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Enhancing the selection of methods for customer integration in innovation processes through a process-oriented description framework

Abstract:

Basic aim of innovating is to provide products and solutions meeting the expectations and needs of their customers and stakeholders. Therefore, customer integration methods provide means to integrate these actors into the innovation process for gathering information, supporting in decision making or creating and elaborating ideas or solutions. One central aspect in this regard is the selection of the most appropriate method for a specific task in the innovation process. This is due to, on the one hand, the variety of objectives and potentials for information generation of these methods, and, on the other hand, the diversity of influence factors, restrictions as well as issues for preparation and post-processing of these methods. Therefore we propose a framework with relevant criteria and parameters for describing methods of customer integration from a process-oriented point of view. This framework supports designers and process owners with the selection, preparation and post-processing of appropriate methods.

Keywords: "Design Management, Knowledge Management and Product Life Cycle Management", "Design Collaboration and Communication ", customer integration, process management

1 Introduction

Customers are frequently seen as enormous potential for generating innovations. Methods for customer integration allow companies to integrate customers in the process of gaining and generating new ideas for products and services. However, designers must select an appropriate out of various methods. Furthermore, the choice of an appropriate method for customer integration is normally limited by several restrictions such as time, budget as well as available skills and resources. In addition, each method entails particular tasks for designers in advance of the integration as well as afterwards.

To enhance the process of selecting an appropriate method for customer integration and integrating it in the innovation process, this paper presents a descriptive framework for classifying methods of customer integration. The proposed framework systemizes relevant parameters for describing those methods from a process-oriented point of view. First we started with identifying requirements of designers who are responsible for organizing and implementing methods for customer integration. Therefore we recognized both existing approaches for characterizing design methods of product development as well as the relevance of the parameters for practice. Consequently, the classification derived will help to compare those methods and to find an appropriate one for a given task along the innovation process. Furthermore, the framework also considers parameters regarding preparation and post-processing of those methods. Finally, the framework reduces the complexity of selecting an appropriate method of customer integration and can be used for communication across organizations.

Our research started with a detailed literature review of publications in the field of customer integration and with deriving requirements for process-oriented description of

methods for customer integration. Most important parameters were identified and collected. In addition, for each parameter reasonable values were derived from literature. All parameters and values are summarized within a morphological box. Finally, we evaluated those parameters and values with the help of a widely-used method: a lead user workshop. Summarized, this research will give some recommendations to the following questions:

- Which parameters help with the selection of an appropriate method for customer integration?
- What has to be done for preparation and post-processing of the method?

2 Theoretical foundations

2.1 Customer Integration

Customer integration and customer orientation are terms that are often mixed up in theory and practice [1]. Therefore it is necessary to provide a definition of customer orientation as well in order to point out the differences. The principle of customer orientation describes the consistent adjustment of all corporate activities on customer requirements, whereas not only actual but also potential and lost customers are taken into account. The willingness of the employees to handle customers differentiated and individually, the commitment to react quickly on change of customer requirements and importance of customer acquisition and customer loyalty within the whole organization are key factors of customer orientation [2]. Hence it becomes clear, that customer orientation is the basis for customer integration. To put it all in a nutshell, customer integration can be defined as "active participation of the consumer in a contracted creation process by providing external factors or by taking over partial performances so that creation process activities of the provider are influenced or even partially replaced" [3]. In other words: "The principle of customer integration states that a customer problem is solved together with the customer" [4].

Methods for customer integration are a common instrument for solving customer problems in collaboration with customers. Consequently, we interpret methods of customer integration as collaboration tasks between companies and customers because both parties work together towards a common goal [5].

While customer involvement provides insights about needs which should be addressed by innovations, customer integration also tries to capture solution know-how from customers [1]. Solution know-how is based on technical or application expertise. Reichwald et al. distinguish between application and object knowledge [6]. Application knowledge refers to practical experience with a product e.g. through intensive usage. Object knowledge focuses not on practical experiences with a product, but on knowledge concerning e.g. the technology, procedure or material of a product.

In addition, customers are not a homogeneous group. Michel, Brown and Gallan constitute three different roles of customers that have to be considered for integration into innovation processes: user, payer and buyer [7]. This typology works for both individual and organizational customers, and depending on the context, the same person might perform all three roles (e.g., buying a cell phone and using it) or perform unique roles (e.g., a mother buys a shirt for her daugther with the money her grandfather gave her for birthday). Each of the three roles has a different perspective on products that differ from each other and usually also differ from the perspective of designers and engineers.

2.2 Methods for customer integration

The procedure of a methodical development in product development is characterized by step-by-step actions, the logical order and defined results and levels. Consequently, this can be conceived as a process with many sub-processes [8]. Usually, the innovation process seldom runs off in a defined and straight order, but differs depending on the actual situation of application [9]. As a consequence, the designer has to plan and control the process by an appropriate arrangement of sub-processes [8]. They use an individual mix of design methods and select therefore the most suitable methods depending on several factors, such as user skills, infrastructure and cost. One specific type of design methods contains methods of customer integration. Those methods can be characterized by an active participation of customers.

Customers can make three different kinds of customer contributions [6]: decision, information and creation. In the case of decision activities, customers only decide or evaluate given facts. These decisions are not limited to dichotomy decisions (e.g. yes/no). It is also possible to allow customers to assess the potential of product ideas, concepts or prototypes on the basis of e.g. nominal scaling. Customers can also rank given products corresponding to their preferences. Conjoint analyses, closed-questionnaire surveys or standardized voting represent examples of decision based customer contributions.

The possibility for customers to articulate preferences or solutions regarding a specific challenge of the product development process is called information. This kind of contribution is not restricted to pure decision-makings and offers customers a much higher degree of freedom in regard to the possible solution space. It allows customers to communicate their needs, personalities, preferences and even solutions to a particular problem. Examples of information based customer contributions are focus groups, idea competitions, feedback hotlines or complaint management.

Creation based customer contributions imply that customers are creative on their own instead of giving information or deciding of how to solve a specific innovative challenge. That means customers come up with own creations as a solution and become real co-designers within the innovation process. First prototypes, which are built by customers or toolkits for the configuration of products, are examples of creation based customer contribution.

The second dimension is cyclicality of the method which ranges from one time interaction for a specific task only, to continuous interaction during an entire innovation process or ongoing for several projects [10]. Both types of methods require a different management approach. One-time methods are applied for one specific task, e.g. selection of the best prototype using conjoint analysis or gathering demand information using focus groups. They have to be prepared and post-processed for each execution. In contrast, continuous methods are ongoing, such as toolkits or online communities. They are permanently available via internet and customers can use them whenever they like.

Figure 1 illustrates the underlying process in which methods for customer integration are embedded in. The process starts with required external input of the innovation process (e.g. for solution information, a decision over the best out of three product prototypes or the creation of a new design). In a next step, appropriate methods are evaluated and the most appropriate one is finally selected. Subsequently, the selected method has to be prepared before and post-processed after its execution. Finally, the output will be delivered to the innovation process.

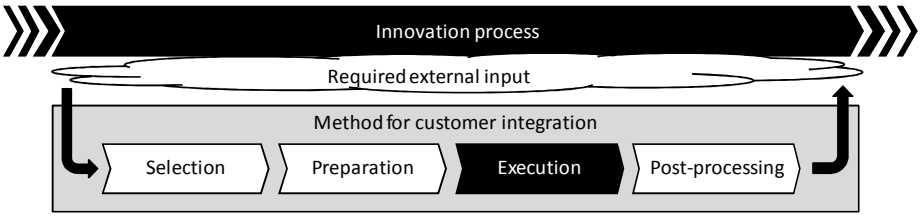

Figure 1 Context of methods for customer integration. Source: based on [8]

In contrast to other research, this paper is not focusing on the methods and their execution but on the process in which the methods of customer integration are embedded in. The method itself and its execution are interpreted as a blackbox.

3 Requirements for describing methods of customer integration

In this research, the different perspectives on customer integration methods as mentioned above have to be considered. Central aspects are the heterogeneity of customers (as stated in paragraph 2.1), the different types of contributions stemming from customers (paragraph 2.2).

From a process-oriented point of view, each contribution from a customer requires different preparation and post-processing. Therefore, when describing methods of customer integration, these aspects form central requirements that have to be considered.

3.1 Process-oriented Method Model (PoMM)

The Process-oriented Method Model (PoMM) describes design methods in a standardized and structured way [8]. It conceives design methods as a process, namely the planned procedure transforming a given input (starting state) into a defined output (ending state). The output of a method corresponds both to the ending state of the actual process and to the input of the following method. PoMM supports designers with the specification of the input and output as well as information on influencing parameters.

One element of PoMM are the process modules for describing methods. These process modules are designed in a process-oriented way to be adjusted to the aimed design process as well as possible. Their contents have direct influence on the application of the design method. Process modules are: input, output, sequence, user, general conditions, hints and working aids. Each of those process modules describe the method but give only little advice for selection, preparation and post-processing of it.

Although, PoMM is a suitable approach for describing design methods in a standardized and structured way, it does not consider relevant aspects of the underlying process in which the method is embedded in, such as selection, preparation and post-processing. All of those aspects are important for designers and process owners in order to choose the most appropriate design method for a given task. In addition, methods for customer integration have specific characteristics that have to be considered for an adequate description.

3.2 Existing approaches for describing methods of customer integration

In a next step we were looking for existing approaches for describing methods of customer integration, comparing them with each other.

The VDI Richtlinie 2221 [11] assigns design methods to the phases of the development process. Methods for customer integration are not explicitly considered, so

this framework is not suitable for describing methods for customer integration.

Ehrlenspiel [12] also developed a collection of design methods. They are divided into general, organizational as well as material-bounded methods. Each method is evaluated for each phase in the development process. However, only the methods themselves are evaluated, but not the underlying process, preparation or post-processing issues.

The next categorization is from Pahl and Beitz [13]. They provide an overview of design methods and evaluate their applicability for each phase of the development process. There is only one criterion for each method called "applicability" with the following values: primary, supporting, not applicable. In addition, it is not possible to compare different methods.

The framework of Wach [14] considers only working aids within the development process. However, some of the criteria and values can be adapted and used for a process-oriented description of methods for customer integration, such as effort for resources or carrier medium.

Freisleben [15] relates design methods and working aids to three phases within the development process: product planning, product design and production preparation. In addition, he divides each of those phases in several tasks. In addition he provides a description of each design method by means of a description, constraints, restrictions, advantages, disadvantages as well as key words. Those criteria are only very general and qualitative.

A comparison and combination of different frameworks is provided by Zanker [16]. He identified recurring criteria and parameters that should be taken into account for the description of design methods. However, most of the criteria and parameters are not defined.

Größer [17] distinguishes between 28 different parameters for classifying design methods from the following criteria: output, input, general characteristics and structural characteristics. Many criteria and parameter of Größer's framework can also be used for describing methods for customer integration, such as the purpose of the output or expenses for method execution.

The last identified framework is from Reinicke [18]. Reinicke already focuses on methods for integrating users into development processes. She also used PoMM as basis for describing methods. However, the framework only describes methods but not the underlying process in which methods are embedded in. Criteria and parameters regarding preparation and post-processing of methods are missing. Anyhow, the framework from Reinicke can be used as a basis for a framework describing methods of customer integration from a process-oriented point of view.

4 Research model

Based on the theoretical foundations of customer integration and existing approaches for describing models of customer integration we propose the following research model. It is build on the Process-oriented Method Model but was extended in three aspects.

First, users are divided into internal and external actors. Identification, motivation and integration of external users into internal processes differ between internal and external actors. We interpret methods of customer integration as a collaboration task, either between customers or between customers and a company. Therefore collaboration-related aspects like synchronicity (same time vs. different time), or location (same place vs. different place) have to be considered in the context of methods for customer integration.

Those aspects are important because especially in collaboration with external actors it is not always possible to be at the same place for the same time. Internet-based methods like web-based conjoint analyses, innovation communities or toolkits allow designers to integrate customers also in a different time and different place scenario.

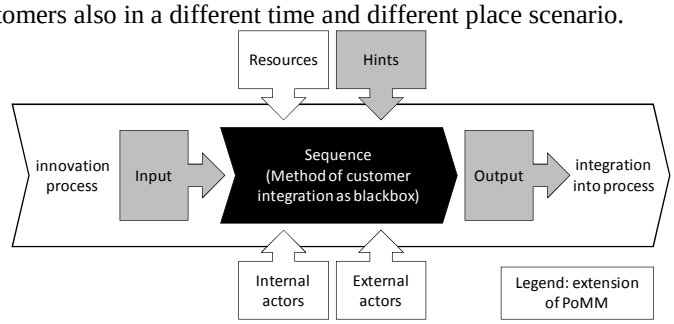

Figure 2 Research model. Source: following Birkhofer and extended

Second, a new category called process integration is added. It contains all dependencies and requirements of the underlying process in which the method of customer integration is embedded in. In contrast to the category general conditions of PoMM, process integration contains all aspects of the process that is calling the method and using its output. This extension is important because it adds aspects that are related to the preparation, execution and post-processing of the method.

Third extension of PoMM is related to the working aids. In the research model working aids are replaced by resources. Working aids are only one aspect of Resources. From a process-oriented point of view it is also important to consider other aspects, such as infrastructure, investment costs or expenses.

5 Criteria for describing methods of customer integration

Overall we identified 30 parameters which are relevant for describing and classifying methods for customer integration. Those parameters can be related to five different categories: input, output, process integration, resources as well as actors.

5.1 Input

First, the category Input contains five input parameters. This category contains all aspects that have to be prepared as input for the method.

First parameter is the Goal of the method. The definition of a goal is critical for the success of each collaboration task such as the integration of customer. A goal is a desired state or outcome. It deals with group goals, private goals, and goal congruence. That is the degree to which individuals perceive that working toward group goals will be instrumental to attaining private goals [5]. We suggest a text field for the definition of the goals [14; 17-18].

The second parameter is the degree of formalization. This parameter is considered by [17] and can take following three values: high, partly and low degree of formalization. It is important to adjust input to an appropriate degree of formalization. If the degree of formalization is lower than expected, the method cannot be executed adequately. Product configurators e.g. require highly formulized input, such as concrete product components.

The third parameter is called content and describes the type of task. The input can be formulated e.g. as a question, exercise, problem statement or model. In a lead user workshop the participants usually start with an exercise or problem statement. In contrast,

the content of a product configurator is e.g. a product model.

The forth parameter is the carrier medium of the input. It can be distinguished among others between speech, paper, electronic medium and a physical model [14; 16]. Each method for customer integration requires a specific carrier medium of the input. Product configurators e.g. require an electronic representation of a product. In contrast, speech is usually sufficient for brainstorming and paper for brainwriting sessions.

The next parameter defines the amount of information that must be prepared for the method execution. Größer distinguishes between single, multiple and plenty of information [17]. This parameter is both important for preparation of the input and for post-processing of the output.

5.2 Output

The next category is Output and also consists of six output parameters of a method for customer integration.

First parameter is the purpose of the output. Größer [17] defines five possible alternatives for purpose that were also adopted by Reinicke [18]: novation, generalization, organization, improvement and specification. In the context of methods for customer integration we add two additional purposes: marketing effect and recruiting. In the one hand, companies can use the application of methods for customer integration for marketing activities, e.g. for public relations articles. On the other hand, integrating customers is a chance for companies to get in contact with motivated and interested customers. Especially in the case of integrated pupils or students, companies can use those contacts for recruiting.

The second parameter of the output is predictability of goal attainment. This parameter was defined by Wach [14] who called this the reliability of the method. He distinguishes the output between definitely, supposable and optionally goal-oriented. For brainstorming e.g. the predictability of goal attainment is only optionally goal-oriented because is cannot be assured that the output is goal-oriented. In contrast, a product configurator provides definitely goal-oriented output, e.g. a desired design for a car.

The third parameter of the output is the contribution of the customer. As described above, customers can make three different kinds of contributions: decision, information and creation [6]. While conjoint analysis only gathers decision information from customers, lead user workshops usually provide creation information such as prototypes.

Furthermore, according to the input above, the following parameters are also relevant for the output: degree of formalization, carrier medium as well as amount.

5.3 Process integration

Third category is process integration. This category contains five parameters that are related to the integration of the method for customer integration into the innovation process.

The first parameter is the date of method execution. It is structured along the innovation process. It is used by several authors and frameworks, including VDI 2221, Ehrlenspiel, Pahl/Beitz as well as Reinicke [11-13; 18]. The following phases of the innovation process are considered for the framework: assessment of demand, planning, development, manufacturing, sales and distribution, use, maintainance and recycling. In contrast to existing frameworks which only consider the development process, our framework regards the entire life cycle of innovations. Lead user workshops are usually

conducted in the planning phase in order to develop concepts or solutions. In comparison, product configurators are applied in the manufacturing or distribution phase by integrating customers for the development of concrete configurations of products.

The second parameter is the dependency on processes. Helbig [19] distinguishes between high, medium and low dependency. High dependency means that a method can only be executed after a specific process step or method. Conjoint analysis e.g. only makes sense if the customer can choose between different product alternatives. In contrast, brainstorming has a low dependency.

The third parameter of process integration is the duration of method execution. Duration of preparation and post-processing is excluded. According to Größer and Reinicke [17-18], this parameter can be distinguished into high, medium and low amount of time.

Divisibility is the fourth parameter of process integration. It describes if the method execution can be divided. According to Größer, divisibility can take the value divisible or not divisible. A lead user workshop e.g. is divisible and be conducted on two different weekends. In contrast, a brainstorming session is not divisible.

Last parameter of process integration is cyclicality. As mentioned above, methods of customer integration can be applied one-time or continuously [10]. Especially methods of virtual customer integration allow a continuous method execution.

5.4 Resources

The fourth category contains Resources and consists of four parameters.

First parameter implies investment costs. These are non-recurring cost that are necessary for method execution. Investment costs can be high, medium or low. In addition we suggest a text field that allows companies to document an empirical value.

Second parameter contains all expenses which occur during method execution. This implies also expenses for equipment. Größer [17] uses the values high, medium and low.

Third parameter is infrastructure and describes all general conditions that are necessary for method execution. Elements of infrastructure are not wasted or consumed after usage. Consequently, infrastructure consists of rooms or also internet capabilities among other things.

In addition to infrastructure, the forth parameter consists of working aids [8] that are consumed after usage. This implies e.g. forms and checklists, paper and writing materials.

5.5 Actors

Finally, the category Actors includes ten parameters describing internal and external actors of the method:

First category contains the number of participants [14;16-17]. Following [20] group size can be categorized in 2-7 and 8-n participants. In addition, we add the value “1”, because the examined methods should integrate at least one customer and one internal actor.

Skills are divided into two separate parameters. The second parameter of Actors contains technical skills. Reichwald et al. term technical skills as object knowledge [6]. Wach [14] and Größer [17] distinguish between technical skills are necessary, partly necessary or not necessary.

The next parameter covers methodical skills which describes the experience and knowledge about the underlying method. Some methods require specific methodical skills

and are therefore not applicable by every actor. Following Reinicke [18] we distinguish again between necessary, partly necessary and not necessary.

The fourth parameter comprises the department of internal actors. Internal actors can come from any department of the company, such as product planning, development, manufacturing, sales and distribution, marketing or management. Integrating actors from appropriate departments is important for the success of innovations.

Next parameter comprises the hierarchical level of internal actors and represents the authority to decide. The authority is very important for implementation of the output. Problems with actors from different hierarchical levels have to be considered in advance. Problems can occur, if actors are dependent from other ones, e.g. in a workshop with employees and their line manager. This constellation can hinder creativity. It can be distinguished between absolutely, limited and no authority to decide.

The sixth parameter implies the role of the actors within the method. The role can be independent of the hierarchical level of the actor. Reinicke [18] only distinguishes between "user" and "moderator". We add the roles of "organizer" and "observer" as well as "developer". Developers are important in the context of methods for virtual customer integration and are responsible for the development and operation of the method.

Motivation of the actors is the seventh parameter. Generally, motivation can be distinguished between intrinsic and extrinsic [21]. Intrinsic motives for participation are fun, intellectual challenging or proud. Extrinsic motives for participation are money or the demonstration of skills and expertise. Customers use product configurators for customizing individual products, an intrinsic motive.

The eighth parameter covers the role of external actors. External actors cannot only be customers but also supplier, installers or mechanicans. All of those external actors can contribute specific experience with products and bring in their individual perspective on the innovation.

The ninth parameter is synchronization of the actors and contains temporal aspects of the integration. It can be distinguished between same time and different time. Unfortunately, it is not always possible to integrate all participants at the same time. Some methods allow an asynchronous integration of customers, like innovation communities.

The last parameter comprises the location of the actors. Similar to the former parameter, the actors can be at the same or different places. Some methods allow the integration of customer at different places including all methods for virtual customer integration.

6 Exemplary application of the classification

6.1 Lead User Workshop

Table 1 illustrates the application of the description framework on lead user workshops [22]. Lead user workshops were introduced by von Hippel [23]. Lead users differ from other users by two characteristics: First, the lead user expects attractive, innovation-related benefits from a solution to his needs and therefore is motivated to innovate. Second, he experiences needs for a given innovation before the majority of the market does are innovative customers that are motivated. Therefore, lead users are usually integrated early in innovation process in order to generate especially radical innovations. Lead user workshops are characterized by an intensive collaboration between lead users, usually with concepts or prototypes as output.

Table 1 Application of description framework on lead user workshops (grey=selected)

criteria	parameter	possible values				
Input	goal	textfield				
	degree of formalization	high		partly		low
	content	question		task		model
	carrier medium	speech	paper	digital	physical model	…
	amount of infos	single input		multiple input		plenty of input
Output	purpose of the output	novation	generalization	organization	improvement	specification
	contribution of the customer	information		decision		creation
	degree of formalization	high		partly		low
	carrier medium	speech	paper	digital	physical model	…
	predictability of goal attainment	definitely goal-oriented		supposable goal-oriented		optionally goal-oriented
	amount of infos	single output		multiple output		plenty of output
Process integration	date of method execution	demand		planning		development
		manufacturing		sales		distribution
		use		maintainance		recycling
	dependency on processes	high		medium		low
	cyclicality	one-time				continuous
	duration	high		medium		low
	divisibility	divisible				not divisible
Resources	investment costs	high		medium		low
	expenses for method execution	high		medium		low
	infrastructure	meeting room		internet		…
	working aids	forms	checklists	paper	craft supplies	...
Internal actors	nr of internal	1		2-7		8-n
	technical skills	necessary		partly necessary		not necessary
	methodical skills	necessary		partly necessary		not necessary
	department of internal actors	development	manufacturing	marketing	management	…
	hierarchical level	absolutely authority to decide		limited authority to decide		no authority to decide
	role within method	organizer	moderator	user	observer	developer
	motivation of internal actors	extrinsic				intrinsic
External actors	nr of external	1		2-7		8-n
	technical skills	necessary		partly necessary		not necessary
	methodical skills	necessary		partly necessary		not necessary
	role of customers	user		payer		buyer
	role of other external actors	supplier	mechanics	installer	seller	…
	role within method	organizer	moderator	user	observer	developer
	motivation of external actors	extrinsic				intrinsic
all actor	synchronization	same time				different time
	location	same place				different place

7 Conclusions

Aim of this research was the generation of a framework capable of providing designers and process owners with the necessary information for a well-founded selection of customer integration methods as well as for the appropriate preparation and post-

processing of the method conduction with the innovation process. Therefore, the paper applied a process-oriented perspective on customer integration methods following established approaches for characterizing methods in design processes. The framework was composed with various aspects identified from literature and considers specific characteristics, such as different roles of customers (user, payer, buyer) or different contributions (information, decision, creation). Overall, the framework consists of five different categories (input, output, process integration, resources and actors), that are decomposed into 30 parameters for a detailed description of relevant aspects of customer integration methods.

Subsequently, the applicability of the framework was demonstrated by characterizing the method "lead user workshop". Clearly, this evaluation of the set of parameters is only an internal review that has to be tested in practice by consulting experts and/or by practical application. In addition, more empirical data is needed to validate and improve some values of the parameters. Furthermore, the parameters only describe methods of customer integration from an external view as a black box. No parameters were collected for describing the processes within the methods.

Nonetheless, the results look promising as to the applicability for customer method selection, preparation and post-processing within innovation process execution

8 Further research

As stated in the conclusions, the framework at hand offers multiple potentials for enhancing the characterization, assessment and selection of customer integration. Moreover, the vital aspect of purposefully preparing and post-processing method execution within innovation processes is possible.

To provide substantiated information in this regard, further empirical evidence of the applicability and appropriateness of the categories, parameters and values is necessary. It could also be interesting to classify the parameters in can- and must-parameters. To enhance this information, the consideration of the aspects of method execution would be interesting, while in this research, the focus was on a process-oriented, external perspective on customer integration methods.

With this additional information at hand, the design of a comprehensive selection method of appropriate customer integration methods seems possible. This could lead to the development of a supporting software tool, calculating e.g. the measure of distance between required input from customers and the available methods of customer integration.

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