EVALUATING METHODS FOR PRODUCT VISION WITH CUSTOMERS' INVOLVEMENT TO SUPPORT AGILE PROJECT MANAGEMENT

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ABSTRACT
The literature from Project Management and Product Development areas consider the vision as one of the main success factors. The agile project management relates the product vision to the project's success too and, in addition, indicates the need to involve customers during this process. Would there be, therefore, methods to help achieve the two objectives during the planning of the project? The paper evaluated methods using an adaptation of the Repertory Grid Technique. The evaluation used constructs from literature of Product Development and Agile Project Management to assess the two aspects: support in building the vision and customer involvement. The results indicated that the methods do not achieve both objectives simultaneously, but on the other hand, have complementary profiles. This indicates that, theoretically, there is the possibility of associations in order to support the agile project management. Finally, the analysis of results also shows some suggestions of associations and possible adaptations of methods that need further study.

Keywords: Product vision, Customer involvement, Agile Project Management, Product development

1   INTRODUCTION
The vision has always been seen as a relevant factor for project success. Authors from the areas of strategic planning, product development, agile project management and traditional project management are emphatic in stating that the creation of a robust vision helps to guide the work of teams and at the same time it can decrease the product development time [1-13].

After the publication of the Agile Manifesto for Software Development [14], and the subsequent dissemination of the fundamentals of Agile Project Management (APM), this issue has been discussed again. According to this approach, the product vision works as a guide for the project team, allowing anticipates, briefly and visually, the features expected for the final product.

Another key element found in the approach to Agile Project Management is the active involvement of customers with the project team, during the entire product development as a prerequisite for the success of the project.

The product development literature contains methods for the product vision, as Vision in Product Design (ViP) [15, 16], Visionary Concepts [17-19], Product Vision Management Method (PVMM) [20], and for customer involvement, as Lead User [21-25], Crowdsoursing [26], Toolkit for Innovation [27-29], whose applicability was not assessed in the context of Agile Project Management. Nevertheless, these methods are not cited by the APM literature. And there is a gap in terms of evaluation of them for build the product vision at the project management context.

Thus, the purpose of this paper is to identify the methods in the literature of product development to build the product vision or systematizes the active customer involvement and analyzes the degree of compliance with the requirements of the Agile Project Management. Finally the paper indicates what the strengths and weaknesses are of each method.

2   PRODUCT VISION IN AGILE PROJECT MANAGEMENT
The word vision originated from the Latin word *visione* and can be defined as an expectation, a desire about something that will be realized in the future. In the Agile Project Management (APM) the product vision represents the big picture, outlining in the early stages of development, the essential characteristics which the product should deliver at the end of project [8, 30]. It is an outline of future product that communicates the essence concisely, describing the goal to be achieved to provide guidance, without restrict the creativity of the project team [31]. In terms of content, a product vision

must be an artifact that represents a nonexistent product, which will be developed, in pictures and brief text descriptions of the product scope [20]. This definition can be deployed and added to the following [8]: (a) sketch of the product, (b) elevator statement [32], and (c) product architecture. Interestingly, the product vision is a midpoint between a concept and a product design, which is established early in the project, when the product information is inaccurate and inconsistent. Despite the product vision contains description of systems, subsystems and components, it is not the purpose of the product vision to make inflexible the product development process. Conversely, the mission is to guide, integrate and communicate the goal to all members of the team involved in the project.

Thus, the product vision should remain relatively constant, working as a core concept in design, although in the Agile Project Management this vision can be updated, adjusted, and corrected at the end of each development iteration. This is necessary because in very innovative product development, there is a high degree of uncertainty about the product resulting especially in the early stages of the project. When more precise information will be acquired in the project, they are incorporated in the product vision represented. Furthermore, the product vision, being also a visual artifact (image), lets act as the interface between the project team and customers, particularly those whose expertise and knowledge of technical issues is limited, because the product vision is able of improving the communication in a clear, succinct and intelligible manner [33]. In addition, it allows the testing and validation of core concepts with costumers early in the development [34].

There are some methods described in the literature of APM [8, 31] to build, assist or represent the product vision. However these methods are an ineffective solution for non software products with many components. On the other hand, there are methods which aim to build a product vision found in other areas such as Product Design, Human-Computer Interface Design, Product Development Management and Project Management which the effectiveness was not analyzed in the context of APM.

One of the contextual elements of outstanding importance in agile approach is the customer involvement as an active participant in product development. This issue has been seen as a gap to be overcome, and it represents a vast field to be explored like the systematization of customer involvement in the construction and validation of the product vision. In contrast, there is an extensive literature in the area of Product Development Management, addressing some recognized methods for systematizing customer involvement that will be shown in the next section.

3   CUSTOMER INVOLVEMENT

The term customer involvement is discussed in different research areas such as marketing, service management, product development, information technology, and agile project management.

According to studies carried out in these areas it may be noted that the customer involvement brings several benefits to product development. Among them: better technical quality of products and in increase speed of innovation by the firm [35], avoids excessive costs of features that are not demanded by customers [36]; increase the commercial attractiveness of the products [22, 37, 38]; reduces time and cost of product development [21, 39]; reduces the errors related to business requirements [40]; higher product quality through better understanding of customer needs and greater ability to negotiate customer´s expectations [41].

Due to the differences between the areas that study this issue it may be noted that the use of the term is not uniform and hence there is lack of a clear definition [42]. According to Kujala [42] the term been used synonymously with "contacting with system users" [43], "consulting end-users" [44]; "participation of users" [45] and "focus on users" [46].

In addition may also be noted: "co-development" [47]; "customer interaction" [48, 49]; "method for reduction of product failures after launch" [50] and; "participatory innovation" [51].

Given the large number of synonyms for the term customer involvement we adopted in this work the definition by Kujala [42, 52]. The author defines customer involvement as term that describes the direct contact with the customer and covers many approaches [42, 52]. It comprises two important aspects for this paper: the first, concerns the type of interaction, also called the types of involvement [49, 53]; the second is with respect to approaches, like methods that systematize this involvement. Regarding the type of involvement, the main distinction is in how active the role of the customer [53]. According to Kujala [53] the types of involvement can be classified into: informative, consultative and participative.

The next section presents the research method used and the scope of the work.

4 METHOD RESEARCH

The study was conducted in four phases: literature review, identification of methods, selection of methods, and analysis of methods. Initially, we performed a literature review about Project Management, Management of Product Development and Product Design. During this phase, we identified and read books and articles indexed in databases of international scientific research (for instance, Science Direct, Web of Science) dissertations and theses available in databases for research and educational institutions.

The literature review was conducted for two purposes: first, identify papers that described methods for representing the product vision; second, identify methods for customers' involvement in the process of product development. To select the papers, two groups of criteria were used for inclusion and exclusion of methods and to aid in the choice and to define the scope of work.

The criteria for the choice of product vision methods were: being, professedly, a method for representing the product vision; result in a product vision that possess the characteristics of a vision according to APM literature [8, 31], i.e., result in a elevator statement; result in a graphic form (images) of a nonexistent product; and define the scope of the product partially or in full. On the other hand, the criteria for the choice of customer involvement methods were ruled just by the type of involvement. We considered only the methods that involved the client actively (participative) [42]. This choice is justified because the active involvement, i.e., the client acting as a member of the project team, is stated essential to the project success according the APM authors [2, 8].

The evaluation of the methods was performed using an adaptation of the Repertory Grid Technique (RGT) [54]. This technique aims to create a list of constructs for analyze the perception of an individual with respect to some pre-existing elements. This assessment is based on a comparison between the methods and reveals how they are proximate or distant of the hypothetical ideal method.

For this paper the elements are represented by the methods to be evaluated (product vision methods and customer involvement methods), while the constructs are represented by desirable characteristics for the product vision and customer involvement in the APM. These characteristics are the criteria based on the theory of APM and more explanations are presented in section 5. The methods were evaluated using a Likert scale from 1 to 7 where the largest scale value represents greater adherence to a particular construct. Concerning the hypothetical ideal method was attributed the highest score in all constructs.

The methods selected were evaluated only on the basis of information extracted from papers where they were found. This can be seen as a limitation of this work, because some of the papers were more detailed than others, including sometimes examples of practical cases.

It is important to say that despite the rigorous assignment of the score it was assigned only by the authors, experts in the area. Scores were assigned by observing not only the absolute adherence to the construct for each method, but also comparing the methods for the same characteristic. Among the methods, we included a hypothetical ideal, whose fully realization the construct met the basic requirements necessary for a product vision and customer involvement, according to Agile Project Management.

5. DISCUSSION

We identified nine methods that met the criteria previously described, including five for product vision and four to customer involvement. The methods for product vision selected for evaluation were: Future Workshops; Vision in Product Design (ViP); Visionary Concepts; Vision Innovative Product-Oriented Process (VOI); and, Product Management Vision Method (PVMM). Regarding methods for customer involvement, those selected were: Lead User; Kansey Engineering; Toolkit for Innovation; and Crowdsourcing. Brief descriptions of the methods, as well as major references in the area are presented in Table 1.

Table 1. Methods for product vision and customers involvement

	Methods	Description
Product Vision Methods	Future Workshops [55-57]	The method consists of workshop sessions in which problems are identified and generated solutions regarding the use of products. The team is asked to construct visions of the ideal product. After that, the product visions are valued by all involved and a consensus vision is established, along with an investigation of the possibility of implementation.
	Vision in Product Design Approach [15, 16]	The ViP method is developed in two main stages, deconstruction and designing. At first, the designer explores a specific area, reflecting on the characteristics of existing products, the levels of interaction performed by users and the context for the need to develop these products. In the second stage, the designer constructs a scenario in the future, through the projection of the factors most relevant of the context, identifies qualities of interaction and generates expected future product designs that meet these needs of interactions.
	Visionary Concepts [17-19]	The method is based on the construction of future scenarios, through the analysis of PEST factors. The concepts are developed to meet the needs of the product for each type of scenario created.
	Vision-Oriented Innovative [10] Product Process	The method starts with the definition and delimitation of the project. After are raised information about existing products, trends, patents and heard suggestions from lead users. The team begins, then, to develop visions of the future state of the project and a consensus scenario is structured. In these scenarios are identified gaps and opportunities in terms of desirable products. Thus, functional solutions and alternatives for product appearance are developed to address these gaps. These product visions are selected and refined and a test of the visions is started with stakeholders.
	Product Vision Management Method [20]	The method consists of six main steps, starts with the definition of project and product scope. The team identifies the needs of customers and develops the pre-requisites of conception and begins the concepts generating. These will be evaluated and selected and constitute the product visions, along with a description of major components and systems, stakeholders, deliverables and project schedule in a matrix synthesis.
Customer Involvement Methods	Kansei Engineering [58]	Kansei Engineering can be defined as a product development methodology, which translates customers' and users' feelings, impressions, and emotions into concrete design parameters.
	Lead User Method [21-25]	Data are derived from the experience of Lead Users in terms of concepts about new products. Creative group sessions with users are used to generate solutions and concepts. There are cases where applications are fully developed in full cooperation with the Lead Users.
	CrowdSourcing [26]	Customers are integrated into the design process with the use of information technology. They develop concepts and improve products for relatively small markets, which are then developed by teams of new products that will consider the production specifications.
	Toolkit for Innovation [27-29]	It provided to the customers a toolkit user (user toolkit) to help them customize key parts of the desired product. Participants of the company abandon the idea of trying to meet needs related to secondary customer information, i.e., the customer starts to perform design activities.

The methods presented in Table 1 were evaluated according to some constructs. The constructs used for the evaluation were derived from the theory of APM. Basically they were created taking into account the principles and values of the Agile Manifesto [14] for software development and some desirable features for the product vision according to the authors of the APM. Figure 1 shows the elements, constructs and scores assigned to the methods. Thus the link between these constructs and APM theory can be explained as follows:

1. Declaration of high level – this is a construct in the desired product vision and aims to guide the project team to do the product positioning that is, a short statement indicating general characteristics of the product that will be developed [8, 31];
2. Use Images – authors such as Chin [2], Highsmith [8] and Pichler [31] suggest that the use of images in the product vision facilitate the discussion and therefore the understanding among team members;
3. Describe the benefits – the description of the benefits is to allow customers to have the idea of delivering value. This construct is related with the principle from the Agile Manigfesto [14] that states "our highest priority is to satisfy the customer through early and continuous delivery of valuable software";
4. Describe the features – this construct is related to the level of coverage of the desired features and it must be in a level that does not restrict the creativity of the team [2,8,31];
5. Describe the physical characteristics – in contrast with the construct 4 this construct serves to give more focus in the partial solutions of the project that are already known by the team members [8,31];
6. Describe the expected performance – The description of the performance guide the team in the use of technology required for the product to be developed;[8,31];
7. Describe the technologies – same as construct 5 [8,31];
8. Enable the participative user involvement – this construct is related to the value in the Agile Manifesto (14) that states "Individuals and interactions over processes and tools".

As can be seen in Figure 1, the method for product vision closer to the ideal was the Product Vision Management Method. It had high score for the constructs "high-level description", and "results in images" about nonexistent products and moreover describes the scope in terms of benefits, functionalities, form, technology and expected performance. This high valued score for these constructs is easily explainable, since the PVMM was developed to meet a gap in the literature of APM, i.e., it was a proposal method for building the product vision of durable goods in the context of the agile approach. On the other hand, PVMM distanced itself from the ideal method concerning the construct "allows the active customer involvement", one of its major deficiencies. Customer involvement during the implementation of the method is participative but only occurs in the early stages, when starts the generation and analysis of design concepts, but not in the final validation of the product vision.

The other two better rated methods were Vision-Oriented Innovative and Visionary Concepts. It is important perceive that both methods are based on the construction of future scenarios and thus require an excessive focus on the characterization of current market, because this the primary sources for the structuring of the future state. With respect to the construct "high-level description" the methods are very close to the hypothetical ideal method. The same way concerning to the product scope description, because there is an effort to characterize the product that will meet the needs found in future scenarios set out by the project team.

Especially in the case of the method Visionary Concepts, there was one very low involvement of the customer, since the product vision is performed by the project team based on previously collected information about the market, or is extracted during the design in a consultative manner with the customer. In the method Vision-Oriented Innovative Product Process, the customer involvement demonstrated to have more emphasis during the early stages of the product vision development, through participation of lead users providing ideas or concepts (visions) which should be better specified in the project. Moreover in this method the customer is asked to participate for testing and validation of the product vision defined. Nevertheless, the VOI method obtained low scores to the construct "describes the technologies". This conclusion is because the product visions generated not necessarily is based on existing technology, contrary the methods Visionary Concepts and PVMM whose there is a concern in developing products that possess technical feasibility.

Elements / Constructs (positive)	Product vision methods					Customer Involvement Methods				Ideal Method	Elements / Constructs (negative)
	Future Workshops	Vision in Product Design	Visionary Concepts	Vision-Oriented Innovative	PVMM	Kansei Engineering	Lead User	Crowdsourcing	Tollkit for Innovation	Ideal Method	
Declaration of high level (concise)	*	5	6	6	7	7	2	3	2	7	Generates excessive documentation
Uses images	4	7	7	7	7	7	7	7	7	7	Does not use images
Describes the benefits	5	7	7	7	7	7	7	*	7	7	Does not describe the benefits
Describes the features	5	7	7	7	7	7	7	7	7	7	Does not describe the features
Describes the physical characteristics (shape)	5	7	7	7	7	7	7	7	7	7	Does not describe the physical characteristics (shape)
Describes the expected performance	5	3	7	7	7	1	*	7	7	7	Does not describe the expected performance
Describes the technologies	5	1	7	5	7	1	7	7	7	7	Does not describe the technologies
Enables the participative involvement	7	1	1	7	4	7	7	7	7	7	Does not enable the participative involvement

Figure 1. Score given to methods
* Not measured

The methods worse rated were Future Workshops and Vision in Product Design. In the first, Future Workshops, there is little systematic and the artifacts generated are nonstandard. One example is the description of the product scope that can be described in several and undefined ways, according the customer decision at the end of imagination stage. Each workshop participant may choose if it is necessary describe the product ideas in short stats or sketches made by hand, to then to decide about the final characteristics and consolidate the product vision by consensus. Moreover, the method does not mention the existence of a elevator statement or discriminate clearly and briefly the product and market key information [8, 32]. Despite this, in the Future Workshops Method there is a close similarity with the hypothetical ideal method concerning the active customer involvement. Moreover, the customer participates in entire process of building the product vision until the implementation.

The second method more distanced from the hypothetical ideal method was the Vision in Product Design. It was very positive rated concerning to the construct "results in images" and to the constructs related to the descriptions of benefits, features and physical characteristics (shape). However, it was low rated with respect the constructs "describes the expected performance" and "describes the technology", because the product visions resulting are not necessary is designed using a technological background. The method does not explore this issue and the result will depend of team skills. In addition, it is remarkable that customer involvement is quite low, since in the project the customers are involved only in a passive manner, through observation or consultation, and the major work is developed by design team.

With regard to methods for customer involvement is noted that what is closer to the ideal method is the Toolkit for Innovation. The lowest score obtained by this method was related to the construct declaration of high level. The declaration of high level in this method occurs only with a brief explanation of the problem to be solved and does not cover features like target market, product categorization, main benefits of the product or reasons to buy it.

In this construct the method can be considered partially deficient. That does not mean that the method generates excessive documentation, but it does not have characteristics that must be present in a declaration of high level according to the authors from APM literature. This problem can also be observed at other methods of customer involvement. The exception is for the Kansei Engineering, which got the top score. We can conclude that there is evidence that would improve the methods for customer involvement with the incorporation of simple practices such as the Elevator Test Statement and Product Vision Box proposed by theorists such as Moore [32] that were modified by theorists of APM like Highsmith [8].

Another more general problem with the Toolkit for Innovation is related to the types of customers who typically use the method. That is, it was created for Lead Users and therefore common customers could not use it to generate concepts and / or innovations because of the expertise required by the tools of the method. In addition, in Toolkit for Innovation may be noted the difficulty in translating the designs created by the customers in feasible parameters for production.

This problem was already pointed out by Von Hippel [28] and indicates that future researches should be done to alleviate this problem. This research would focus, for example, to study ways that would be more efficient to communicate or "translate" the design information generated by clients for staff of engineering and manufacturing.

In regarding those methods that have distanced themselves from the more ideal method may be noted the Kansei Engineering and the Lead User. Kansei Engineering obtained low scores on the constructs "describes expected performance" and "describes the technologies", because the method generates final results of design and it does not suggest that design explore what the expected performance or technology will be used in the product. Moreover the Lead User distanced itself from the ideal method, because it was not possible to verify the existence of formal documents that describe the expected performance. It doesn't means that this construct is not present in the method, but it was not noticed in the articles or books surveyed by the authors. The same happened for the construct "describes the benefits" to the method Crowdsourcing.

Note that this method has good score and was in an intermediate position between the ideal method and the worst ones evaluated (Lead User and Kansei Engineering). The exception to this method is related to customer participation. It can be classified as "participative", however very punctual and with little collaboration between the company and customers. In this particular method the company does, through high-level statements, disclosure of problems that need to be solved. Based on this, the customer is supposed to develop your own solution to that, in a period determined by the company, and send it for consideration.

Among the evaluation results can be noted that the analyzed methods are complementary and could theoretically be combined to obtain better results. A hypothetical example would be the joint application of methods PVMM and Toolkit for Innovation where the first obtained a satisfactory score on the construct "provides for active involvement", while the second one got the top score. Another example of complementarily can be observed between the methods Vision in Product Design and Kansei Engineering. All constructs considered in this assessment would be fully met. It is worth emphasizing that these associations are not such ideal requirements and so, evidence that the complementarily between the methods should be studied further. This study should consider, in addition to vision and methods of engagement, such characteristics as adaptations to the types of project, size of teams, co-location of these teams or not, etc.

6   CONCLUDING REMARKS

The literature in Product Development and Project Management are virtually unanimous in stating that the use of a product vision, and the active costumer involvement, are fundamental requirements for success of new product projects. If, on one hand, the use of the product vision provides, for example, a reduction of product development time, based on anticipation of key final characteristics, on the other hand, customer involvement allows this anticipation is made as faithful as possible the desires of consumers by including these in process decision making. Thus, it is essential that these two theories are applied together in the process of building the product vision, in agreement to the premises of Agile Project Management. Accordingly, there is an important theoretical gap, because the methods for construction of the product vision and the methods for systematically involve the customer are discussed in separate spheres, and therefore there is no literature linking, in a systematic manner, the two theories.

Our analysis proves the aforementioned assertion, because none of the methods achieved simultaneously high scores for all evaluation criteria, with the exception of Product Vision Management Method, which was the closest to the Ideal Method. Nevertheless, the PVMM is a method still must be validated in case studies, in order to investigate, in practical terms, if this result is realistic. On the other hand, there is complementarity between some evaluated methods. This indicates that combinations of methods can be made to obtain optimal results. An example is the combination between the Lead User and Visionary Concepts methods. While the Lead User method has a low score for the constructs "declaration of high level (concise)" and "describes the expected performance", the Visionary Concepts method presents high scores to the same criteria. In contrast, for the construct "enables the participative involvement" the method Visionary Concepts present a deficit, unlike the Lead User method. Clearly, other combinations can be proposed and tested for application in the Agile Project Management. An investigation based on case studies should be conducted to ascertain the real benefits of using combinations of methods.

Finally, we found convenient the use of the Repertory Grid Technique in evaluation of methods, because the results were satisfactory for the purpose of this paper. However, the activity of assigning values to the methods was restricted to the authors. In future works, we propose that this evaluation is performed by a greater number of specialists in Product Development, in order to validate the results.

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