescriptions of the LSS [Lean Six Sigma] methodology and their 'knowing and doing' approach to action, learning and practice." This example shows the appearance of NIH syndrome in a case in which the IGs were generated outside the company.

We can conclude that, although rich and developed, IGs research stream does not focus on NIH mitigation during the use of IGs in consultant intervention, or on developing IGs that would prevent the NIH appearance during the knowledge transfer in the client company. In other words, although there is IG research that points out that "[a] key component of IGs is how they are enacted" (Coughlan and Coghlan, 2008, p. 49), the NIH syndrome and the importance of IGs developed so that they are effective in knowledge transfer and NIH mitigation, remain out of the scope of the IG research stream.

2.2.3 Importance of IGs for consultant intervention. The role of knowledge transfer tools (i.e. artifacts) for effective knowledge transfer is recognized by the literature (Engeström, 1999; Korbi and Chouki, 2017). IGs are a specific type of knowledge transfer tools that are developed to transfer accumulated knowledge from a specific research field into practice (Suzić *et al.*, 2018a, 2018b). Thus, IGs are developed specifically to conduct consultant interventions. Moreover, the characteristics of the IGs define the settings and the final effect of the consultant intervention.

However, we found only a few articles that address consultancy and IGs in combination. The most pertinent work for the present research is Caldwell and Dyer (2020, p. 942), who stated that "[t]he prevailing assumption is that knowledge of the change process is already standardised, codified and commercially proven and that implementation can be managed within fixed project timelines." Put in the terms of the present research, Caldwell and Dyer say that the prevailing assumption in the literature and in practice is that the IGs used by consultants are expected to provide plans for a specific concept implementation that were conceived outside the company and without the clients participation. The authors further stated that "[t]he core presupposition of these programmatic approaches to change is that knowledge transfer can be "enacted" in practice through prescribed rules, standards, routines, project plans and methodologies" (Caldwell and Dyer, 2020, p. 942). We read these "programmatic approaches" as the use of IGs to develop implementation plans (IPs) [7] without the clients' participation. Other research that conducted deep analyses of IGs (Suzić *et al.*, 2018a, 2018b) – specifically for mass customization (MC) implementation– is in line with the claims of Caldwell and Dyer (2020). In the cited studies on MC IGs, none of the 20 analyzed IGs had planned the possibility of including clients in the development of the IPs. Thus, it seems that the IG research stream predominantly provides premade IPs for consultant interventions.

These premade solutions for IPs have been already criticized in the management literature (although not always using the same terminology). For example, when studying the implementation of operations management best practices, Sousa and Voss (2008, p. 698) stated that an explanation for difficulties in best practices implementation could come "from too great a mismatch between the proposed form of best practice and the particular

organizational context" – where best practices represent premade solutions. In their study focused on MC Svensson and Barfod (2002, p. 88) said that "it is necessary for every company to *develop its own development plan* which will help to move in the direction towards mass customization" (italics added). So, in a way, the study suggests the participation of clients in the development of IPs. Staying in the field of MC, Salvador *et al.* (2009, p. 1558) stated that "[m]anagers need to *tailor the approach* in ways that make the most sense for their specific businesses" (italic added), again pointing out a need that clients (i.e. company managers) should be able to influence the way that MC is implemented in their companies. Suzić *et al.* (2018a, p. 867), addressing the managers (i.e. clients) warn of the rigidity of available IPs that were developed outside the client company by stating that the sequential models (i.e. premade IPs) available in literature should be approached with a "critical mind since [...] [these premade IPs] could be too rigid and insensitive for individual company situation."

Finally, Suzic and Forza (2023, p. 552) is the only study found to openly promote client participation in IP development concluding that "enactments of the [...] implementation plans were self-motivated" and that IPs were effective since they were developed "in close collaboration with company staff [clients], [and] not by proposing solutions prepared in advance." This study provides us with a hint of the effect that participative IP development had in two conducted consultant interventions.

We found several papers that are relevant, although to a lesser extent, to consultancy and IGs in combination, even though not directly addressing the topic of the present research. In chronological order, Bronnenmayer *et al.* (2016), while researching the determinants of management consultant success, identified "intensity of collaboration" as one of the main factors in perceived management consulting success. This intensity of collaboration is relevant to how consultants use IGs. Dutta and Kumar (2022) explore the processes through which knowledge creation occurs during enterprise resource planning (ERP) software implementation and how external consultants help to operationalize it. Specifically, they analyzed the four modes of knowledge conversion (i.e. the SECI model: socialization, externalization, combination and internalization) during consultant-supported ERP implementation. Suoniemi *et al.* (2022) looked into the conditions under which consultant involvement in customer relationship management systems implementation can lead to benefits to the company. Finally, Chowdhury (2023) argued for methodological flexibility in the application of systems thinking used for consultant interventions.

The role of IGs in consultant interventions, therefore, has received limited attention. By showing the relevance of IGs in mitigating the NIH effect in consultant interventions, we will provide additional motivations for further investigation of this topic which is highly relevant for practice.

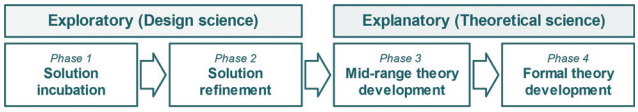
3. Method

3.1 A DSR approach

The present research is following the DSR approach. Specifically, the research follows the four DSR phases proposed by Holmström *et al.* (2009), where first two phases are design science oriented, and the last two are explanatory and theory building oriented (Figure 4). The present research deals with the second and the third phase, with major focus on the theory building Phase 3.

The "solution incubation" (Phase 1) deals with the development of the initial solution design of the artifact. The "solution refinement" (Phase 2) deals with the empirical testing and refinement of the developed artifact. Also, in Phase 2 the cooptation of the unintended consequences is done to take into consideration the feedback from the empirical testing to refine the artifact. The first two phases were conducted as a part of the research that has been reported in Suzic and Forza (2023).

Figure 4 DSR approach



Source: Adapted from Holmström *et al.* (2009)

Exploratory and explanatory parts of the DSR approach are complementary (Holmström *et al.*, 2009). The exploratory part of the research seeks to develop an artifact aimed at solving a class of problems (van Aken, 2004). Solutions proposed at the end of Phase 2 have limited generalizability, but create a base that will support the building of the theory in Phases 3 and 4 (Holmström *et al.*, 2009).

In Phase 3, the artifact that was field tested previously is reviewed in the context of the previously existing research in the relevant research field(s). This enables the development of the mid-range theory, that seeks the relevance of the findings from Phases 1 and 2 (Holmström *et al.*, 2009). "[T]he aim of the Mid-range theories is to develop a deeper understanding of a theory in a specific context of application" (Holmström *et al.*, 2009) – which in our case is the consultant intervention done with the use of IGs.

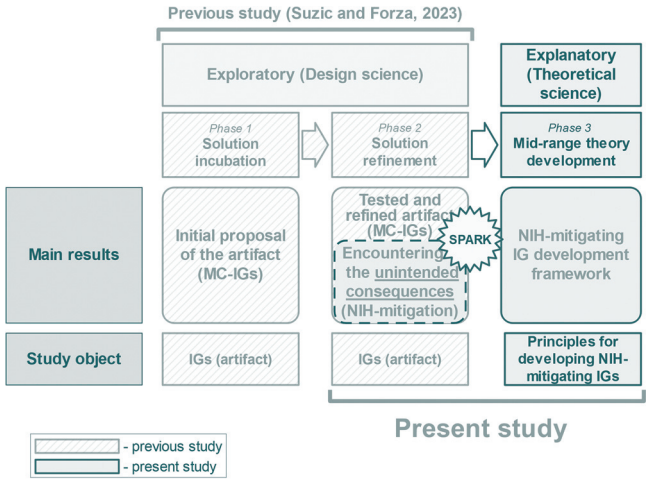
The current research does not include the Phase 4 (Figure 4) from Holmström *et al.* (2009). Thus, the present research does not seek to propose a formal theory but rather stops at proposing a mid-range theory in the form of an NIH-mitigating IG development framework in the context of consultant intervention as a specific type of knowledge transfer.

3.2 Research design

3.2.1 Prologue (connection with the previous study). Notably, the DSR-based research can take a long time and is often done in multiple iterations spanning long periods of time (usually multiple years or even more) and multiple publications (e.g. Akkermans *et al.*, 2019; Ivert and Jonsson, 2014). In the present subsection, we present in brief also the research phases that preceded the present work, and subsequently, we focus on the work done for the present research. We do this to provide a clear overview of the phases that led to the present research and to facilitate the communication of the research done. The present research is a continuation of the research published in Production Planning and Control (Suzic and Forza, 2023). Specifically, Figure 5 (i.e. a concretization of the DSR approach presented in Figure 4) shows three research phases performed (based on Holmström *et al.*, 2009). The first two phases were conducted as a part of a previous study (Suzic and Forza, 2023) – Figure 5. Contributions of these two phases include the original artifact development (Phase 1), and artifact testing and refinement (Phase 2). The third phase, which is the theory building, is done in the present research (Phase 3) and its main contribution is the proposed NIH-mitigating IG development framework. Noticeably, the present study has its roots in Phase 2 where, as a part of unintended consequences (Holmström *et al.*, 2009), the first impacts of IGs on the mitigation of NIH were observed. This consequence was later revisited and the current research is the result of theory building based on these findings from Phase 2.

3.2.2 Inception of the DSR (previous study). The goal of the initial study (Suzic and Forza, 2023) was to develop IGs for implementing MC in small and medium enterprises (SMEs). The research was motivated by recorded lack of IGs for MC implementation (MC–IGs) suitable for SMEs. This is where our initial DSR study started. The newly developed IGs were proposed in Phase 1 of the research (Figure 5). In Phase 2, the developed artifact was

Figure 5 Research design



Notes: IGs = implentation guideliens; MC = mass customization; MC-IGs = mass customization implementation guidelines (the developed artifact)
Source: Developed by authors

tested in two consultant interventions in case companies through observational evaluation. Observational evaluation is a method for evaluating the artifacts developed through DSR that uses the case study to "[s]tudy [the] artifact in depth in [a] business environment" as well as the elements of the field study to "[m]onitor [the] use of artifact in multiple projects" (Hevner *et al.*, 2004, p. 86). The testing was performed in two rounds, namely, short-term and long-term observation evaluation. The long-term observational evaluation took place three years after the original testing of the artifacts in companies and confirmed the effectiveness of the developed MC–IGs. Details of the developed MC–IGs are presented in the Results section.

3.2.3 Team composition. Notably, two members of the research team participated in the original study that developed the artifact and conducted consultant interventions in two companies. Both of them are academic researchers with experience in consultant intervention knowledge transfer. The other two members of the present research team had no previous knowledge of the developed IGs, and their inputs were crucial for the critical view of the reasoning and control of the whole research process (including the research design). One of these other researchers had a variety of consultant experiences, while the other one has long-standing experience in global consulting firms, as well as major client organizations that deliver large-scale projects around the world. All four authors hold PhD and have acted or are still acting as university researchers. The team, therefore, englobes consultant expertise and academic research expertise in each member even though the members differ in their orientation toward consultancy and academic research.

3.2.4 The spark: encountering the unintended consequences (start of the present study). In the Phase 2 (Figure 5), mitigation of NIH syndrome emerged as an *unintended consequence* of the IGs application (Holmström *et al.*, 2009). Specifically, in the two case companies the NIH syndrome appearance has not been registered during the consultant intervention and the later application of the developed IPs. Without available theoretical framing, at the time of the original study, this finding has been labeled as "behavioral

component" of the consultant intervention and concluded that "the developed MC implementation plans are effectively implemented by the company personnel, and it seems that the proposed MC–IGs are effective in reducing the resistance to change that is present to varying extents in all individuals and organizations [i.e. NIH syndrome was mitigated]" (Suzic and Forza, 2023). The finding was noted and reported, but it was not further elaborated since it went out of the scope of that study. Since it makes the basis of the present research we elaborate on this point later in the results section.

3.2.5 The mid-range theory building (present study). Starting from the recorded NIH-mitigating capacity of the developed IGs, the present study is bridging Phases 2 and 3 (Figure 5). This bridging is done through abductive reasoning (Mantere and Ketokivi, 2013). Specifically, starting from the deep understanding of the two consultant interventions and with the use of the primary data, we theorize the existence of two models for IP development (i.e. nonparticipative and participative models). In short, in participative IP development client takes part actively in the plan creation. Once the initial theory base is laid through abduction, the goal of the Phase 3 becomes to establish the theoretical relevance of the empirically experienced phenomenon, that is NIH syndrome mitigation. So, as the main part of the present research, Phase 3 represents the mid-range theory building, which takes the final form of *NIH-mitigating IG development framework*. Notably, the object of the present study is changed from IGs development (Phases 1 and 2 – Suzic and Forza, 2023) to establishing principles for developing NIH-mitigating IGs (Phase 3 – present study). To move in the direction of the theory building, we had to frame our empirical findings in a more general theory. The framing theory we use is the *theory of the NIH attitude functions* (Antons and Piller, 2015). Through deductive reasoning (Mantere and Ketokivi, 2013) we applied this general theory to derive five *principles for the development of NIH-mitigating IGs* as a part of NIH-mitigating IG development framework. Notably, each derived principle corresponds to one of NIH attitude functions from Antons and Piller (2015). Finally, with the developed framework defined and principles in place, we revisit the empirical data to identify the mechanisms that led to NIH mitigation in two consultant intervention cases and their impact on enacting the five theorized principles for the development of NIH-mitigating IGs.

4. Results

In this section, we provide the results of the present research which has the final goal of proposing the NIH-mitigating IG development framework. However, as promised in the Method section, and to facilitate the reader's understanding, we briefly present the previous phases of the DSR research conducted (i.e. Phases 1 and 2 – Figure 5). The importance of presenting the previous phases lies in the fact that the phenomenon recorded in the Phase 2 of the research (i.e. NIH-mitigation effect of the IGs) is the basis of the theory building done in the present research. Furthermore, in the final subsection, the consultant interventions in two companies (from Suzic and Forza, 2023) are revisited to identify the characteristics of the consultant interventions relevant for NIH-mitigation as well as the mechanisms that connect them to the principles for the development of NIH-mitigating IGs.

4.1 Initial solution and solution refinement

The case IGs were developed for implementing MC in SMEs (Suzic and Forza, 2023). To facilitate the reader, in Table 2 we provide essential details about the IGs development, their main characteristics and the outcomes of the consultant interventions done with those IGs in two companies. For more details on the developed IGs please refer to Suzic and Forza (2023).

Furthermore, we provide two main elements of the IGs. The first one is the MC maturity grid, which represents the core component of the IGs – Figure 6. The second component is

Table 2 Main characteristics of the developed IGs and consultant interventions

IG characteristics	*Details*
Research method for development	Design science research (DSR)
Main tool used	Maturity grid
Model of implementation plan development	Participative
Form of consultant intervention	One-day workshop
Workshop group characteristics (clients)	Senior company staff who have the power to decide and later implement decisions in the company (3–6 participants)
Number of test companies	2
Type of companies	SMEs
Length of the study	3 Years
Type of consultants	Academics
Consultants' field of expertise	Deep knowledge of enablers/practices of mass customization that are contained in the maturity grid tool
Type of knowledge transfer (according to Antons and Piller, 2015)	Type 7
Consultant intervention is successful from an NIH syndrome standpoint	Yes
Criteria for claiming consultant intervention a success (adapted from the original study)	C1: Implementation plan was successfully generated during the consultant intervention, with mitigation of NIH syndrome Testimonies from the companies: "I got something useful on which we could base our next steps." – Company 1 "We got steps, first, the second, the third, and so on. We made a priority list. This is the result, and this is the most important point. I mean, we got to a conclusion. Therefore, now we know what we have to work on." – Company 1 "Among many things, we know what we have to work on, from which side, from which point to start working." – Company 1 "This for me [i.e., the developed implementation plan] is an input to realize the sales configurator – Using it will allow us to realize our product offerings in a fast and standardized way." – Company 2 "Now we have a view of the development plan." – Company 2 C2: Implementation plan was enacted in the company without the appearance of NIH syndrome Three years after the consultant intervention took place, both companies were revisited to identify whether the developed IPs were successfully executed. In both cases, the developed IPs were executed to a high extent, with some of the initiatives still in the process of implementation, since the developed plans required more than three years to be realized

Source: Developed by authors

the procedure for the use of the MC-IGs – Figure 7. These two IGs components, along with the information in Table 2, provide the reader with the essential data needed to follow the results obtained in the present research. However, for the purposes of limited space available, we do not go into further details on the case IGs.

4.2 Basis for the theory building: participative IP development model

In DSR, the exploratory part of the research seeks to develop an artifact aimed at solving a class of problems (van Aken, 2004). The specific artifact that has been considered in the exploratory phase of the present DSR was aimed to "support a holistic assessment of the MC maturity status of an SME and to support the development of MC implementation plans that are actually implemented" (Suzic and Forza, 2023).

However, the DSR recognizes that in parallel with the effects of the artifact that are expected, there are also effects that are originally unintended by the artifact developers (Holmström *et al.*, 2009). In the consultant interventions conducted with MC–IGs, the unintended consequence (while welcome and coopted later) was the lack of NIH syndrome appearance in the consultant intervention. In other words, the consultant interventions in

Figure 6 The core component of the MC–IGs [MC maturity grid – (Suzic and Forza, 2023, p. 569)]

Grid area =>	1	2	3	4	5	6	7	8	9	10	11	12
Maturity level ⇩ ⇩ V	Standardization of parts: Periodic rationalization to eliminate parts no longer needed	Standardization of parts: Day-by-day limitation of new parts introduction	Standardization of production sequences	Grouping of parts into part families through a similarity-based classification system	Product space organized in clearly distinguished product families	Product modularization	Organizing machines/assembly stations on the shop floor in order to maximize the speed and efficiency of processing part/product families	Low and continuously reduced set up times	Technical configurator	Sales configurator	Keeping stocks at optimal levels	Sophisticated and dependable supports for determining available to promise
1	Never done	NO attention is paid to parts proliferation by: (1) design/production engineers and purchasing staff and (2) the organization	No attention is paid to production sequence proliferation by the organization and by the individual design and production engineers	Parts are not grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes)	Products are not clustered in product families	No modularization at all	Machines are clustered on the shop floor based on their functional similarity	We do not have a clear view of set-up times because we have never considered them	BOMs and PSs (if present) are manually defined possibly by modifying similar BOMs/PSs *(BOM - bill of materials PS - production sequence)*	Customers, salesmen and the technical-sales employees (CSTS) do not have any structured support to choose the specific characteristics of the product and to control their compatibility	We do not have a production planning and control system that assures an acceptable service level at the subsequent stage *(production of parts, assembly of final products or delivering product to the customer)* and maintains working capital *(finished products, modules, components, parts and raw materials)* at an acceptable level	It is difficult for us to say whether or not the products that are available in the finished products stocks or are in production are available to promise
2	We standardized the parts and we eliminated parts no longer needed *BUT* this was an isolated initiative	Attention is paid to parts proliferation by: (1) design/production engineers and purchasing staff (2a) NO parts standardization guidelines (2b) NO SW supports for part standardization	(1) It is easy for design/production engineers to reuse the same sequences (because the production sequence database is well organized and because production sequences are grouped in classes)	(1) Parts ARE grouped in families using similarity-based classification criteria (shape, size and materials, and therefore production processes), (2) The criteria used are NOT FORMALIZED and coincide with the production and design engineers' experience	(1) A PORTION of the product assortment is composed of products clustered in product families according to similarities in product functions and product-related production processes (2) But the way the clustering is obtained is NOT GUIDED by design procedures	(1) In SOME of our product families, all of the products have been thought about such that each product function performed by a specific chunk (module) and is not performed through interaction with more chunks	(1) Machines and assembly stations are able to process different parts/products (within a family) with similar efficiency *AND* (2) Machines and assembly stations are clustered based on the part/product families to which they are dedicated	(1) Set-up times are VERY LONG *AND* (2) No systematic reductions of set-up times are being applied	for A LOT of possible product variants of SOME product families BOM and/or PS are automatically generated	CSTS have a structured support (without SW) to choose ... and control ...	We have a production planning and control system that assures an acceptable service level at the subsequent stage (...) and maintains working capital (...) at an acceptable level	We know how much of each product is available to promise both in our stocks and in production but in the latter case, we are not really dependable regarding when they will be available in the warehouse. If the product is not yet launched into production, we apply some fixed lead times that are common for several products for the promise
3	(1) There is a systematic procedure to eliminate parts no longer needed *AND* (2) This procedure is periodically done on SOME part families	(1, 2a) Part standardization guidelines for design/production engineers and purchasing staff exist and are SOMEHOW applied, (2b) NO SW support	(1) ..... *AND* (2) There are rules and SW support to limit the introduction of new production sequences	(1) ..... *AND* (2) Part families are formed through a FORMALIZED and structured MANUAL classification system	[1] A CONSIDERABLE PORTION of the product assortment is *... idem ...* (2) The way the clustering is obtained is GUIDED by design procedures (3) The distinction between product families is good, but can still be improved considerably	(1) We designed ALL of our product families in a modular way. We have families of modules (each function is performed by only one module) with standardized interfaces	(1) ..... *AND* (2) ..... *AND* (3) The positioning and organization of the machines/assembly stations minimizes the time the parts/products take to pass through them	(1) Set-up times are NEITHER LONG NOR SHORT *AND* (2) Reductions of process set-up times are achieved by continuous analysis of and changes made in: used technology (use of machines with low set-up times, fasteners, positioning aids, standardized tools,etc.) and organization (standardization of set-up procedure, using offline set-up, etc.) OR by application of special tools (dedicated to part families and/or product families)	for MOST possible product variants of ALMOST ALL product families BOM and/or PS are automatically generated	C or S or TS use software to choose the MAIN characteristics of the products and to control their compatibility (at least for the MOST IMPORTANT product families)	We have a production planning and control system that assures a very good service level at the subsequent stage (...) and maintains working capital (...) at a very low level	We know how much of each product is available to promise both in our stocks and in production and, even in the latter case, we are very dependable regarding when the product will be available in the warehouse
4	(1) ..... *AND* (2) This procedure is periodically done on ALL part families	(1, 2a) Guidelines for design/production engineers and purchasing staff exist and are applied very RIGOROUSLY, (2b) SW support exists	(1) ..... *AND* (2) ..... *AND* (3) We make production sequences that differentiate products as late as possible	(1) ..... *AND* (2) Part families are formed through an AUTOMATIC (SW) classification system	[1] THE WHOLE product assortment is *... idem ...* (2) *...idem ...* and these design procedures are DEEPLY ABSORBED by the whole organization (3) Product families are CLEARLY DISTINGUISHED and do not overlap each other	(1) ..... *AND* (2) Our modules may have a longer life than single product families (product platforms exist)	(1) ..... *AND* (2) ..... *AND* (3) ..... *AND* (4) A system is in place to continuously improve the speed and efficiency of the autonomous units in processing parts/product families	(1) Set-up times are VERY SHORT *AND* (2) Reductions of process set-up times are achieved by *...idem ...* *AND* by application of special tools *...idem ...*	for ALMOST ALL possible product variants of ALL product families BOM and/or PS are automatically generated	C and/or S use a software to choose ALL of the characteristics of the products and to control their compatibility (for ALL or ALMOST ALL of the product families)	We have a production planning and control system that assures an optimal service level at the subsequent stage (...) and maintains working capital (...) at an optimal level	We know exactly how much and when a specific product variant to be promised to a customer will be available in the warehouse and we are also able to modify the configuration of products already launched in production in order to be able to promise customized products at the earliest delivery date in a reliable way and without incurring additional production costs or decreasing the level of service to our customer

Note: ' (1).....' should be read as 'text previously marked with "(1)" in this GA is repeated here'

both companies were accepted very well, and IPs were developed and later implemented without NIH syndrome appearance.

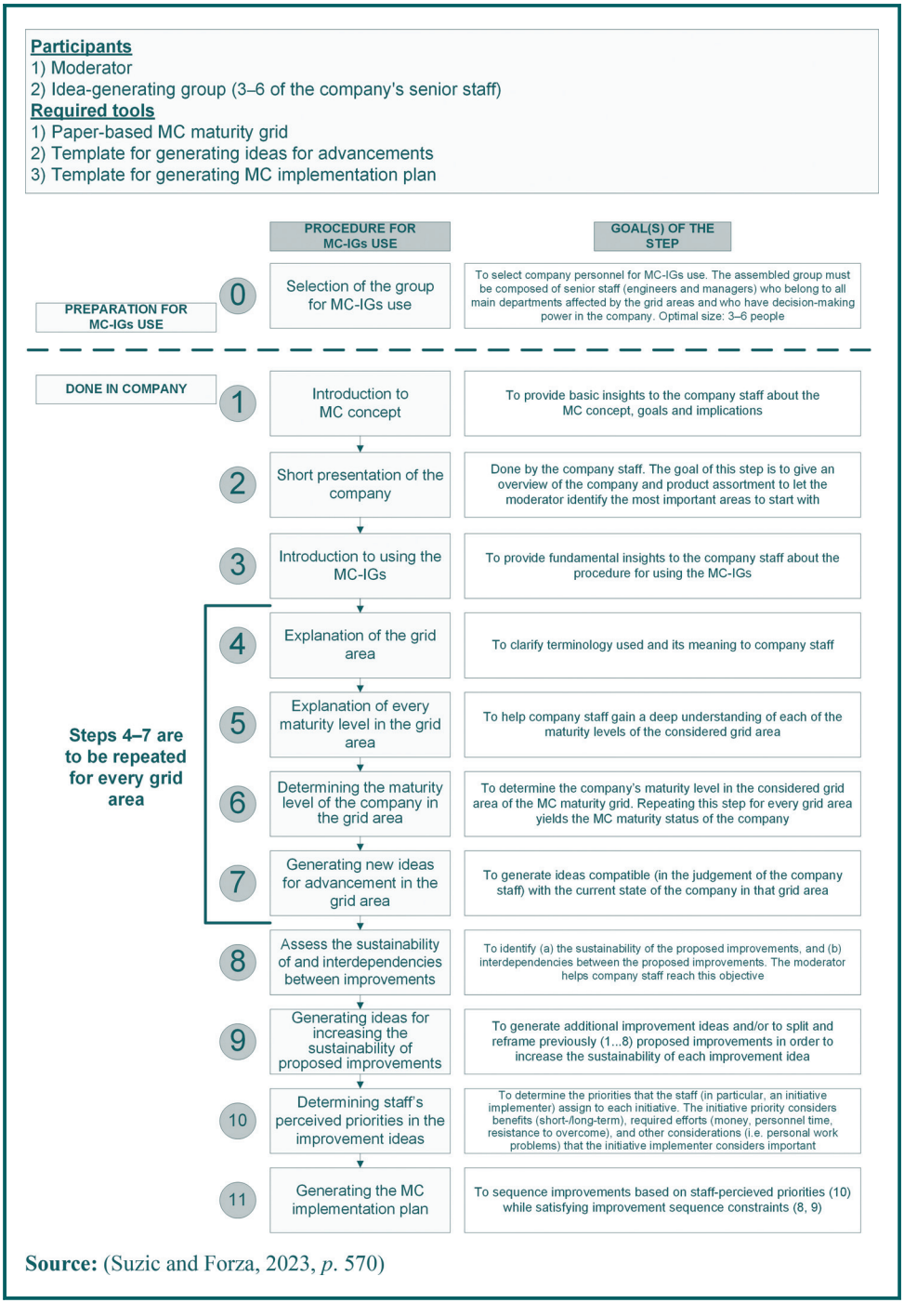
At the time of the consultant interventions, the researchers were focused on artifact development. The positive effects found in the form of NIH mitigation were coopted in the artifact design and the procedure to conduct the consultant interventions (Figure 7). However, no further steps were taken in researching the phenomenon encountered.

The unintended NIH mitigation observed by Suzic and Forza (2023) is the point where the theory-building in the present research begins. Specifically, after the experience with two consultant interventions, we went on to theoretically frame the NIH-mitigation effect of IGs. By reflecting on what could have led to this mitigation of NIH syndrome we noticed that the MC IPs generated with the MC–IGs proposed by Suzic and Forza (2023) were by design generated with the participation of the company staff. Thus, the IP proposal was not generated before researchers arrived in the companies. The idea generation (Step 7 – Figure 7) considered each company's as-is situation regarding the MC maturity status – assessed by applying the MC maturity grid (Figure 6). Having had this idea of a potentially important cause, we revisited the body of MC–IGs that have been analyzed in depth in previous research (Suzić *et al.*, 2018a, 2018b) to understand if IPs are usually developed before or after the consultant enters the company. The analysis showed that all 20 IGs from the sample offered premade IPs [8].

At this point, by using abductive reasoning based on the two consultant interventions and the analysis of 20 available IGs, we theorize the existence of two types of IP development (Figure 8), namely:

1. nonparticipative IP development, and
2. participative IP development.

Figure 7 Procedure for use of MC–IGs

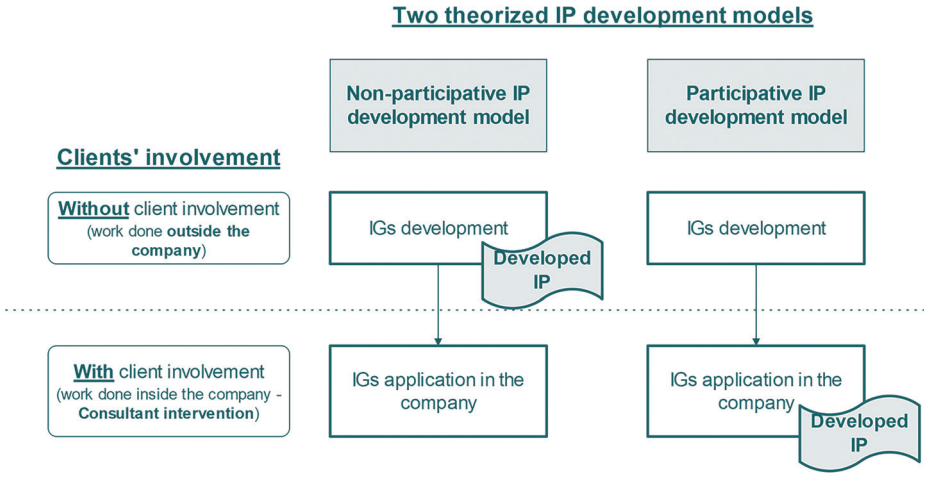


Source: (Suzic and Forza, 2023, *p.* 570)

We base this categorization on the externality of IP creation. We argue that if an IP is developed *a priori*, without the client's participation (i.e. nonparticipative IP development), there is a risk that the implementation of these plans will encounter significant NIH-based resistance, as in the case documented by Caldwell and Dyer (2020).

To increase the chances of successful consultant intervention, we theorize that the act of creating an IP should be "moved" inside the client company, thus, internalizing the knowledge

Figure 8 Differences between nonparticipative and participative IP development models



Notes: IP = implementation plan; IGs = implementation guidelines
Source: Developed by authors

creation process by merging external topic-specific knowledge with internal situation-specific knowledge (Figure 8). This suggestion follows Clagett's (1967, p. 50) conclusion that "the problem is not, "how to overcome N. I. H.," but how to prevent creating it." Our reasoning is theoretically supported by Schein's (1987) philosophy of the collaborative relationship between consultant and client (i.e. process consulting), which according to Wickham (2008, p. 20) is built upon the notion that "the only people who can, ultimately, help the business are the people who make it up" and that sees consultants as facilitators of the change.

Translated into the IGs context, we argue that the current predominant model for IP development (which we name nonparticipative) could be challenged and replaced with a participative model (Figure 8) in which an IP is developed with and approved by the client to enable consultants to mitigate NIH syndrome in the client company. In the participative model, IGs should provide common ground for the joint creation of an IP by the consultant and the client(s), rather than imposing a fixed solution written elsewhere. By refraining from asserting *a priori* solutions, the participative model should further stimulate collaboration and allow for flexibility in a posteriori IP development.

To transform IP development model into a generalizable theory, we needed to frame it into a more general theoretical framework. A suitable theory we identified was the theory of NIH attitude functions (Antons and Piller, 2015).

4.3 Mid-range theory building: NIH-mitigating IG development framework

At this point of the research our empirical findings and theorized participative model for IP development (Figure 8) needed a framing in the more general NIH theory. This framing was done in the present phase of the research (Phase 3) where we propose a mid-range theory in the form of NIH-mitigating IG development framework.

After reviewing the NIH syndrome literature, we opted for Antons and Piller's (2015) *NIH attitude functions* as the starting point for conceptualizing our theoretical framework. Attitudes are defined as relatively time-consistent individual evaluations of an object of

thought, including physical artifacts, people, groups and ideas (Bohner and Dickel, 2011). These attitudes serve individuals to adapt to the environment and also serve attitude functions that are: ego-defensive, value-expressive, social-adjustive, knowledge and utilitarian (Ajzen, 2001; Antons and Piller, 2015; Eagly and Chaiken, 1993). The main reason for choosing NIH attitude functions for the basis of our framework is that this theory connects in a comprehensive way NIH syndrome with the attitude functions theory accepted broadly in psychology (Ajzen, 2001; Bohner and Dickel, 2011; Demski and McGlynn, 1999; Eagly and Chaiken, 1993).

Each of the attitude functions can be a source of NIH syndrome and can lead to irrational devaluation or even rejection of potentially valuable external knowledge. These functions are important for understanding the mechanism of the rejection of external knowledge by individuals/groups. Based on Antons and Piller (2015) we provide an overview, characterization, operationalization and triggered heuristic and related theories in Table 3.

Thus, NIH attitude functions represent a comprehensive general theory explaining attitudes toward external knowledge that can lead to NIH syndrome appearance in knowledge transfer. In addition, our initial assessments showed that the phenomenon we experienced in practice during consultant interventions is fully covered by five NIH attitude functions. Thus, our initial assumption was that through deductive reasoning NIH attitude functions could be adapted from a general knowledge transfer context to a specific NIH-mitigation IG development for consultant intervention knowledge transfer.

We proceed from the belief that these five attitude functions greatly influence the readiness of clients to accept the knowledge transferred through the use of IGs. How IGs are developed and later applied in industry influences the effectiveness of the knowledge transfer they are developed to support.

Based on the NIH attitude functions, we derived our core propositions – five principles for the development of NIH-mitigating IGs. We applied deductive reasoning (Mantere and Ketokivi, 2013) – moving from general (NIH attitude functions in knowledge transfer) to specific (development of NIH-mitigating IGs for consultant intervention). At

Table 3 NIH attitude functions, their characterization, operationalization and triggered heuristics

NIH attitude function	*Characterization*	*Operationalization*	*Triggered heuristics and related theories*
Ego-defensive function	Defining, expressing and defending self-identity	Individuals might block information proving or suggesting that others are more competent than they perceive themselves to be	Psychological ownership; self-serving bias
Value-expressive function	Clarifying and confirming self-concepts and values	Helps people satisfy the need to clarify and confirm their self-concepts, showing what kind of individuals they are and what they stand for	Omission bias
Social-adjustive function	Facilitating and maintaining social relationships	Can be seen as protecting and also fostering the group-related part of the self-concept	Social identity theory
Knowledge function	Providing simple structures to organize information processing	Supports individuals in attaining a meaningful, systematized and stable perspective	Cognitive consistency and selective information processing, confirmation bias
Utilitarian function	Securing positive outcomes and preventing negative ones	Allows an individual to secure positive outcomes and prevent negative ones	Ownership bias; endowment effect

Source: Adapted from Antons and Piller (2015)

this point, for the sake of clarity, we remind that in our abductive research journey, we started from an empirical observation (unintended consequences – i.e. NIH mitigation), where we inferred that an explanation could be found in NIH research. Consequently, to theoretically explain the phenomenon, we had to generate deductively (from theory and not from empirical evidence) these five principles, principles that later on will be contrasted with empirical evidence going back to the original empirical observation and reading it through new lenses. The goal was to transfer the essence of five NIH attitude functions (part of general theory) to the level of IGs development (specific context). This was done by developing one principle for each NIH attitude function – so five principles in total. For example, from *ego-defensive function* we derived the first principle – *preserve the client's ego*. Thus, the analytical reasoning applied was done with the goal to provide the matter experts that develop IGs with clear principles which can guide them in developing IGs capable of mitigating NIH syndrome during the consultant intervention. The development of IGs in this way is meant to play a proactive role in preventing NIH syndrome from appearing during a consultant intervention. In the following paragraphs, we provide our five principles for the development of NIH-mitigating IGs. We recognize specific NIH attitude function to which each principle responds and the mechanisms through which a principle should help mitigate NIH by developing appropriate IGs:

Principle 1: Preserve the client's ego – is a response to the Ego defensive function which leads individuals to block information that could suggest that others are more competent than they perceive themselves to be (Antons and Piller, 2015). According to this principle, the IGs for consultant intervention should be developed in a way that allows clients to still perceive themselves as experts in their domain and as competent to contribute to the change process. For example, IGs should not be imposing "a perfect solution" to the clients, but exploring possible solutions with the client.

Principle 2: Adhere to the client's values – is a response to the value-expressive function which "helps people satisfy the need to clarify and confirm their self-concepts, showing what kind of individuals they are and what they stand for" (Antons and Piller, 2015, p. 200 based on Eagly and Chaiken, 1993). According to this principle, the IGs should be developed in a way that clients feel that their core values, both personal and organizational, are taken into account during the consultant intervention. For example, IGs should not impose general statements on what is right and what is not, instead should provide an opportunity for clients to decide the most appropriate line of action.

Principle 3: Fulfill the client's social needs – is a response to the social-adjustive function which "can be seen as protecting and also fostering the group-related part of the self-concept" (Antons and Piller, 2015, p. 200). According to this principle, the IGs should be developed in a way that clients get the perception of control over the ideation process and a sense of ownership for the generated ideas. For example, stimulation of sharing and generating the ideas by the clients themselves, where consultant becomes facilitator of the ideation process and IP development.

Principle 4: Build on the client's knowledge – is a response to the knowledge function that "supports individuals in attaining a meaningful, systematized, and stable perspective" (Antons and Piller, 2015, p. 201 based on Eagly and Chaiken, 1993). According to this principle, the IGs should be developed in a way that clients are able to fit the newly generated ideas into their current knowledge, attitudes, perspectives and experiences. For example, IGs should be general enough to allow clients to connect their knowledge with the one provided by the consultant.

Principle 5: Ensure positive outcomes for the client – is a response to the Utilitarian function which "allows an individual to secure positive outcomes and prevent negative ones" (Antons and Piller, 2015, p. 201 based on Bohner and Dickel, 2011; Demski and McGlynn, 1999). According to this principle, the IGs should be developed in a way that clients receive some form of benefit from their engagement in the consultant intervention. For example, these could be rewards or

acknowledgements that come as a result of the company recognition for the idea generation process in which the clients participated.

These five principles compose our NIH-mitigating IG development framework (Table 4). Besides providing the five core principles for the development of NIH-mitigating IGs, the proposed framework also describes the principles, dives into operationalization of the five core principles and connects the five core principles with exemplifications of consultant supporting behavior that should help mitigate NIH syndrome during the consultant intervention.

Table 4 NIH-mitigating IG development framework

Five principles for the development of NIH-mitigating IGs	*Principle description*	*Principle operationalization*	*Exemplification of consultant's supporting behavior for principle enactment*	*Corresponding NIH attitude function (Antons and Piller, 2015)*
1. Preserve the client's ego	Clients should still perceive themselves as experts in their domain and as competent to contribute to the process	Implementation guidelines should show what is possible but should not impose "a perfect solution" or "the best practice" on clients	– Explore possible solutions together with the client – Ask open-ended questions *The consultant intervention should not be about "who is most competent" or "who is the smartest" but about sharing ideas, discussing questions and involving the client in generating the solution*	Ego-defensive function
2. Adhere to the client's values	Clients should feel that their core values, both personal and organizational, are taken into account during the consultant intervention	The IGs should not impose any general statements about what is right and what is not. IGs should be able to offer stimuli, but not solutions developed a priori to address the clients' problem	– Provide an opportunity for clients to express themselves and to decide on the most appropriate implementation of the desired concept *Consultant should be receptive to clients' core values and their general perception of how things are done at the company*	Value-expressive function
3. Fulfill the client's social needs	Clients should have the perception of control over the ideation process and a sense of ownership for the generated ideas (since the consultant is seen as an outsider)	The IGs should allow opportunities for clients to share ideas among themselves. IGs should offer interesting stimuli for group discussion. There should be no premade finite solutions	– Act as a facilitator, providing guidance during the ideation process without prescribing any specific solutions to the clients *The consultant should leave it up to the clients to generate ideas and make decisions*	Social-adjustive function
4. Build on the client's knowledge	Clients should be able to fit the newly generated ideas into their current knowledge, attitudes, perspectives and experiences	IGs should be developed in a way that is general enough to allow connection with the clients' body of knowledge. IGs should not contain specific statements that could conflict with clients' experience	– Identify the knowledge and experiences that the clients possess *Discussion should be conceived around clients' ideas about company processes, and new knowledge should be built upon these ideas. Newly generated ideas should be consistent with the existing knowledge/clients' know-how*	Knowledge function
5. Ensure positive outcomes for the client	Clients should expect some form of benefit from their engagement in the consultant intervention – rewards, or at least acknowledgements, from the ideas generated during the process	The IGs should enable idea generation by the clients and support recognition from the company. IGs should be developed in such a way that the ideas are generated by the clients and inserted into the implementation plan	– Encourage clients to generate ideas and propose their own solutions, which will result in peer recognition and potential incentives from the company's management *The consultant should not propose solutions that will deprive clients of a reward. In this way, individual self-expression is achieved and peer recognition is obtained*	Utilitarian function

Source: Developed by authors

4.4 Revisiting the two consultant interventions: identification of the mechanisms that lead to NIH mitigation

After completing the theory-building part of the research, that is the NIH-mitigating IG development framework conceptualization (subsections 4.2 and 4.3), we made another step in the research. That is, we revisited two original consultant interventions published in Suzic and Forza (2023).

The consultant interventions (Suzic and Forza, 2023) were done in two companies from Italy. Both companies had a goal to transfer knowledge on MC concept during the consultant interventions, which were organized in group workshops. The first company (Metalmech Inc. [9]), is of medium size (100 employees), from the manufacturing sector, producing hydraulic power units, assembly lines and industrial high-pressure flexible hoses. The main product characteristics are product variety and configurability. The participants in consultant intervention had an engineering background – 3 mechanical engineers and 1 management engineer covering roles of:

- logistics and operations manager;
- sales/marketing manager (also covering responsibility for product management);
- design engineer for the family of hydraulic power units; and
- design engineer for the family of assembly lines.

The second company (Soft Automation Inc.[8]) is small (35 employees), from the service sector, providing software and services in fields of automation systems, control systems, monitoring systems, manufacturing execution systems, revamping of existing outdated production systems and systems maintenance services. The main product characteristics are customizability and a high level of adaptation to customer needs. Also in this case, the participants in consultant intervention had an engineering background – 2 electronics engineers, 1 mechanical engineer and 1 management engineer covering roles of:

- technical director;
- manager of the department for research and development;
- manager of the department for industrial automation; and
- manager of the department for the development of automation in the energy plants industry.

In both cases, consultant interventions were done by two academic researchers with deep knowledge of enablers/practices of MC.

The data available from these two consultant interventions is rich primary data consisting of audio recordings and transcripts of group workshops, audio recordings and transcripts of the interviews conducted as a part of the long-term observational evaluation, results of the consultant interventions with ideas and IPs generated, product data from both companies, web site analysis, analysis of the consultant interventions conducted immediately after their enactment and so on.

This rich primary data was used in two ways for the present research. It has been used first to detect unintended consequences of the Suzic and Forza (2023) study, which are the starting point of the present abductive part of the research. Second, it has been used at the end of the theory-building phase to revisit the consultant interventions in light of the proposed NIH-mitigating IG development framework. Specifically, the work was done to understand does newly developed framework explain the effects of NIH-mitigation that has been recorded in that research. Having access to the primary data of the two consultant interventions we conducted a mental exercise (Whetten, 1989) in the form of mapping. Specifically, we conducted the mapping exercise (Table 5) in three steps:

Table 5 Mapping the consultant intervention features of the case IGs to principles for the development of NIH-mitigating IGs

Consultant intervention features (in the case companies)		*Mechanisms explaining how a consultant intervention feature supports the principles for the development of NIH-mitigating IGs*				
		1. Preserve the client's ego	*2. Adhere to the client's values*	*3. Fulfill the client's social needs*	*4. Build on client knowledge*	*5. Ensure positive outcomes for the client*
1	Freedom to choose the starting point of the analysis/ workshop	Clients are able to choose the starting point of the workshop process, which gives them a sense of control ** In C1 the consultant intervention started with Part standardization, while in C2 the consultant intervention started with product families discussion*	Clients have the opportunity to put more emphasis on what is important to them *Starting with a discussion on product families (C2) showed the emphasis that company has on clearly defining them*	Clients jointly decide on the starting point of the workshop, which makes them feel like a group *In both companies, clients (company staff) decided together the starting point of the consultant intervention discussing the possibilities before the start*	Clients are allowed to start from the point that is most relevant to their situation *The analysis of two consultant interventions confirmed that part standardization (C1) and product families (C2) were really among the most relevant problems in both companies, and that starting from them was not a coincidence*	N/A
2	Possibility of separating workshop work for each product family	Clients are in control of the workshop process *C1 immediately separated work on three product families (hydraulic power units, assembly lines and high-pressure flexible hoses), while C2 decided to work on one overall maturity profile*	N/A	Clients jointly decide whether they will address the whole company or each product family separately in the workshop *The decision on whether to make analysis separately for product families was a group decision in both companies – not imposed by consultants*	The possibility of separating work into product families enables each client to connect the workshop to the company reality *In C1, by focusing on three different product families, clients were able to connect the knowledge transferred with their own knowledge effectively*	Clients gain a sense of ownership in the future implementation steps in the company related to their product family *C1: Since clients responsible for specific product families were able to contribute to decisions for the future of these product families, a sense of ownership of the final implementation plan was obtained*
3	The sequence of the workshop is defined during the workshop	Clients are in control of the workshop process, which gives them a feeling of being in charge of the situation *In both companies, clients (with the help of consultants) decided each next step (12 grid areas), effectively deciding the sequence of the workshop which gave the sense of being in charge of the consultant intervention*	Clients have the opportunity to put more emphasis on what is important by ordering the sequence of the columns analyzed *Clients in C2 went from product families directly to product configurators. The clear message was that these are the concepts most valued by the clients*	Clients decide on the workshop sequence as a group *In both companies, the sequence of the workshop was decided in consensus. No friction in the groups was recorded pointing out the correctness of this approach from the point of view of clients' social needs*	Clients' existing knowledge is crucial for deciding the workshop sequence *In both companies, consultants focused on a deep understanding of clients and building on clients' knowledge, to connect the knowledge on various enablers with the knowledge possessed by clients – e.g. in C2 the knowledge of coding and producing the automation software for final clients*	Clients may feel acknowledged for deciding on the workshop sequence *Clients in both companies accepted their active role in deciding the sequence of the consultant intervention feeling acknowledged for steering the course of the intervention*
4	Ideas for moving toward mass customization are generated by the clients	The clients maintain expert status without the threat of outside knowledge being superior, since the client generates the ideas *In both companies, clients generated their ideas for the implementation of mass customization maintaining their expert status and competence working with a consultant*	Clients get the opportunity to express personal values and company values through the generated ideas *In C2 clients emphasized value of product families through generated idea: "Formalize the product families; classify and study the product trends; and analyze market opportunities for the current products"*	Clients sense that the generated ideas are owned by the group *In both companies group idea generation was well accepted and a sense of group ownership of generated ideas was observed by consultants*	The ideas are deeply rooted in the clients' knowledge and in their everyday company reality since ideas are generated by the clients themselves *Not being limited with prescribed solutions, clients in both companies rooted their ideas naturally in their knowledge of the company, fitting the newly generated ideas in the existing knowledge, perspective and experiences*	With client-generated ideas, there is an immediate "idea ownership" reward. When the project is implemented, there is also the possibility of material rewards and recognition *In both companies, the sense of "idea ownership" was observed. Clients were able to demonstrate their expertise in a peer group and contribute to the development of the implementation plan, receiving immediate recognition*
5	The implementation plan is generated by the clients	By evaluating and deciding the priority, impact and effort required for each idea, the clients act as idea implementation experts	Clients have the opportunity to prioritize the ideas that are in line with personal/company values *Clients in both companies*	The implementation plan is created and agreed upon by the clients, resulting in a sense of group ownership *In both companies, the*	Since the ideas generated are the building blocks of the implementation plan, the implementation plan itself is grounded firmly in	By approving an implementation plan, every client is implicitly taking responsibility for implementing part of the

(*continued*)

Table 5

Consultant intervention features (in the case companies)		*Mechanisms explaining how a consultant intervention feature supports the principles for the development of NIH-mitigating IGs*				
		1. Preserve the client's ego	*2. Adhere to the client's values*	*3. Fulfill the client's social needs*	*4. Build on client knowledge*	*5. Ensure positive outcomes for the client*
		In both companies, clients felt comfortable deciding priority, impact and effort for generated ideas. Thus, clients effectively decided the order of implementation for each idea confirming their expert status	*expressed clearly their priorities for each idea, instinctively building in their values in the implementation plans*	*opportunity to impact the order of the ideas in the implementation plan gave a sense of group ownership and control of the group over the consultant intervention*	and fits perfectly with the clients' knowledge *In both companies, the development of the final implementation plan came very naturally and organically, since ideas were already firmly based on the company knowledge and further reinforced by prioritization of the ideas through the use of clients' know-how*	plan. This implementation will bring acknowledgments and possibly material rewards *In both companies, implementation plans were approved. Implicitly, peers approved their colleagues' contributions during the consultant interventions. In this way, even without further material rewards, an immediate reward in the form of acknowledgment is received by clients. Furthermore, by approving their plans, consultants also give acknowledgment to all clients that participated in implementation plan development*
6	There is no "forcing" of the relevance of a particular concept (enabler/ practice)	The possibility of skipping some of the enablers/ practices/grid columns allows clients to remain in their "comfort zone" and retain their expert status *C2 took this possibility, skipping (and deciding not to discuss) 5 out of 12 grid areas (e.g. group technology, set-up times, keeping stocks on optimal levels and available to promise). At the same time, consultants saw the possibility to discuss these enablers, but the discussion was not forced leaving final decision to clients*	Skipping some of the enablers as irrelevant gives clients the opportunity to concentrate on the enablers that are more in line with the core values of the client/company *By skipping some of the enablers, clients in C2 were able to concentrate on the enablers that, at the moment of consultant intervention, were more important for them. Interestingly, during the long-term observational evaluation, the skipped enablers were addressed and recognized as important for C2. Thus, at the first interaction clients were not ready to discuss certain aspects and possible advancements since they were too far from their as-is situation*	Concentrating on the enablers relevant to their company's needs allows the clients to maintain a group identity *Clients in C2 reached a group consensus of what were the areas important to them and their company at the moment of the consultant intervention*	Skipping an enabler provides the possibility of creating stronger connections with the clients' knowledge because the focus is placed on the enablers that are closer to the clients *C2 skipped 5 grid areas. However, the length of the consultant intervention was not reduced. This enabled a very solid connection of the enablers discussed with the existing company knowledge*	N/A
7	Open discussion among peers	Including everyone in the group discussion with other company members means all clients have the opportunity to confirm their own expertise *In both companies, junior staff had possibility to express themselves during the open discussion. Each client had an opportunity to be heard and, thus, confirm his/her expertise*	Open discussions provide the opportunity to explicitly and implicitly synchronize the idea-generation process with the company's/clients' core values *Open discussion in both companies offered the opportunity to steer the consultant intervention in the direction of clients' values. In fact, the consultant intervention was enacted in different sequences in two case companies, and consequently, the ideas were generated first for the areas valued mostly by the clients*	Open discussions allow constructive communication and knowledge exchange among the clients, adhering to their social needs *The group discussions in both companies were lively, without premade solutions offered, and got social approval from groups of clients. Notably, clients in both companies commented very positively on the possibility offered by the group discussion to confront constructively with colleagues from different departments/offices*	Open discussion on ideas and how they are relevant for the company provides a perfect vehicle to ground the ideas in the company's/ clients' knowledge *Open discussion of ideas in both companies brought the possibility to ground the implementation plan on the existing knowledge. Notably, in C2 similarities between different product families were noted for the first time during the open discussion, enabling the cooperation between the two product development teams, enabling the use of the company know-how to a higher extent*	Open discussion provides immediate acknowledgement for the active clients who provided contributions during the discussion *After the initial phase of the group workshop, with a slower pace, clients got understanding of the dynamics and were ready to contribute to the consultant intervention in full. The immediate acknowledgement by their peers is probably one of the main reasons for contributing to the consultant intervention*

(*continued*)

Table 5

Consultant intervention features (in the case companies)	*Mechanisms explaining how a consultant intervention feature supports the principles for the development of NIH-mitigating IGs*				
	1. Preserve the client's ego	*2. Adhere to the client's values*	*3. Fulfill the client's social needs*	*4. Build on client knowledge*	*5. Ensure positive outcomes for the client*
8 Focusing the discussion	By focusing the discussion (using the grid) on one area/enabler at a time (piecemeal approach), clients are not overwhelmed by a complex concept such as MC. This leaves the competence of the client intact, building on it instead of challenging it *The piecemeal approach was appreciated in both companies. This approach enabled clients to keep their status of experts inserting them slowly in a complex concept like mass customization*	N/A	Focusing the discussion facilitates group dynamics since there is a clear focus during the dialogue *Clients appreciated the possibility that the group focuses on one aspect of the mass customization concept at the time. This guidance was received as help in achieving meaningful work while keeping control over the consultant intervention since the object of the focus was decided by the group*	By making the discussion specific/focused, the clients are able to make a deep analysis of the area in case and to make a sound connection to their own knowledge. If the discussion were vague and general, the probability of seeing it as too abstract and "foreign" would be much higher *By asking clients to connect the grid area/ enabler (on which the discussion is focused for the moment) with their knowledge and by building on the company examples the clients were able to fit the newly generated ideas into their existing knowledge without a problem*	Focused discussion provides the opportunity for every client to contribute to generating ideas, since the grid covers all company functions. So, this focus provides clients with an opportunity to be heard and acknowledged by their peers *With the maturity grid covering all main areas of product variety management and mass customization, the possibility of not being heard on the issue of importance for any of the clients was reduced.* *Clients tend to discuss their problems, and consultants were there to help that any issue mentioned gets discussed in the end. And by having a chance to address the issue of high importance to them, the clients obtain the needed peers' acknowledgement*
9 Learning about and differentiating between the enablers of the MC concept	Clients get acquainted with basic terms in a way that is not intrusive or condescending. This allows them to feel knowledgeable and competent *In time companies develop their internal vocabulary, and the possibility to understand what each term means (e.g. distinguishing part standardization and product modularization) without threatening their expert status was received positively in both companies*	If clients value particular enablers, they will appreciate their significance in the implementation process *In C2, when clients were able to apply the notion of product modularization to the coding they did in their software solutions, the enabler was quickly accepted. Thus, although not known to the company before the consultant intervention, product modularization was understood and rapidly connected to the company's knowledge of product development*	Clients learn about enablers together, as a group, allowing them to perceive the learning process as part of a group experience *In both companies learning about the enablers was a group exercise. Many times, a colleague with more experience with an enabler (e.g. product configurator) helped consultants in explaining the enabler to a colleague that had less experience with an enabler*	By consolidating knowledge about MC enablers, the foundations upon which new knowledge can be built are established. Company knowledge, thus, becomes a basis for further growth *The knowledge of mass customization enablers was organically built on the existing company knowledge. This is due to the effect of knowledge consolidation which was initiated by learning about different MC enablers*	Since "learning" and "labeling" the enablers takes place in an open discussion, the clients who possess some specific knowledge are acknowledged and have the opportunity to be consulted regarding future decisions on the specific area *In both companies, clients who are experts in a certain field (e.g. product development) are immediately acknowledged during the consultant intervention. They have been consulted by peers during the discussion on the subject of their expertise and usually had a great impact on the decision of the implementation plan*
10 A holistic approach that makes evident the complexity of the MC concept	Clients become knowledgeable about the MC concept and its implementation *In both companies, clients agreed that they gradually came to understand the complexity of the MC implementation due to the holistic nature of the IGs. Nevertheless, the expert*	MC implementation is aligned with the company's core values and takes into account the holistic character of the production process. The implementation plan is generated with the client's core values in mind *In both companies, the holistic approach resulted in a very good alignment of*	N/A	Although the complexity of the holistic view becomes evident to the clients during the workshop, it also becomes clear that the grid and the consultant intervention are conceived in a way that enables the organic building of the IP on the company's knowledge *In both companies, the*	Clients may be perceived by their peers as MC implementation experts *It was noted that during the consultant intervention, different clients (in both companies) were taking the lead on different points of discussion depending on their expertise. Effectively, this was an opportunity to*

(*continued*)

Table 5

Consultant intervention features (in the case companies)	*Mechanisms explaining how a consultant intervention feature supports the principles for the development of NIH-mitigating IGs*				
	1. Preserve the client's ego	*2. Adhere to the client's values*	*3. Fulfill the client's social needs*	*4. Build on client knowledge*	*5. Ensure positive outcomes for the client*
	status of the clients was left intact	*the mass customization concept with the company's core values*		*holistic approach of the IGs enabled a strong connection between newly acquired MC knowledge and existing company knowledge. Thus, clients did not have a problem devising IPs that were later executed in practice*	*recognize these clients as MC implementation experts*
11 There is no one right answer, no one-size-fits-all solution	Since the ego function asks for uniqueness, a tailor-made solution helps clients feel special *With 23.298.085.122.481** possible configurations for the MC maturity status of the company, both companies understood that their consultant intervention is unique and that their case is special*	A solution that was created for and together with a specific client will clearly acknowledge the client's values *The IPs that were developed with both companies were unique and deeply rooted in the values of the single company. They differed in number of ideas (5–3) as well as in the grid areas covered and the contents of those ideas, making the IPs unique for each company*	Clients perceive themselves as a group that was addressed as a unit with its own needs and challenges, different from other companies *In both companies, IPs were created by clients in a group. Having understood that they created something unique for their company reinforced the sense of group ownership*	N/A	All clients are acknowledged for generating an implementation plan that perfectly suits the company's needs *In both companies, the IPs were generated by client groups. An immediate acknowledgement is received from the group itself and from the consultants that facilitated the IP development*

Notes: *Italic text in cells presents examples from two consultant interventions. Where: – C1 is Metalmech Inc. and – C2 is Soft Automation Inc. **The number of possible configurations in the developed MC maturity grid is $1,3^{12} = 23.298.085.122.481$ with 12 being the number of grid areas and 13 being the number of possible maturity levels in one grid area
Source: Developed by authors

1. *Identification of the consultant intervention features* – we define consultant intervention features as characteristics of the consultant intervention that could potentially prevent NIH from arising. The goal of this step was to conduct an in-depth analysis of the primary data gathered during the consultant interventions (i.e. notes, interviews, recordings, analysis done) to identify the consultant intervention features that potentially had an impact on NIH-mitigation.
2. *Mapping of the consultant intervention features to the principles* (for developing NIH-mitigating IGs) – this step had the goal of understanding if a specific consultant intervention feature supports enacting one or more of the principles. Noticeably, in the final list of the features (Table 5) only the features that support at least one of the principles were kept.
3. *Description of the mechanisms of support* – finally in this step we described a specific mechanism through which the consultant intervention feature supports the specific principle resulting in NIH-mitigating effects.

Two researchers who developed the MC–IGs and conducted the consultant interventions (Suzic and Forza, 2023) identified specific features of consultant interventions relevant to NIH mitigation. In this process, we conducted a content analysis of workshop transcripts and analyzed workshop notes and discussions with clients after the workshops were conducted. As a result, we identified the consultant intervention features that potentially had the NIH-mitigating effects. Furthermore, we mapped the consultant intervention features to the principles for developing NIH-mitigating IGs (Table 5), describing the mechanism through which each specific feature supports a specific principle (Table 5) – where such

support exists. Notably, the mechanisms through which consultant intervention features supported a specific principle were also informed by the conclusions derived from direct interactions with company staff and the reactions that were noted during the workshops.

Finally, the third and fourth researcher, who had no previous knowledge of the case IGs and did not participate in the consultant interventions, were asked to critically assess the analysis and the mapping done. Without previous knowledge of the case IGs and their application, the researchers acted as controls. In this way, the two researchers critically approached the terms used and the explanations provided for consultant intervention features and mechanisms, which led to an improved description of the mechanisms and also to the elimination of some consultant intervention features whose effect was not clear and strong enough, or some mechanisms that could not be defended. In addition, for every mechanism that was identified, we provided an example from two case companies where consultant interventions were conducted (italics in Table 5). Thus, after multiple iterations of the entire research team, the two researchers confirmed the final results of the mapping exercise provided in the Table 5.

In result, 11 consultant intervention features identified support enactment of four or five principles (Table 5). There are no significant differences in the number of the features that support specific principle enactment since the principles are supported by 9, 10 or 11 features. A summary of the mechanisms that support enactment of specific principle in the two consultant interventions is provided in the subsequent paragraphs:

Mechanism supporting Principle 1 – Preserve the client's ego – support mechanisms for this principle are found in: ability to choose the starting point of the workshop process; the control of the workshop process; maintaining the expert status of the client without the threat of outside knowledge being superior; having an opportunity to evaluate and decide the priority, impact and effort required for each idea; having a possibility to skip some of the proposed practices and remaining in the "comfort zone;" inclusion of the whole client group in the discussion; using a piecemeal approach without overwhelming the clients; getting acquainted with the basic terms of concepts without intrusion or condescending; empowering clients to being knowledgeable about the main concepts; a tailor made approach to consultant intervention.

Mechanism supporting Principle 2 – Adhere to the client's values – support mechanisms for this principle are found in: opportunity to put more emphasis on what is important to clients, also by deciding the sequence of the workshop; opportunity to express client personal values and company values through the generated ideas; opportunity to prioritize the ideas that are in line with personal/company values; possibility to skip some less relevant enablers and practices and instead concentrate on those that are more in line with the core values of the client; opportunity to lead an open discussion which leads to explicitly and implicitly synchronizing the idea-generation process with the clients' core values; possibility to implement valued enablers; generation of IP with the clients' core values in mind; and creating a solution together with the client that acknowledges the client's values.

Mechanism supporting Principle 3 – Fulfill the client's social needs – support mechanisms for this principle are found in: clients' jointly deciding the starting point of the workshop; clients' jointly deciding on whether they will address the whole company or each product family separately in the workshop; clients' deciding on the workshop sequence as a group; sense that the generated ideas are owned by the group; the IP creation by the clients, resulting in a sense of group ownership; concentrating on the enablers relevant to their company's needs allowing the clients to maintain a group identity; open discussions allowing constructive communication and knowledge exchange among the clients, adhering to their social needs; focusing the discussion that in turn facilitates group dynamics, since there is a clear focus during the dialogue; group learning about the enablers/key concepts; and perceiving themselves as a group with its own needs and challenges (different from other companies).

Mechanism supporting Principle 4 – Build on client knowledge – support mechanisms for this principle are found in: starting the consultant intervention from the point most relevant to the clients; possibility to

separate work into product families which in turn connects the intervention better to company reality; relying on the clients' existing knowledge to decide the workshop sequence; rooting the ideas deeply in the clients knowledge; grounding the IP on the clients' knowledge; skipping some enablers makes it possible to focus on enablers closer to clients' knowledge; supporting the grounding of the generated ideas in clients' knowledge through open discussion; deep discussion of specific topics making possible connection to their own case; consolidating the knowledge about the enablers; and by organic building of the IP on the companies knowledge.

Mechanism supporting Principle 5 – Ensure positive outcomes for the client – support mechanisms for this principle are found in: gaining the sense of ownership since the implementation steps are related to their product family; gaining a sense of acknowledgement for deciding the intervention sequence; possibility to, besides "idea ownership" effect, gain material rewards and recognition for project implementation; by taking on responsibility to implement the plan by committing to the ideas generated; immediate acknowledgment for the clients who propose ideas in the group open discussion; focusing discussion which in turn provides opportunity to be heard by peers on the topics on which the client in knowledgeable; opportunity that a client gets to be consulted as an expert on a certain area for the future decisions in that area; perceiving some of the clients as MC implementation experts by their peers; and acknowledging the clients for generating a tailor-made IP for their company.

5. Discussion and conclusions

The spark that initiated the present research came from the previous study (Suzic and Forza, 2023) in the form of unintended consequences (Figure 5) that were observed during the use of the developed IGs. Specifically, NIH syndrome was mitigated in two consultant interventions. Although inspired by the previous study, the real breakthrough came in the present study when we theorized two IP development models (nonparticipative and participative – Figure 8). Thus, we understood that to increase the chances of successful consultant intervention, the IP development should be moved inside the client company and involve the clients (i.e. participative IP development model). This new understanding enabled us to analyze the available IGs (Suzić *et al.*, 2018a) and understand that the predominant model in IG development is nonparticipative IP development, and, thus, the IGs developed this way are prone to create NIH during the consultant intervention. From there on, we were able to identify NIH attitude functions (Antons and Piller, 2015) as the suitable general theory of knowledge transfer from which we could develop our *NIH-mitigating IG development framework* as a mid-range theory that supports the development of IGs that can help consultants mitigate NIH syndrome during the consultant intervention. Thus, the participative IP development model is the basis on which the newly developed framework rests.

With the present research, we aimed to unite the research streams on consultant intervention as a specific type of knowledge transfer (Cerruti *et al.*, 2019; Jones *et al.*, 2023; Kilmann and Mitroff, 1979; Pellegrinelli, 1997), NIH syndrome (Ajzen, 2001; Antons and Piller, 2015; Bohner and Wänke, 2002; Clagett, 1967) and IGs (Bokinge and Malmqvist, 2012; Coughlan and Coghlan, 2008; Ortiz *et al.*, 1999; Rouhani *et al.*, 2015; Suzić *et al.*, 2018a, 2018b). From the theory building of the NIH-mitigating IG development framework and from revisiting the rich empirical data of two consultant interventions conducted, we derive key implications for theory and practice, as well as future research opportunities. We expect that the main findings of the present research will help consultants and researchers developing IGs by mitigating the risk that NIH syndrome will appear during the consultant intervention, enabling in this way a successful knowledge transfer.

5.1 Theoretical implications

5.1.1 Proposing a proactive rather than reactive approach to NIH mitigation. In his pioneering work on NIH syndrome, Clagett (1967) wrote that "the problem is not how to

overcome N.I.H., but how to prevent it." Thus, at the very beginning of the research on NIH, Clagett practically suggested a proactive approach to NIH mitigation. Strangely, the relevant NIH literature (Antons and Piller, 2015; Kathoefer and Leker, 2012; Katz and Allen, 1982; Lichtenthaler and Ernst, 2006) remained focused on the reactive approach, that is NIH mitigation during the knowledge transfer (i.e. overcoming the NIH during the consultant intervention) – Figure 3. Thus, knowledge transfer literature dealing with NIH virtually neglects the IGs as tools for knowledge transfer that could help NIH mitigation, staying focused on reactive NIH mitigation (Figure 3).

As for the IGs stream, the notion of a participative IP development model – as a basis for a proactive approach to NIH mitigation – is present in the relevant literature (Salvador *et al.*, 2009; Sousa and Voss, 2008; Suzić *et al.*, 2018a; Suzic and Forza, 2023; Svensson and Barfod, 2002). Some rare research managed to connect the effects of IGs with NIH appearance (Caldwell and Dyer, 2020; Suzic and Forza, 2023), however, in an implicit way and not naming the NIH syndrome *per se*, but recognizing the effects that nonparticipative IP development model (Figure 8) can have on clients acceptance of these IPs. Notably, the participative IP development model has not been clearly articulated up to the present study.

We argue that one of the reasons for this unusual situation is the lack of research covering consultant intervention, NIH and IGs in ensemble (Figure 2). Specifically, the disconnectedness of the stream that deals with NIH and the one that develops IGs is symptomatic. As a result, IGs remain almost invisible as tools for knowledge transfer and especially for consultant intervention (Jones *et al.*, 2023; Kilmann and Mitroff, 1979; Pellegrinelli, 1997, 2002; Ward *et al.*, 2009). Thus, there was a need to connect these three research streams to enable a proactive approach to NIH mitigation.

The present research shifts the focus *from a reactive approach* to NIH mitigation (i.e. what to do during the consultant intervention) *to a proactive approach* to NIH mitigation (i.e. how to develop the consultant-used IGs in the right way). Specifically, the present research stressed the importance of client participation in creating an IP, arguing that the location of the IP's creation is crucial in the emergence of NIH syndrome. Notably, if the IP is developed during the creation of IGs, outside of the client company and without participation from the client (e.g. best practices, see Sousa and Voss, 2008), it is highly probable that NIH syndrome will appear in the company. However, if the IP is developed within the company with the client's participation (see Suzic and Forza, 2023), we argue that acceptance of the IP will be much more probable. In this way, the focus of the NIH mitigation shifts from the act of consultant–client knowledge transfer (as a current reactive focus of the NIH literature) to how the IGs are developed to mitigate NIH (proactive approach – Figure 8). Thus, by proposing the development of IGs that move the creation of an IP inside the client company (Figure 8), we follow Clagett's suggestion (Clagett, 1967, p. 50) that NIH should be prevented (and not overcome).

5.1.2 Proposing a NIH-mitigating IG development framework that can enable subject matter experts to develop IGs that are, by their design, capable of mitigating NIH syndrome during the consultant intervention. Although IGs are developed as supporting tools for consultant interventions (Suzić *et al.*, 2018a, 2018b), their role in NIH appearance during the consultant intervention is neglected by the researchers. The rich IG research stream defines what characteristics IGs should have (Coughlan and Coghlan, 2008; Ortiz *et al.*, 1999; Rouhani *et al.*, 2015), how effective IGs should look like and what properties they should have (Suzić *et al.*, 2018a). We can also find the IG building blocks definitions in the relevant literature (Suzić *et al.*, 2018a). Thus, the available IGs are predominantly focused on the contents and providing instructions on how a specific concept should be implemented.

Albeit, some IGs point out hindrance factors to look out for when conducting the consultant intervention (Hanafy and ElMaraghy, 2015; Ismail *et al.*, 2007; Kudsk *et al.*, 2013). But also these, with the exception of resistance to change (Kudsk *et al.*, 2013) fail to address the NIH syndrome as a potential hindering factor for effective use of IGs. Thus, the effect of NIH

syndrome is not recognized among the possible hindrance factors. In this way, the IGs are developed without considering what effect their characteristics (once developed) will have on the acceptance of the knowledge by clients during the consultant intervention. Some exceptions among the IG studies (Caldwell and Dyer, 2020; Suzic and Forza, 2023) implicitly mention NIH effect, but they do not frame their research in the general NIH theory.

Thus, the IG research stream does not recognize NIH syndrome as an obstacle to successful knowledge transfer during the consultant intervention, instead focusing on the operationalizing steps for the implementation of specific concepts. This means that experts developing IGs (i.e. researchers and/or consultants) until the present study did not have a theoretical framework that could guide them in developing NIH-mitigating IGs.

In fact, the main contribution of the present research is a new mid-range theory (Holmström *et al.*, 2009) in the form of the proposed NIH-mitigating IG development framework. Starting from empirical findings of the previously conducted study (Suzic and Forza, 2023), we theorized that if the IGs are developed using a nonparticipative IP development model (Figure 8) where an *a priori* IP is developed without the client's participation, the chance of NIH appearance will be high. Subsequently, in the theory-building phase, we framed the development of our framework into the Antons and Piller's (2015) general theory on NIH syndrome (i.e. NIH attitude functions). Specifically, we argue that IGs should be developed according to the proposed framework of five principles for the development of NIH-mitigating IGs in order for the consultant's intervention to be accepted by the client without the appearance of NIH syndrome. The framework proposes that IGs should be developed in a way that preserves the client's ego, adheres to the client's values, fulfills the client's social needs, builds on the client's knowledge and ensures positive outcomes for the client (Table 4). Neglecting the role of the IGs used for the consultant intervention can have a detrimental effect on the client's acceptance of the transferred knowledge because the knowledge offered by the consultant – with the use of IGs – could be seen as external to the company and, thus, be rejected.

5.1.3 Operationalization of the NIH attitude functions framework. In the present study, we want to recognize the importance of the work done in the stream of knowledge transfer literature dealing with NIH for the results we obtained. Specifically, we want to emphasize the importance of Antons and Piller's (2015) work done on the general theory of NIH attitude functions. This specific work enabled us to better understand the externality of consultants as participants in the consultant intervention. Specifically, it helped us to frame our empirical experience with consultant interventions and better understand the unenviable position of Type 7 and Type 8 knowledge transfer (Table 1) that is prone to NIH appearance in client companies. Furthermore, starting from this general theory of NIH attitude functions, we were able to deductively derive our mid-range theory in the form of NIH-mitigating IG development framework (Table 4). Finally, we were inspired by various calls for future work that Antons and Piller (2015) made in their pivotal work and tried to contribute to some of them.

Specifically, an important contribution of the present research is the operationalization of the NIH attitude functions framework (Antons and Piller, 2015) for a specific area of IG development. Thus, using deduction we moved from the general theory of NIH attitude functions to the mid-range theory in the form of NIH-mitigating IG development framework (Table 4). To the best of our knowledge, the present research is the first to systematically address the issue of inappropriate development of IGs, which can potentially lead to NIH syndrome and is a concern for consultants during knowledge transfer. Furthermore, the present research responds to a call for research from Antons and Piller (2015) in a number of ways:

- it brings a fresh perspective, as it examines the influence of IGs on the success of consultant interventions;

- it provides a framework with explicit countermeasures and mechanisms to mitigate NIH syndrome;
- it answers the call to introduce a group-level perspective as an addition to the dominant individual perspective of NIH analysis; and
- through a proposed NIH-mitigating IG development framework, it brings us closer to understanding how managerial decisions are made in companies.

5.2 Practical implications

Tracking the source of consultancy-induced NIH syndrome back to the development of the IGs – Another contribution of the present research is its emphasis on IGs as an essential part of consultant interventions for mitigating NIH syndrome (Figure 3). Except for some rare research (Caldwell and Dyer, 2020; Suzic and Forza, 2023), the relevant literature does not focus on IGs as a source of potential NIH syndrome during the consultant intervention. By focusing on IGs in consultant interventions, we are placing a spotlight on the dynamics between the IGs used and the consultant's approach. Up to now, the available literature either provided IGs without taking into account how they should be applied (Suzić *et al.*, 2018a, 2018b), or focused on the type of consultant intervention (Pozzebon and Pinsonneault, 2012) without considering the type of IGs used. The present research argues that the consultant approach alone is not sufficient to mitigate NIH syndrome if IGs are not developed to facilitate participative IP development.

Identification and description of the mechanism that lead to NIH mitigation based on the conducted consultant interventions – In the last part of our research (subsection 4.4) we revisited the two consultant interventions previously conducted (Suzic and Forza, 2023). Based on the primary empirical data (i.e. notes, interviews, recordings and analysis done), we identified consultant intervention features that could lead to NIH mitigation, mapped them through a mental exercise (Whetten, 1989) to the relevant principles for the development of NIH-mitigating IGs and finally identified and described specific mechanisms that support enacting of specific principles. In addition, we provided concrete examples from the two consultant interventions to support and further explain the reasoning behind the various reported mechanisms. Although we recognize that all IGs are different (e.g. context dependent, related to developers' experience and competences), we believe that this detailed mapping exercise of the characteristics of IGs that were used in successful consultant–client knowledge transfer can help future IG developers frame their DSR artifact development endeavors with the result of successful knowledge transfers without NIH appearance.

5.3 Limitations and future research

One of the limitations of the present research is that we considered only participative and nonparticipative IP development models when we examined how the IGs used by consultants could be developed (Figure 8). However, it is more likely that there is a client nonparticipation/participation range in the creation of IPs. Nevertheless, we believe these two extreme cases were suitable for the analysis in the present research. This kind of range could be an object for future studies.

Another limitation is that the framework developed has not been tested in practice. In fact, the research stops on the Phase 3 of the DSR research proposed by Holmström *et al.* (2009) – mid-range theory building. Future analyses should include a wide range of IGs with which the conceptualized NIH-mitigating IG development framework should be tested. To do this, future studies could include a number of companies in which the ability of the developed IGs to mitigate the negative effects of NIH can be further tested. This can be achieved through action

research or through interviews with consultants and clients of the consultant intervention after the consultant intervention has been performed in the company. Another approach to test the proposed NIH-mitigating IG development framework would be to conduct a multiple case study (Voss *et al.*, 2002) in purposes of theory testing (van Aken, 2004; Voss *et al.*, 2002). Furthermore, a comparison could be made between two IGs, one with participative and one with nonparticipative IP development models for consultant interventions, testing them in parallel in case companies.

In the present research, to mend this lack of developed framework testing, we opted for a mapping exercise (Whetten, 1989) where we analyzed features of two conducted consultant interventions and mapped them to principles for the development of NIH-mitigating IGs, identifying and describing the mechanisms that led to the enactment of specific principle and NIH mitigation and providing examples for these principles from two case companies. Built on this experience, future research could also include more mapping exercises that would replicate the same procedure proposed in the current paper to identify other features of the specific consultant interventions that support the enacting of principles for the development of NIH-mitigating IGs. This work could lead to further theoretical development and clarification of mechanisms through which the principles proposed are enacted.

Notes

1. Notably, for the purposes of this paper terms "consultant intervention" and "consulting intervention" are seen as synonyms.
2. *Exploratory part of DSR* deals with the development and refining of artifacts that resolve a specific practical problem. Through the use of the developed artifacts, data are obtained for later analysis (Holmström *et al.*, 2009).
3. *Explanatory part of DSR* deals with the development of explanatory theory – which can be either mid-range or formal theory – based on the data obtained from the use of the artifact with goals of establishing theoretical relevance and generalizability (Holmström *et al.*, 2009).
4. *Abductive reasoning* – starting from an incomplete set of observations, one offers the best prediction that may be true. In abductive reasoning, the cause is inferred from the effect. Thus, the researcher hypothesizes a general conclusion based on a specific limited number of observations (Mantere and Ketokivi, 2013). Example: Incomplete observation => The grass is wet; Best conclusion (may be true) => It must have rained or someone has watered the grass
5. *Deductive reasoning* – starting from a general rule one comes to a specific conclusion which is always true. In deductive reasoning, the effect is inferred from the cause. Thus, the researcher starts with an accepted theory to draw specific conclusions for a specific case (Mantere and Ketokivi, 2013). Example: General rule => When it rains objects get wet. It rained; Specific conclusion (always true) =>The grass must be wet
6. "Although it is unfair to expect that theorists should be sensitive to all possible boundary constraints, clearly there is value in conducting some simple mental tests of the generalizability of core propositions" – Whetten (1989, p. 492)
7. Implementation plan (IP) is a detailed step-by-step procedure for implementing a specific concept.
8. Complete analysis of 20 IGs is available on request from the authors. Here the further analysis is omitted for the purposes of the available space and to facilitate the readability of the paper.
9. Both Metalmech Inc. and Soft Automation Inc. are fake names aimed to keep confidentiality of the company data

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Corresponding author

Nikola Suzic can be contacted at: nikola.suzic@unitn.it