DOI NUMBER· 10.19255/JMPM01401

KEYWORDS
Value Proposition Design • Quality Function Deployment • Design thinking • Service innovation.

Including the

VOICE OF THE CLIENT IN THE CREATIVE PROCESS

a case study of the integration of Quality Function Deployment (QFD) to the Value Proposition Design (VPD) in the service sector

RICARDO ASSIS PELICIONI
• Escola Politécnica da USP, São Paulo, SP, Brazil
• *pelicioni@yahoo.com.br*

FABIANO ARMELLINI
• Polytechnique Montréal, Montréal, Canada
• *fabiano.armellini@polymtl.ca*

PAULO CARLOS KAMINSKI
• Escola Politécnica da USP, São Paulo, SP, Brazil
• *pckamins@usp.br*

SAMUEL BASSETTO
• Polytechnique Montréal, Montréal, Canada
• *samuel.bassetto@polymtl.ca*

• ABSTRACT •

By integrating quality-management tools to product design, this paper aims at proposing a model to assist in idea prioritization in value proposition design (VPD) processes in the service sector, tested in an experimental case study of a startup of the wholesale segment. To make for the subjective perspective in idea prioritization, this work conceives and adopts a hybrid approach, so to integrate the VPD canvas with the quality function deployment (QFD) methodology, the latter designed to listen to the "voice of the client." Comparing the results obtained from the standard and the hybrid VPD models, we noticed an average prioritization shift of around 30%, when comparing the relative position of a given idea in the priority ranking in both models. We also found, particularly in this case, that the design team tended to attribute a higher importance to "gain creators," while customers gave more importance to "pain killers." These findings evidence the divergence between the designers' feelings and the customers' perception of needs. We close with conclusions and recommendations derived from this case-study experience.

1. INTRODUCTION

In the process of creation of new products and services, designers have an increasing need for processes that allow the identification of customer needs through models that enhance creativity, flexibility and the interaction among participants, as a means to provide credible results with lower margins of error. To respond to that need, we watched in the recent years a boom of tools derived from creative models, based on the design thinking, which encourage interactivity with customers as a way for collecting marketing data. These tools suit the needs of companies that are looking for service customization, or for reviewing their basic assumptions about how they deliver value to their customers. However, a known flaw of these creative design models, in special the Value Proposition Design (VPD), is related to the processes of classification and prioritization of data, since they are often based on the subjective analysis of the designers that participate in the process. In addition, although the participants exercise an enlargement of the vision of the customer's problems, and exercise creativity to overcome them, the in-depth contact with their object of study (in this case, the clients and their real needs) only occurs in later phases, that is, in the testing phase, which is practically the last one.

This paper reports and assess the case from the experience of a company in the services sector (a wholesale startup of construction material) with the VPD canvas. After presenting the problematic from the theoretical perspective, this paper describes and critically evaluates the application of the VPD canvas by the company and their lack of confidence in the results (in special, with the prioritization of elements in the canvas). Next, we propose and experiment a hybrid model that inserts advisory logic and systematic listening to the "voice of the customer" to the canvas. Finally, we compared the results from the two exercises.

2. LITERATURE REVIEW

The main goal of this section is to present the two methods that are integrated in the proposition that is presented and tested in this paper. We begin with a short introduction on the current demand for service innovation that is one of the reasons behind the boom of creation tools, such as the VPD. Next, we talk about the "design thinking"stream, in

comprises the VPD approach. Only then, we present the VPD and QFD methods that are mixed together in our proposition.

--- 2.1 The current demand for service innovation ---

The current market scenario has been marked by the great need to create and provide increasingly customized services as a competitive differential. According to Grönroos (1990), this phenomenon may be related to several transformations in the society, such as the population growth, greater time people dispose for leisure, longer life expectancy, greater cultural diversity and greater complexity of new products.

Such trend may also be related to the technological advances of the last decades, which has given customers greater awareness of their role as demand generators, which make them more and more avid for new propositions that can satisfy them through their convenience, and a subsequent loyalty to a company or brand that provides this new proposition.

On this issue, Drucker (2008) affirmed that the purpose of a business is to create a customer. Put differently, companies must deeply know the desires of their customers (even unconscious ones), so to shape their "needs." This is emphasized by Kotler et al. (2010), who say that the importance of marketing sciences in the future is in "provide meaning," since customers are looking for more than simply satisfying needs, but also experiences and business models that can touch their emotional ("spiritual") side.

To that effect, the use of tools that allow interaction between clients and service providers is essential for identifying market needs, as well as their interpretation and translation into tangible and feasible proposals, not only for economic benefits, but also to grant agility and practicality.

--- 2.2 The design thinking and its influence ---

We have noticed in the last few years a boom of tools that focus on observation, empathy and creativity, emerging from new schools of thought concerned in connecting creation with the human psychology. One of the exponents of this movement is the so-called design thinking, which, according to Brown (2009), can be defined as an approach that appropriates the designer's problem-solving mental process in order to meet people's needs, given a technology and a commercial need.

The premise of design thinking is to consider people (customers) as the focal point for a creative problem solving, which is the case of the development of new products and services. Design thinking excels in the collaborative work of multidisciplinary teams, where individuals from different profiles, backgrounds and personal and professional experiences, can holistically contribute for the generation of solutions.

"Design thinking" is an interactive process, formalized in distinct phases, whose purpose is to define, research, devise, prototype, choose, implement and learn. The highlighted element is the proposed sequence of generating ideas and evaluations to reach a consensus, which put the human being (the "client") as a fundamental and central element for the generation and validation of ideas. (Vizioli and Kaminski, 2014.) Its origin is attributed to John Arnold, who used this process in his product development lectures in Stanford (Brown, 2009), but the first reference to the technique in the literature is from Rowe (1987). The popularization of this problem-solving method in the last decade is due to the ever-growing pressure on companies, of all sizes and activities, for coming up with innovative adding-value propositions, in a scenario of higher and higher incertitude and complexity. Putting differently, mastering innovation management is no longer just a requirement for technology companies that can afford complex and sophisticated product-development management frameworks, such as the product funnel or the stage-gate method, which will not necessarily boost the creativity skills the company require.

Another possible reason for the high acceptance of design thinking methods nowadays may be related to the fact that they seem, at first sight, to be more intuitive, user-friendly, result-driven and interactive in comparison to traditional tools and structured analysis based on more assumption-focused logic. Creative models may also give the impression to their users that they offer a more synthesized and practical results with respect to logical systems, that sharply contrasts with their judgment (sometimes related to the lack of knowledge in their use) and are of difficult to grasp, much focused on a specific niche of professionals (engineers and other technicians).

--- 2.3 Idea classification and prioritization in creative models ---

While promoting a friendly interface for its users, the creative and intuitive models should, first of all, excel innovation through creating and adding value to products and services, and transpose the solution of a problem into a tangible and profit-generating result. In general, design thinking dictates that it is necessary to prioritize the main ideas obtained in the process of interdisciplinary teams by proposing possibilities that can be translated in terms of actions to solve problems.

However, even though its participants, by the use of these tools, enjoy a broader view of problems and needs to be solved and met, the contact with the customers will take place only in the late phases of the process, when the concepts are verified in the interface with the object of study. As noticed by Price (2012), although the identification of stakeholders and their inclusion into the design process is important to most design thinking approaches, they do not always demand the inclusion of all stakeholders.

This, in a way, tends to make it difficult to prioritize ideas, whose importance may be differently assessed by designers, at it would be by real customers. In fact, designers are in general motivated by solving problems and improving products and services, but they may lose the focus of meeting customer needs. However, according to Cheng (2010), the inclusion and interaction with customers at the very beginning of the process is of paramount importance, since a project succeeds only if the customer is satisfied with the developed product. Therefore, the starting point of product development should be the voice of the customers, that is, their needs and desires.

In addition, the misunderstanding of the customer's real needs may lead to delays and increasing costs in product development, since wrong assumptions may result in the unnecessary generation of prototypes as well as tests for validation of ideas and suggestions that do not meet the real needs of the clients, which require time and financial resources on their execution.

To that effect, Brown (2009) himself, one of the greatest contemporary enthusiasts of creative methods for products and services, warns that a good level of discernment is required for a team to judge when suggestions and reflections from third parties are likely to have more value than creativity.

--- 2.4 The value proposition design (VPD) canvas ---

The VPD canvas is a business design tool conceived by Osterwalder et al. (2014), whose goal is to trigger creativity among its users, just like the design thinking. The VPD aims at proposing a simple, clear and fast way to conceive useful minimum viable product propositions. Osterwalder et al. (2014, p. 13) define the VPD as "a system which aims at using interactive tools for the chaotic and non-linear quest for value propositions that customers want, corroborating them through further research." It finds its roots in the business model canvas (Ostenwalder and Pigneur, 2011), and it is actually a breakdown of two of the core "blocks" of the business model, namely: "value proposition" and "client segments," as shown in Figure 1.

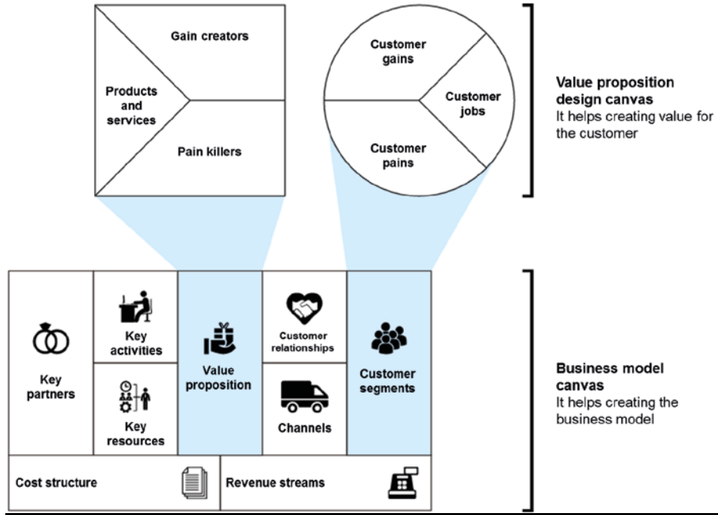

FIGURE 01. The VPD and the business model canvas (adapted from Ostenwalder et al., 2014)

In short, the process aims at improving the accuracy of the value proposition, which is the cornerstone of the business model canvas, so that it fits the customer profile hypothetical assumptions connected to the chosen segments.

There are two approaches to start filling the canvas. For technology-push products, the creation team knows, beforehand, the potential and limitations of the technology they possess. Thus, the starting point consists of properly stating the value proposition. The second step is to segment the marked, in order to find the profile of the customer whose needs might suit the value proposition. In the case of market-pull products, the staring point is the customer: from the definition of the target segments, and the characterization of their needs, the creation team is capable of defining the value proposition. (Osterwalder et al., 2014.) In reality, what we often see is a mixed approach, where an initial technology proposition yields to a prioritization of one of more customer segments, but the analysis of these segments usually requires an improvement of the initial value proposition, for a best fit to the market needs.

In the VPD methodology, the users are "forced" to think about these issues by the means of "trigger questions". These questions help them to identify, on the side of the customer, its jobs, pains and gains related to the central problem elected, and, on the side of the value proposition, main product or service features, the gain creators and the pain killers that match the offer with the demand. The canvas is filled sticking Post-its to the appropriate blocks in an exercise of creativity stimulation through visual thinking (brainstorming, storyboards, etc.), as shown in Figure 2.

FIGURE 02. Completing the VPD canvas (adapted from Ostenwalder et al., 2014)

Once the elements are identified, the VPD user is instructed to proceed to hierarchize them within each block, from those believed to be the most relevant to the less relevant to the proposed value. This process is basically hypothetical, and uses customers' fingerprints without ratification with customers. At most, the method suggests the participation of clients in the creation sessions. But except for the case of tailored-product business models, this participation will be anecdotal, because a few client representatives cannot speak for the whole segment. It is only at later stages that intense interaction with the customer is focused (including the possibility of qualitative validations), in order to certify the resulting convictions. Such complementary phases are freely defined here as:

- Validation tests: proposition of fast and economic validation models that allow collecting evidence that the proposed suggestions are viable. The tests can be based on tools such as interviews or prototypes of low complexity in terms of construction;
- Hierarchy of tests: prioritization of those regarded as most critical regarding the uncertainty of the proposals;
- Promotion of tests: at this stage, at last, the voice of the customer comes up through the interaction of the creation team with clients;
- Collection of results and learning: a compendium of the results is then collected and analyzed, so to assist in the adjustment of the hypotheses, in order to arrive at final value proposition.

The VPD canvas proposal is notorious in terms of facilitation and interaction in the process of generating value in services. However, few references in the literature so far analyze the potential flawless of the method, whether due to its novelty, but also

because there is a vast offer of models available for designers, who will simply pick a different one in case of dissatisfaction.. Nevertheless, some interesting insights are found in professional users' reviews about the tool available on the web, such as this interesting remark from Peter Johnson in his blog: *"the customer side [of the canvas] isn't grounded enough in behavioural psychology or customer behaviour research. It does not guide the user into deep empathy for their customers or draw out enough new insights."*[1]

Consequent to this thought, the VPD risks leading users to views and proposals based on personal interpretations of customer needs, which may be equivocal and, therefore, induce to error. Having said that, it is inevitable not to consider the possible failures in the process of developing products based on the use of such models. Such potential failures, according to Abreu (1997), have an intrinsic relationship with the fragile understanding, measuring and prioritizing perceived as suitable for the success of a project, as summarized in Table 1.

Leading Causes	Results
Lack of understanding of the needs of customers, who generally express their desires sensed in an undefined and fragmented fashion	Insufficient understanding of the qualities required by customers
Difficulty in translating needs exposed orally into numeric expressions, necessary to specify a product	Emphasis on quality of measurable features erroneously considered important
Incomplete transfer of information from the beginning to the end of the development process	Important decisions about products and services are delegated to executors with little market vision
Difficulty in determining and qualifying the priority of the features to be developed and critical points to be solved	Little understanding of the critical importance

TABLE 01. Reasons for failure in product/service development (adapted from Abreu, 1997)

--- 2.5 The quality-function deployment (QFD) method and its fit to solve the weaknesses of the VPD ---

In this context, there is a need for a methodological counterpoint that can take advantage of features offered by the simple VPD, as well as the empathy generated by its users and which, however, is able to support, on the other hand, decision-making based on allowances taken as logical, tangible and more structured.

Among the methods available in the literature on the quality processes, one that presents relatively low complexity in its application, as well as in the presentation of reliable results is the Quality Function Deployment (QFD) method. Queiroz et al. (2011) attest to the comprehensiveness of the method, which suits higher-education institutions, as well as restaurants, car dealers, agribusiness co-operatives, among others.

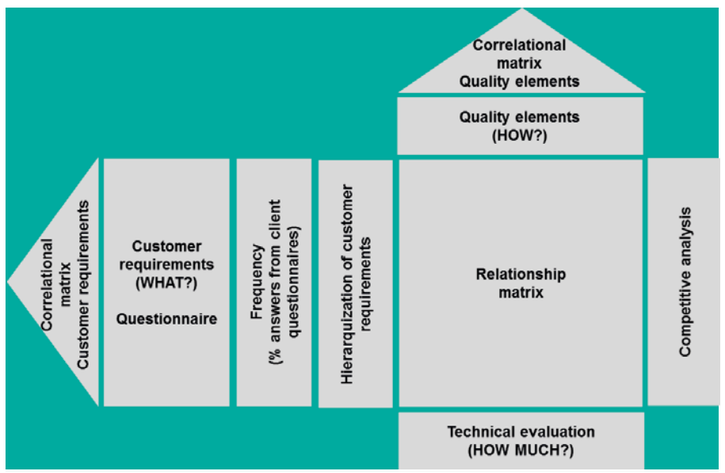

FIGURE 03. Typical representation of QFD's "house of quality" (adapted from Cheng and Melo Filho, 2010)

QFD's premise is to define and, more important, to prioritize of the needs of the client as the compass for problem-solving (Datorre et al., 2016). In short, the QFD methodology is based on "listening to the voice of customers," by inquiring their demands, needs and expectations with respect to product and service performance. This is supposed to be performed through quantitative methods, using questionnaires, interviews, claim forms, etc., as the main tools for collecting data for identifying customers' requirements.

In practical terms, the QFD consists in arrays or standard blocks, as generically defined in the "House of Quality," illustrated in Figure 3. Such a pattern is responsible for sheltering and enabling the manipulation of collected data.

It is worth mentioning that the echoes of objectivity in terms of definition of the QFD as a tool are often interpreted by laypeople as a template that demand high levels of specialization of its users and intricate steps for getting results. (Cheng and Melo Filho, 2010)

Despite the bases of the QFD are clearly supported by logic, flexible integrator elements are also presented to the user, which should be used to demystify that it should be classified as severe and not practical in terms of applicability and use.

According to Chang and Melo Filho (2010), in structuring the logic and reasoning of the participants in the application of the QFD method, it is more important to take into account phenomenology characteristics such as relevance and wealth of viewpoints than accuracy. The goal is not to find laws or patterns of thought to explain and predict people's reasoning logic. Conceptual models, matrices and tables from a particular study are nothing but conceptions and intellectual constructs.

Despite this effort to show that the QFD is feasible and not necessarily complex, one notices an effective low adoption of the method in services. Galvani and Carpinetti (2012) attribute this misunderstanding to the fact that service-provider companies are not used to seeing their business as a series of processes with their respective inputs and outputs. Admitting the concept of interconnected processes, the final product, that is, its output, it may be something not physical, like information, an order or a customer service. Such observations are confirmed by Baldissera (2012), who stated that the QFD method is primarily conceived and used for tangible product development, but it can also be applied to the development of services to ensure the quality from the initial phases of the project. The QFD listens to the clients ' requirements and translate them into measurable characteristics, obtaining products and services that meet and/or exceed the expectations of those customers.

1. Available: http://www.peterjthomson.com/2013/11/value-proposition-canvas/. Access on 2016/07/16.

Method	QFD	VPD
Goals	• Ensure the quality of products and services according to the customers' desires	• Create products and services that customers want to purchase based on the value proposition (perceived benefits)
Nature	• Logical and Inquisitive	• Interactive and creative
Methods	• Listen to the voice of the customer (VOC)	• Generate hypotheses
Main Tools	• Qualitative Questionnaire • House of quality (HOQ)	• Trigger questions • Canvas • Testing and learning cards
Steps	• Conduct qualitative interviews with customers • Identify customer requirements • Attribute weights to customer requirements • Propose solutions to customer requirements (quality elements) • Adopt intensity requirements of customers x quality elements • Correlate requirements and proposed solutions • Calculate absolute and relative weights in order to prioritize customers' demands • Perform competitive (comparative) analysis	• Conduct interactions with clients • List pains, gains and jobs to be performed by observed clients • Propose hypotheses in terms of solutions to the idealized problem (pain relievers, gain creators, products and services) • Propose validation tests • Collect results, organize information, anticipate problems and identify what needs to be improved in order to advance the process
Results	• Fulfill customer needs	• Generate innovative and desirable value proposition for customers
Possible Gaps	• Technical bias had to lay as intimidator or back the specialized public • Weaknesses on the part of users in the development of the qualitative survey • Lack of managerial support and commitment of teams • Relative long time to implementing the model • Lack of experience in dealing with matrices	• Process is too empirical for hypothesis generation regarding customers' needs • Lack of logical coverage for the prioritization of ideas. This method tends to follow the impressions of the creators instead of the voice of the customer • customers only have their voice "listened to" in late steps of the process (prototyping), endangering the proposals previously generated • the method does not include in its scope the competitive analysis

TABLE 02. Overview of the QFD and VPD methods

To provide greater understanding about the peculiarities of the two models discussed in this paper, as well as their advantages or weaknesses on in relation to the other, a critical comparison of the methods is performed in Table 2.

As one can see, the VPD and the QFD are quite different in terms of methodological approach, goals and outcomes. The proposition that follows is an attempt to find a good compromise between the gaps from one method and the other, and arrive to a method that, on the one hand, stimulates creativity and intuition, and on the other hand, attaches some empirical validation of the results through a client survey.

3. METHODOLOGY

The methodology employed in this work, presented in the following sections, consists of three steps, which is mostly grounded in an intervention research approach, in which researchers are part of the experiment. In the first step, we built a case study based on the application of the VPD model (employed "as is") in a real situation. The second step consists the proposition of a hybrid model, where we propose modifications in the standard VPD model, by including steps that are originally part of the QFD approach. Finally, the third step consists of the application of this hybrid model in the same case conducted in the first step, and a comparative analysis to assess the impact of the adoption of the hybrid model.

The study was conducted in a wholesale business startup focused on the commercialization of goods and materials for construction, renovation, maintenance and repair with an emphasis on the professional public.

The company adopts a lean organizational structure, whose core is composed by managers of specialized products in different categories, such as basic materials of construction, painting, wood, electricity, tools, flooring, wall tile and ironware.

The company belongs to a large European group, which is already active in several markets in this continent. The startup is part of this group's strategy to penetrate the Latin-American market, as the group senior management believes that, based on marketing analyses, there is a current gap in the current offer of companies in this segment for specialized services to construction professionals. To that effect, its administrators considered it necessary to use a method that could provide them with ideas on how to fill this gap, as well as help in planning their marketing strategy, and the VPD canvas was the choice to that effect.

Because of the company's broad spectrum of prospective clients, the first step to delineate the object of study is to characterize and stereotype some of the most common types of clients that could use the services of the company, in order to get more accurate results. This procedure is supported by Cheng and Melo Filho (2010), to point out that the strategic definition of the market is based on not only its potential and competitive advantages of the company but also the identification of the target audience, paying attention to not include too large segments that comprise people with irrelevant opinions for the business. Osterwalder et al. (2014) reinforces such a need to emphasize that one of the most common mistakes in the process of verifying customer profiles is based on the grouping of many customer segments in one analysis model.

The result of this exercise is presented in Table 3, which presents the characterization of

the great communities that comprise the market for the wholesale company. The creation team responsible for the project selected the "expert solution providers" segment, as the one with greatest possibility of adherence to the development of this analysis, particularly if considered elements such as identification with the business model proposed (wholesale of professional materials for the construction, installation, maintenance and renovation). Besides, this group was considered, among all segments, the one that would be willing to share and contribute, and able to bring significant contributions to the identification of needs for services.

Customer segments	Customer profiles	Customer routine and premises
Not paying managers	• Engineers and architects • Masters of works • Autonomous workers	• Work with small structures • Plan works and purchases for their customers • Merchandise is paid by the final customer
Recurring buyers of large volumes	Small and medium-sized construction companies	• Respond to a list of materials from contracted labours • Plan and carry out construction projects of major renovations of structured way as part their own employees • Negotiate before purchase • Are better equipped in terms of means of transport and tools
Expert solution providers	• Electricians • Plumbers • Carpenters • Locksmiths • Glaziers • Plaster workers	• Buy products to carry out projects that they draw, produce and install themselves • customers pay a for complete project installed (labour + products)
Pragmatists final users	Individuals undergoing renovation or finishing projects of their own	• Concerned about the patrimony under work • Define and discuss the project with technical and rational vision (functionality of the products vs. time and budget gain) • guided by professionals in their product choices • Buy and pay for the products and providers

TABLE 03. Customer profiles for the wholesale company under study

4. REAL-CASE EXECUTION OF THE VPD

The execution of the VPD was based initially in processes of interaction with customers, through visits to their work environments so to observe their routine, targeting power better understand their workflow and the possible weaknesses and the associated demands. Visits to the competitors were also made in the attempt to collect evidence of failures in processes that could represent opportunities for improvement to be exploited in generating solutions to their current users.

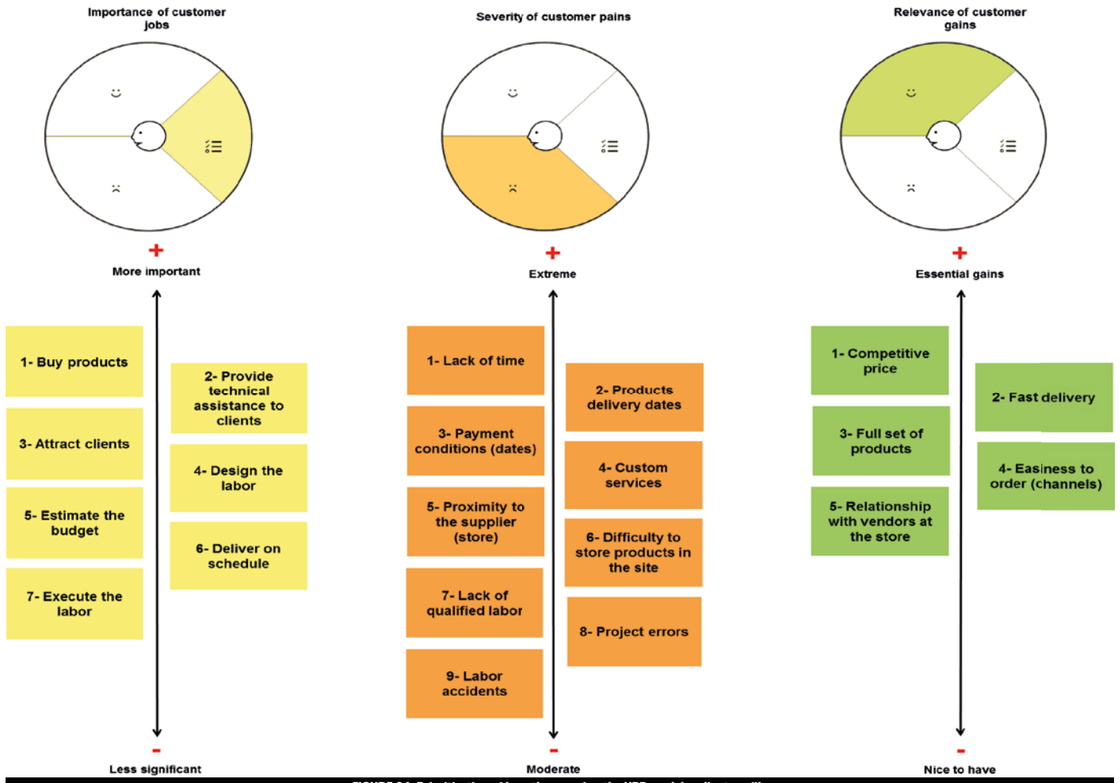

FIGURE 04. Prioritization of hypotheses using the VPD model – client profile

This process is based on one of the main assumptions of the initial creative processes, that is, the empathy with the object of study. It is also part of this flow in VPD, where the observation of customers is defined by Osterwalder et al. (2014), as the "set of characteristics assumed, observed and verified in the market." The authors also highlight that it is not mandatory to start the process with existing knowledge about the target customers, but exploring ideas and outlining a profile based on what its potential customers can look like.

It should be noted that, although the steps identified in the literature were strictly applied to the real case here, there is no clear delineation to indicate how the results of such observations should be organized for future reference. Therefore, the participant team used varied methods for retention of information, such as brief notes, pictures or mere mental records and empiricism based on their experience.

Once in possession of such information, the team proceeded to the construction of the model itself. The first step was to use previously collected impressions and associate them to the trigger questions. Such questions proposed by Osterwalder et al. (2014) are of great service to assist the user to deepen more and more its impressions about the customers, so to help the user in the later completion of the VPD canvas.

The interdisciplinary group of participants proceeded with the completion of the first part of the VPD canvas, that is, the client profile. Its construction was based on the use of Post-it notes, where keywords were written to designate jobs performed by customers, their perceptions regarding gains (perceived benefits) and pains (risks and obstacles related to their activities). At this moment, there is no concern with the ordering of ideas, being required only that the participants have as much information based on empathy processes previously executed, and associated activation questions into something approaching a brainstorming process with visual support and minimum collection organization in the fields. As a result, the team was able to identify six jobs, five gains and nine pains.

Then, as for the proposals relating to the activities of customers, its

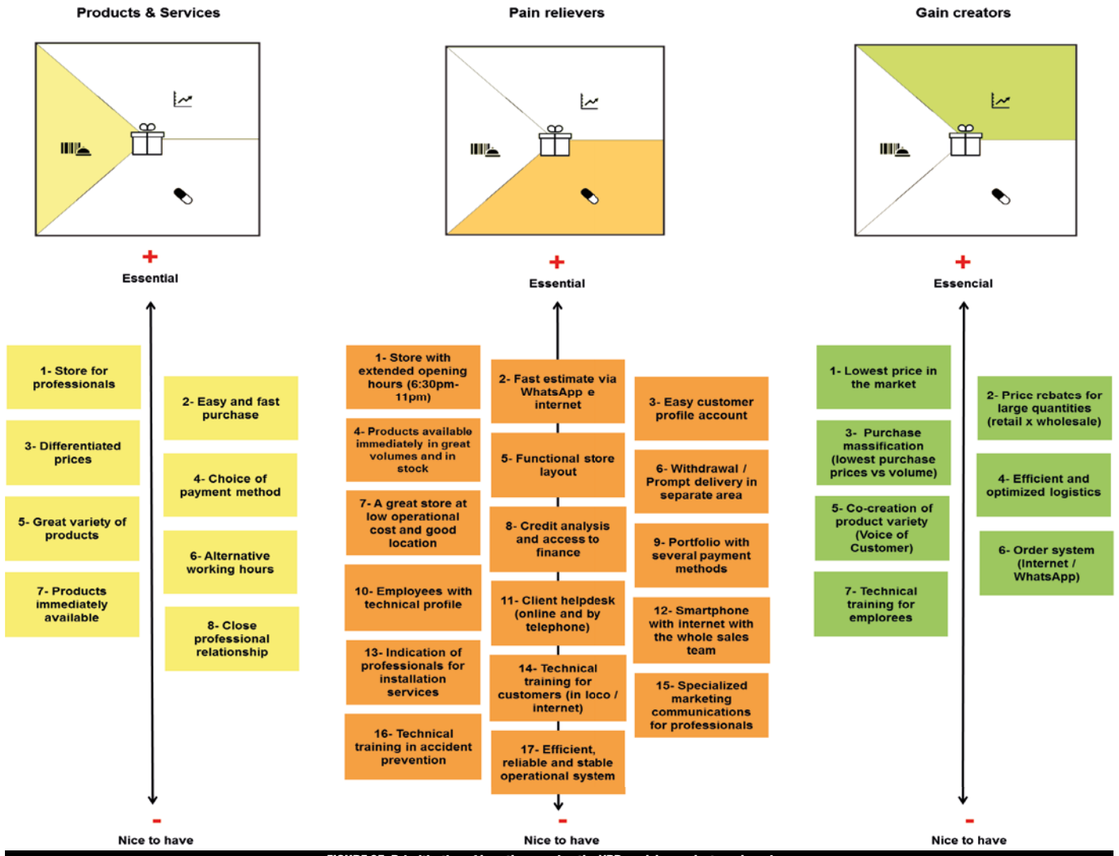

FIGURE 05. Prioritization of hypotheses using the VPD model – products and services

gains and pains were prioritized by participants, to create the perception of relevant proposals, as seen in Figure 4. It is worth highlighting that this prioritization is based on the judgment and intuition of the creation team after a quick discussion and reach of consensus.

As the next step, the second half of the canvas was filled, with the map of proposed values. The suggestions, included in this part of the canvas, are an echo of those obtained in the client profile template, which strived for providing answers to the previously raised requests, once again making use of creativity methods, such as brainstorming and visual organization as a support for creativity.

It is at this step of the canvas filling that the users proceed with the elimination of ideas that are perceived as redundant or of little relevance to the activities to be performed by the client, or related to the value proposition. The elimination is performed by simply removing the corresponding Post-it out of the canvas.

Finally, the team moves to the prioritization process within the value block, by means of intuition and experience of the creation team. As a result, the team found eight service features, seven gain creators and 17 pain relievers, as illustrated in Figure 5.

It is worth pointing out that the following steps of VPD methodology (namely, the validation tests or prototyping and collect of information) are not included in this work due to their irrelevance to the subject of this paper, which is, the idea prioritization process.

5. HYBRID (LOGICAL-CREATIVE) VPD MODEL PROPOSITION

The aim of this section is to present the VPD model proposition, which consists of a combination of the VPD and QFD steps. In fact, the goal of the hybridization is to provide a support to prioritize ideas, so it starts after idea-identification in the canvas. The following subsections present the five steps for the introduction of QFD into the VPD exercise.

--- 5.1 Obtaining the QFD quality matrix ---

The auxiliary matrix adopted to the conceptual model proposition is based on the direct extraction method illustrated in Figure 3. This matrix enables to easily grasp the real needs of customers from questions ("WHAT?" or customer requirements), and the possible answers to these needs ("HOW?" or elements of quality), both provided in the language of the client. (Cheng and Melo Filho, 2010).

As the aim is to generate a model that aggregates the advantages of the VPD and the QFD models, some adaptations are due to the matrix so to provide greater convenience in their use, as well as accommodate specific needs required by the study. Therefore, we propose a simplified matrix, which does not present any correlational matrices (that is, the upper and side triangles of Figure 3). Cheng and Melo Filho (2010) give support to this adaptation of the canvas, as they state that, at the operational level, simpler models can be adopted, if required. Therefore, given the nature of the elements analyzed for the elaboration of the matrix, aiming the suitability to the needs of the study, we selected some points for its customization (matrix), as shown in Table 4.

--- 5.2 Questionnaire template and data collection ---

For the elaboration of the research questionnaire, the goal is to allow the identification of the actual demands from customers in a comprehensive way. We propose a quantitative-qualitative survey to that effect, due to its flexibility and extent. That choice, according to Cheng and Melo Filho (2010), allows the generation of ideas for deepening the user's point of view, eliminating conditioning preconceptions. Besides, since we aim at combining the existing elements of the creative-intuitive VPD method with those from the logical QFD, we realize that the best way to do it is by inspiring the questionnaire on the client profile trigger questions that are used in the early stages of the VPD canvas. However, this questionnaire must be adapted to the context of the application, so to create such confluence.

--- 5.3 Data analysis: filling up the VPD canvas with the voice of the customer ---

To facilitate its later deployment, we propose the division of the questionnaire into two levels (primary and secondary), which is a common practice for tree-diagrams from the quality management system. For the analysis of the results, standardized variables must be defined, converted into percentages according to the frequency of responses from customers. The scales of importance (or weight) are then based on a percentage value of the answers, as proposed in Table 5.

I- What's the point to be achieved with the use of QFD?	
Types of Situation	**Recommandation**
1. Related to the product/service development, aiming at supporting the research and development function in the design and specification of the product, service, processes and materials, so that customer requirements are achieved.	- A more elaborated conceptual model would need
II- How should the conceptual model must be formulated?	
Types of Situation	**Recommandation**
2. Related to the product/service development, to support the Marketing function in the refinement of the concept and realization of the competitive analysis, inside dimensions and requirements of the client and product features or service.	- Formulate according to the reasoning of the design and development team
III- How should the tables and matrices must be deployed and filled?	
Types of Situation	**Recommandation**
3. With regard to the attribution of the importance of rows and columns	- Independent of the specification of value-creativity and flexibility are encouraged.

TABLE 04. Answers to the QFD operational questions

Response rate	Degree of importance (weight)
1 to 10%	1
11 to 20%	2
21 to 30%	3
31 to 40%	4
41 to 50%	5
51 to 60%	6
61 to 70%	7
71 to 80%	8
81 to 90%	9
91 to 100%	10

TABLE 05. Degree of importance (weight) according to the response rat

The process of deployment of the quality elements consists in converting the voice of the customer, obtained through the application of the questionnaire, into features capable of measuring if they meet the requirements. To allow the combination of this analysis to the VPD approach, we suggest using, once again, VPD elements that could contribute to this step. In this case, the client profile canvas seems to be the evident choice, as visual means for organizing ideas, in order to encourage the creative synthesis in obtaining the characteristics of quality elements (propositions to requests from the public). Brown (2009) supports this practice by noting that words and numbers have their usefulness, but only a drawing can simultaneously reveal both the functional features of an idea and its emotional content.

The process focuses then on transposing the answers, obtained through the questionnaire (more specifically, at the secondary level), to the corresponding categories from the trigger questions, that is, jobs to be done, pains and gains.

The next challenge is to effectively provide the quality elements, in response to the requests made by customers. The traditional way to do this is based on creativity and participative tools, brainstorming being the most popular among them, and used both for VPD as QFD. The result of this step is filling the value proposition half of the VPD canvas.

As it happens with the standard VPD, redundant ideas obtained from the answers to the questionnaires should be eliminated from the canvas at the end of this step. In the universe of QFD, it resembles the creation of affinity diagram, which is defined as the graphical representation of related data.

--- 5.5 Customer requirements versus quality element (correlational process) ---

This process is defined by Cheng and Melo Filho (2010) as the element that makes it possible to identify the cause-effect correlations between items from two tables, so to allow their prioritization. For the analysis of correlations among customer requirements and the elements of quality, a numeric scale of intensities must be adopted, such as the following: 0 for non-existent correlations, 1 for weak correlations, 3 for average correlations and 9 for strong correlations. One such scale enables the correspondence degree of importance (weight) with correlation values (intensity), using equation (1) next.

$$P_aE_q = (G_i \times V_c) \quad (1)$$

where:

P_aE_q = Weight of the quality element

G_i = Degree of importance

V_c = Value of the correlation

With that, it is possible to calculate the absolute (P_a) and relative (P_r) weights of each item, according to equations (2) and (3) that follow.

$$P_a = \Sigma P_aE_q \quad (2)$$

$$P_r = \Sigma P_aE_q / \Sigma P_a \quad (3)$$

where:

P_a = Absolute weight

ΣP_aE_q = Sum of quality elements' weights

P_r = Relative weight

ΣP_a = Sum of absolute weights

The absolute and relative weights are essential elements to advance with the fundamental objective of this paper, that is, showing the influence metrics that the logic of the QFD can have over the VPD by overlapping its empirical practices. The calculation of all these parametares allows the filling of the conceptual QFD matrix.

To sum up the test of the hybrid model, as well as to allow a comparison with the standard VPD model, we present in Figure 6 a comparative chart with the steps for the VPD model (Ostenwalder et al., 2014), the QFD model (Cheng and Melo Filho, 2010) and the hybrid model developed for this paper. As one can realize, the proposition of to insert hypothesis testing prior to prioritization (and to help in the prioritization) using an adapted QFD structure that brings the voice of the customer into the early phases of the analysis, instead of waiting for the testing phases of the VPD model (steps 4 to 7) to that effect.

6. HYBRID MODEL TEST AND RESULTS

For testing the hybrid model proposition, we use the same VPD application case presented in section 4. The point of departure is the list of ideas that were identified during the VPD canvas filling process, which is found

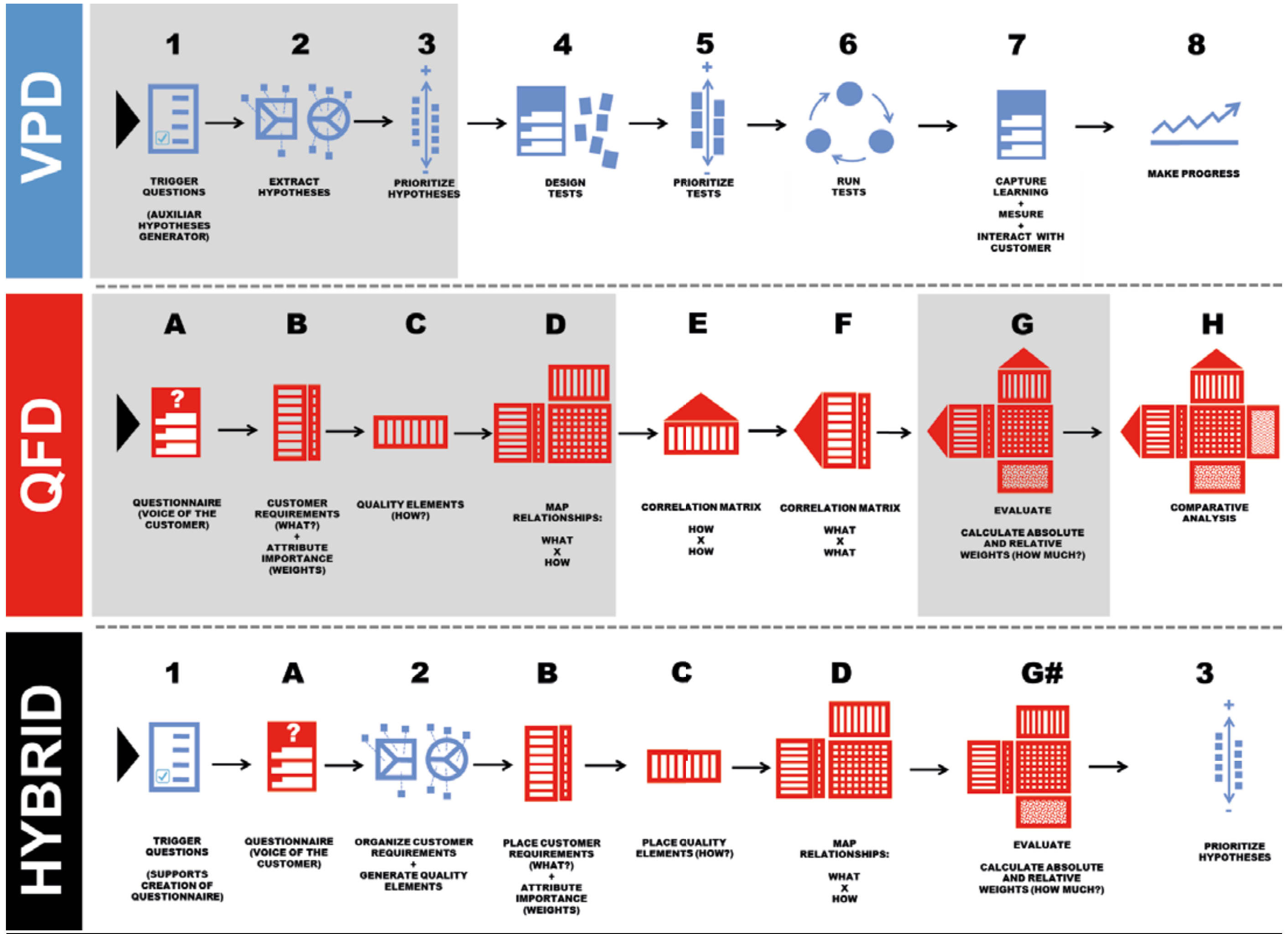

FIGURE 06. Comparison of the steps for the VPD, QFD and hybrid models

in Figure 4 (client profile) and Figure 5 (product and services). However, we do not take into consideration the priority ranking that is illustrated in these two figures, since our goal with the hybrid model proposition is exactly to propose a different approach for this step. To the application of the hybrid model in this case, we followed the steps presented in section 5.

The first step is the generation of the survey questionnaire, inspired by the VPD trigger questions, but adapted to the reality of the case. The resulting questionnaire (found in the Annex), in this case, consisted of 25 questions that comprise multiple-choice and open ones.

The team engaged in the application of the method took care to collect and adapt questions from different groups (jobs to be done, client activities, pains and gains), in order to follow the same logic of the VPD with respect to the use of auxiliary elements for the identification of customer needs. To keep the traceability of the origin of the questions, we labelled each question in the questionnaire to indicate which part of the canvas they refer to.

The process for obtaining the customer's voice starts from the selection of the target audience. 26 expert solution providers were interviewed, all male and aged from 31 to 65 years-old. As previously mentioned, such client profile was considered to be of greatest relevance in terms of identification of needs for the business model. The size of the sample is in consonance to the recommendations from Cheng and Melo Filho (2010), who point out that this kind of survey begins to produce good results even with small samples, and consider the number of 20 to 30 personal interviews enough to capture the voice of the customer.

In order to ensure maximum reliability of results from the population interviewed, customers with distinct profiles, size and business type (commercial, industrial or residential) have been taken into consideration. The sample was also diverse in terms of standard quality finishing (low, medium and high profile) and the value of the real estates they work on (price by square metre), so to avoid distortions or bias in data collection.

The analysis of the data collected allowed the construction of the conceptual QFD correlational matrix, shown in Table 6 for illustrative purposes only. The ranking of the ideas is the result of the decreasing ordering of the final scoring for each idea.

Analyzing the results obtained using the VPD in its standard version and those achieved with the application of the hybrid model, it is possible to

Customer requirement (WHAT?) / Quality element (HOW?)																													
CLASSIFICATION	PRIMARY LEVEL (SURVEY QUESTIONS)	SECONDAY LEVEL (SURVEY ANSWER CHOICES)	% survey answers	Degree of importance (weight)	Co-development of product range (Voice of Customer = Product line design)	Technical training on accident prevention (Partnership with training institutions)	Dealing with suppliers | Mass acquisition	Credit analysis and granting for registered customers (account & billing)	Payment methods portfolio	Optimized and efficient logistics	Lower prices for cash purchase (higher volume x lower margin)	Staggered prices: retail vs. wholesale (quantity based)	Fast quotation (via web-site & whatsapp)	Differentiated ordering system (via web-site & whatsapp)	Fonctional layout (fluxo otimizado para compra | retirada | checkout)	Marketing & Specialized communication with construction professionnals	Technical training for clients: in loco (events) | internet (youtube | social networks)	Continuous training for employees (technical | main routines)	Client support system development (online and telephone Q&A)	Development of platform for indication of installation-service providers	Smartphone with internet and whatsapp for the whole sales team	Dedicated area for prompt delivery and product pick-up	Extended openin hours (from 6:30am to 11pm)	Immediate product availability in shelves with high stock volumes	Efficient, trustworthy and stable information systems	Employees with technical experience, empathy and attentive to customers demands	Simplified registration form	Great store with low operational costs and well located	
GAINS	Why do you buy from your current suppliers?	Fast delivery / retrieval of merchandise	9%	1						9			3	3								9	9	9				9	
		Client service / relationship	5%	1														9	9		9		1			9			
		Merchandise price	32%	4	12		36				36	36																36	
		Assortment (everything in the same place)	27%	3	27																			9					
		Physical location of stores	23%	3						3																		27	
		Payment methods according to my needs	5%	1				9	9																		1		
GAINS	What are they good at?	Ease of purchase	17%	2									18	18	6				18		18			18	18			6	
		Fast delivery / retrieval of merchandise	17%	2						18					18						6	18	18	6				18	
		Payment methods according to my needs	20%	2				18	18		6	6															2		
		Assortment (everything in the same place)	46%	5	45																			15					
PAINS	How can they improve?	Client service / relationship	30%	3									3	3				27	27		27		3			27			
		Fast delivery / retrieval of merchandise	25%	3						27					27							27	9	9				27	
		Merchandise price	13%	2	6		18				18	18																	
		Assortment (everything in the same place)	23%	3	27																			9					
		I am happy with the service I currently have	10%	1																									
GANHOS	What would make you change your supplier?	Client service / relationship	93%	10									1	1				9	9		9		1			9			
		Payment methods according to my needs	7%	1				3	9																		1		
		Merchandise price	26%	3	9		27				27	27																27	
		Assortment (everything in the same place)	2%	1	9																			3					
		Physical location of stores	60%	6						6																			
		Fast delivery / retrieval of merchandise	5%	1						9					9							9	3	1	1			9	
GAINS	What is the most important thing for you during a purchase?	Fast delivery / retrieval of merchandise	2%	1						9					9							9	3	1	1			9	
		Shipping price	5%	1						9												3							
		Delivery time	30%	3						27					27							27	3	27	27		9	27	
		Merchandise price	9%	1	9		9				9	9																9	
		Assortment (everything in the same place)	18%	2	18																								
		Client service / relationship	8%	1									1	1				9	9		9		1			9			
		Physical location of stores	10%	1																								9	
PAINS	What are the main problems of your activity?	Client service / relationship	6%	1									1	1				9	9		9		1			9			
		Problems with delivery (delay | missing or incorrect items)	65%	7						63												63	21						
		Organization of site (lack of stock space)	6%	1																								3	
		Lack of skilled labor	23%	3	3	9										9	27	9	9										
PAINS	What are the main risks of your activity?	Labor accidents	84%	9		81											9												
		Economic crisis	11%	2	2		18	18	18		6	6								6									
		Lack of payment on the behalf of the contractor	5%	1							1									3									
PAINS	What are the common mistakes in your routine?	Mistakes in project execution	26%	3													27		9										
		Project errors	7%	1													9		3										
		Labor accidents	4%	1		9											1												
		Delivery time	40%	4						36												36	12	12				36	
GAINS	What makes you happy about your routine?	Meeting delivery schedules	6%	1																		3						9	
		Financial payback	54%	6	18		18	6	6		54	54								54									
		Client (contractor) satisfaction	45%	5													15	5		45									
JOBS TO BE DONE	How do you perform your purchases?	I specify the materials and the contractor perform purchases	55%	6				18	18		18	6	6	6					54										
		I perform quotations and purchases myself	25%	3				27	27		27	27	27	27															
GAINS	How do you keep informed about the last trends in your business?	Training courses	25%	3		3										9	27												
		Expositions and fairs	7%	1		1										3	3												
		Stores	14%	2												6	6												
		Internet (specialized websites and videos)	54%	6		6										54	54	54											
PAINS	Do you have relationship with a sales representative in the places you normally purchase construction material?	Yes	52%	6												54	54	54	54						54				
		No	48%	5																									
JOBS TO BE DONE	Do you often plan your purchases or perform emergency purchases?	I plan my purchases	82%	9									81	81					27			81							
		I do not plan purchases. I buy on an emergency basis	18%	2									6	2									18	18	6				
GANHOS	Which of these technologies do you use?	Computer	17%	2									6	6		18	18	18	18						18		6		
		Smartphone	22%	3									27	27		27	27	27	27	27	27				27		9		
		E-mail	18%	2									18	18		18	6								18		6		
		Whatsapp	22%	3									27	27		27	27	27	27		27				27		9		
		Facebook	14%	2												18	18	18	2						18				
		Smartphone applications (APP)	8%	1									9	9		9	9	9	9	9	3				9		3		
JOBS TO BE DONE	Do you often pick-up yourself the merchandise you purchase from your suppliers?	I perform material pick-up	91%	10						9					9							9		9				9	
		I do not perform material pick-up	9%	1						3																			
PAINS	Why do you pick it up yourself?	Save time	21%	3						27					27								9					27	
		Emergency (the construction demands materials we do not have)	75%	8						24					24							72	72		8			72	
		Save on shipping	4%	1						1																		3	
PAINS	How long are you willing to wait for merchandise pick-up?	5 to 10 minutes	8%	1						9					9													9	
		10 to 15 minutes	12%	2						18					18													18	
		15 to 20 minutes	14%	2						18					18													18	
		20 to 30 minutes	26%	3						27					27													27	
		30 to 40 minutes	22%	3						27					27													27	
		40 minutes to 1 hour	19%	2						18					18													18	
PAINS	Do your suppliers offer delivery services?	Yes	87%	9						81												81		27				27	
		No	13%	2						18																			
PAINS	What is the average time for delivery?	24 hours	70%	7						63												21		7				63	
		48 hours	13%	2						18												2		2					
		72 hours	8%	1						9												1		1					
		5 to 7 days	10%	1						9												1		1					
JOBS TO BE DONE	Do you often negotiate / bargain with your suppliers?	I bargain with my suppiliers	64%	7	7		7	7	7		63	63														63			
		I am not used to bargain with my suppliers	36%	4																									
GAINS	If you replied yes to the previous question, what is the average of discount you are able to get?	Up to 5%	30%	3	3		9	27	9	9	27	27																	
		From 5 to 10%	65%	7	7		21	63	21	21	63	63																	
		Above 10%	5%	1	1		3	9	3	3	9	9																	
GAINS	What does attract you more about the offering from the so-called "Home Centre" stores?	Assortment (everything in the same place)	73%	8	72																			24					
		Client service / relationship	15%	2									2	2				18	18		18		2			18			
		Opening hours	5%	1									1	1					3				9						
		Merchandise price	7%	1	3		9				9	9																	
PAINS	What do not you like about these "Home Centres"?	Long waiting lines	33%	4											36			12				36	12				36		
		Lack of technical support	42%	5												45	45	45	45		15				45	45			
		Shipping delays	6%	1						9												9	3					9	
		Merchandise price	18%	2	6		18				18	18																	
GAINS	What kind of economy would you like to have in your work?	Money (material acquisition)	17%	2	6		18	18	18		18	18																	
		Time (shorter displacements | purchase and delivery | site execution)	83%	9						81			81	81	81				81	81	81	81	81	81	27		81	81	
JOBS TO BE DONE	What payment methods do you use the most for construction material purchase?	Cash / debit	66%	7	7		7	7	7		63	63																	
		Deferred payment	5%	1	1		1	9	9			9															1		
		Faturated ("boleto" | credit card)	29%	3	3		3	27	27			27															3		
Absolute weight			-	-	301	109	222	266	206	799	472	495	327	323	471	297	382	440	548	225	339	679	300	370	304	270	167	750	9062
Relative weight			-	-	3,32%	1,20%	2,45%	2,94%	2,27%	8,82%	5,21%	5,46%	3,61%	3,56%	5,20%	3,28%	4,22%	4,86%	6,05%	2,48%	3,74%	7,49%	3,31%	4,08%	3,35%	2,98%	1,84%	8,28%	100,00%

TABLE 06. Visualization of the conceptual QFD matrix

notice a high deviation with respect to the hierarchy inherent assumptions guided by empirical processes from VPD, compared to those obtained with processes of getting the voice of the customer of the proposed method. To quantify this deviation, we calculated the relative displacement of each "idea," using equation (4).

$$d_i = |r_{iv} - r_{ih}| / n \quad (4)$$

where:

d_i = Relative displacement of idea 'i'

r_{iv} = ranking of idea 'i' in the standard VPD approach

r_{ih} = ranking of idea 'i' in the hybrid VPD approach

n= number of ideas in the canvas

In this case, we have 17 elements (n=17) in the "pain killers" canvas, and seven (7) elements (n=7) in the "gain creators" canvas. Calculating the relative displacement of all 24 elements, we found an average displacement of 30%, with a standard deviation of ±20%.

Despite the occurrence of small congruencies presented in graphic representations shown in Table 7 (gain creators) and in Table 8 (pain relievers), it is evident the difference in interpretation of what is to be considered priority from the customer perspective, with respect to the feeling of the creating team.

It should be noticed here that the models (VPD in its transcript of a real experience and the hybrid model as a result of the initial goal of this work) were executed by different teams from within the wholesale company. However, we do not consider this factor as relevant for the sake of this analysis, since both methods based on procedures with clear procedures to describe their respective steps for the achievement of their goals.

Trigger questions group	Quality elements	Priority with the hybrid model	Priority with VPD	Graphical representation 0 5 10 15 20 25
Gain creators	Efficient and optimized logistics	1	4	
Gain creators	Price rebates for large quantities (retail x wholesale)	5	2	
Gain creators	Lowest prices in the market	6	1	
Gain creators	Technical training for employees	8	7	
Gain creators	Alternative order systems (Internet / WhatsApp)	13	6	
Gain creators	Co-creation of product variety (Voice of Customer)	15	5	
Gain creators	Negotioation with suppliers (purchase massification)	21	3	

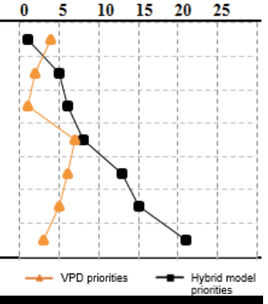

TABLE 07. Comparison of prioritization results using the VPD and the hybrid model (gain creators)

Trigger questions group	Quality elements	Priority with the hybrid model	Priority with VPD	Graphical representation 0 5 10 15 20 25
Pain relievers	A large store with low operational costs and well located	2	7	
Pain relievers	Retrieval of merchandises in a separated area	3	6	
Pain relievers	Development of a client service system (online and telephone)	4	11	
Pain relievers	Functional layout (optimized for purchase / retrieval / check-out)	7	5	
Pain relievers	Technical training for clients: in locus (events) / internet (youtube and social networks)	9	13	
Pain relievers	Product imediately available on shelves and in great amount in stock	10	4	
Pain relievers	Smartphone with internet e WhatsApp for all the sales team	11	12	
Pain relievers	Fast estimate via WhatsApp and Internet	12	2	
Pain relievers	Efficient, reliable and stable operational system	14	17	
Pain relievers	Store with extended opening hours (6:30pm-11pm)	16	1	
Pain relievers	Specialized marketing communications for professionals	17	15	
Pain relievers	Employees with technical profile	18	10	
Pain relievers	Credit analysis and access to finance and alternative payment methods	19	8	
Pain relievers	Development of platform for indication of professionals for installation services	20	14	
Pain relievers	Portfolio with several payment methods	22	9	
Pain relievers	Easy customer profile account	23	3	
Pain relievers	Technical training in accident prevention	24	16	

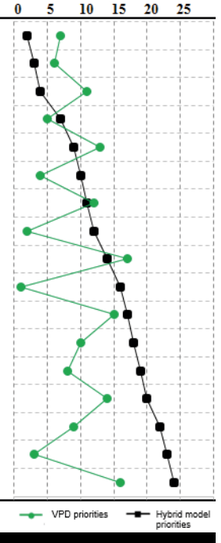

TABLE 08. Comparison of prioritization results using the VPD and the hybrid model (pain relievers)

7. DISCUSSION AND CONCLUSIONS

The motto for the proposal to create a conceptual model came with the purpose of promoting greater efficiency in the processes of identification of customers' demands, through a tool that embraced the simplicity of modern-day systems originating from the design, with their harmonious and user-friendly character, and the logical assumptions from established methods.

We proved in this paper that the fusion of elements of the VPD and QFD are feasible and that may bring positive results in terms of achieving the proposed objectives, that is, more appropriately prioritizing the customer needs before running sophisticated tests that often require prototyping and minimum viable products to take place. We are aware that our results may be biased by particularities of the case studied, and that a proper validation of the model should include, minimally, a second case study and a control case. Nevertheless, we still believe to have contributed to the identification of the proposition for the hybridization of the two approaches.

The consistency of the results obtained using the hybrid model are due to the voice of the customer, which is "listened to" at the beginning of the process, which provided subsidies to a most appropriate weighting in terms of identification and prioritization of needs. Separately, the VPD uses hypothetical resources for the elect and list requests to be offered by its target audience. Our argument is that it is better to attach quantitative data to the early stages of the VPD method, which boosts, with a relative low-effort, the quality of the first-cut of the canvas, and avoid the associated costs with trial and errors in later validation steps.

One of the most important benefits and clearly noted as resulting from the hybrid model, which is not in the VPD, is the ability to match quality elements of different natures, that is, gain creators and pain relievers. This is possible in the hybrid model because of the judicious mapping and later measurement of their links through the relationships matrix, which allows one to assess the impact of the offered propositions with respect to the demands generated in the survey process.

Yet another relevant point, the use of the VPD trigger questions for the preparation of the QFD questionnaire may be considered as a facilitator for this task, which is considered by specialists as the most critical step for the implementation of the QFD methodology. In fact, a questionnaire that could lead to an equivoque interpretation of the customer needs would compromise the whole analysis, and the use of the VPD trigger questions could prevent this risk.

Moreover, the use of the VPD canvas, in special the customer profile half of the canvas, as the "recipient" for the results of the QFD survey, allowed a visual representation of the results. This visualization helped in the organization of the results obtained through the survey, as well as to assist in the generation of hypotheses for the quality elements. This practice showed itself to be more effective than the use of affinity diagrams, which is the usual practice among QFD users.

Still in an effort to make the method more susceptible to the understanding and good user experience, we suggest the adoption of the simplified QFD matrix adopted in this conceptual model, given its lower complexity in terms of details. It contributes to the generation of a solution package with clearer steps, ready-to-use templates (formulas and calculation on a proper and popular software), as well a friendly profile.

Despite the favourable results presented so far in the application of the hybrid model, it tends to be more extensive in its execution, in comparison with the standard VPD method. That is to say that, even though the aim was to apply a part of the QFD approach within a more intuitive and practical method, as a strategy to make it more "user-friendly", the hybrid method may still find resistance from users, due to the application of quantitative methods, whose application is less agreeable and intuitive.

Finally, one of the main questions relating to results (more specifically that related to why different models derived different conclusions), we argue that this is due to the mere subjective nature of creative models. Subjectivity is at the heart of the creative process, and it cannot be eliminated. At most, as we propose here, we shift from the provider's subjectivity to the client's subjectivity. The intention here is not to eliminate subjectivity, but to balance the creative process by other practices and techniques, in order to avoid the risk of "escape from reality" of the creating team, through which the assumptions model is anchored in the execution model. Such was the case of the use of the QFD method as a counterpoint to the model of creation through assumptions, which is at the core of the VPD model.

There is the opposite mistake, though, that should also be avoided. Listening to hard to the voice of the market may inhibit breakthrough innovations, since quantitative surveys will tend to suffocate singular and exceptional ideas as outliers: the average opinion will normally tend to prioritize incremental innovations. This issue was not considered in this paper, and therefore a limitation of this method.

The conceptual model proposed here suited quite well the company under study, whose goal was to understand the expectations of their customers and align their offer to that, but may not suit a company whose intention is to revolutionize a market segment. For this last case, further investigations should focus on trying to answer the following questions: how could we make sure that the "voice of the client" is the one we should listen to, or that the designers' perspective is the most interesting one? How could we have a mix of both perspectives and propose something to take the best from the two worlds (the pragmatism of the client versus the visionary and innovative mindset of the designer)?

Our impression is that the more the QFD method is used, the more "traditional" concepts of the market will be aggregated to the analysis. In a context of technological paradigms and trajectories (Dosi, 1982), it means do not disrupt from them. However, if the goal is to disrupt, listening to hard to the market may bias creativity, and therefore the QFD approach should be avoided. But, yet, this analysis was not the focus of this paper and, therefore, this assumption is to be confirmed by future research. ◆

• APPENDIX •

APPENDIX 1 The survey questionnaire

Trigger question	#	Question	*Type of answer*
GAINS	**1**	Why do you buy from your current suppliers?	Open question
GAINS	**2**	What are they good at?	Delivery time ☐ Shipping price ☐ Fast delivery / retrieval of merchandise ☐ Merchandise price ☐ Assortment (everything in the same place) ☐
PAINS	**3**	How can they improve?	Open question
GAINS	**4**	What would make you change your supplier?	Open question
GAINS	**5**	What is the most important thing for you during a purchase?	Delivery time ☐ Shipping price ☐ Fast delivery / retrieval of merchandise ☐ Merchandise price ☐ Assortment (everything in the same place) ☐ Client service / relationship ☐ Physical location of stores ☐
PAINS	**6**	What are the main problems of your activity?	Open question
PAINS	**7**	What are the main risks of your activity?	Open question
PAINS	**8**	What are the common mistakes in your routine?	Open question
PAINS	**9**	What makes you happy about your routine?	Open question
JOBS TO BE DONE	**10**	How do you perform your purchases?	Open question
GAINS	**11**	How do you keep informed about the last trends in your business?	Open question
PAINS	**12**	Do you have relationship with a sales representative in the places you normally purchase construction material?	Open question
JOBS TO BE DONE	**13**	Do you often plan your purchases or perform emergency purchases?	Open question
GAINS	**14**	Which of these technologies do you use?	Computers ☐ Smartphones ☐ E-mails ☐ WhatsApp ☐ Facebook ☐ Smartphone applications ☐
JOBS TO BE DONE	**15**	Do you often retrieve yourself the merchandise you purchase from your suppliers?	Open question
PAINS	**16**	Why do you retrieve it yourself?	Open question
PAINS	**17**	How long are you willing to wait for merchandise retrieval?	Open question
PAINS	**18**	Do your suppliers offer delivery services?	Open question
PAINS	**19**	What is the average time for delivery?	Open question
JOBS TO BE DONE	**20**	Do you often negotiate / bargain with your suppliers?	Open question
GAINS	**21**	If you replied yes to the previous questions, what is the average of discount you are able to get?	Open question
GAINS	**22**	What does attract you more about the offering from the so-called "Home Centre" stores?	Open question
PAINS	**23**	What do not you like about these "Home Centres"?	Open question
GAINS	**24**	What kind of economy would you like to have in your work?	Open question
JOBS TO BE DONE	**25**	What payment methods do you use the most for construction material purchase?	Open question

• AUTHORS •

RICARDO ASSIS PELICIONI holds the title of Mechanical Technologist from Centro Universitário Santo André (2001) and has an MBA in Product and Service Management & Engineering from Escola Politécnica da Universidade de São Paulo (2017), Brazil. With over 17 years of experience in product development, his areas of expertise include the generation of consumable articles and customer-driven services from its inception to commercialization for the segments of industry and construction on both professional and DIY markets

FABIANO ARMELLINI holds B.Eng. (2003), MSc. (2006) and DSc. (2013) degrees in Mechanical Engineering from Escola Politécnica da Universidade de São Paulo (Brazil), with exchange studies at Michigan State University (USA). He is an assistant professor in the Department of Mathematics and Industrial Engineering at Polytechnique Montréal (Canada) and member of the Centre Interuniversitaire de Recherche sur la Science et la Technologie (CIRST). Dr. Armellini is co-founder of two successful Brazilian consulting companies focused on engineering design, product development and innovation management. He has several years of professional experience in performing and managing innovative product development, as well as in the design and implementation of innovation processes as a consultant. His experience embraces several different industry sectors, such as aerospace, automotive, telecommunications, industrial automation, food, mining and chemical sectors. In research, Dr. Armellini's interests lie on innovation management, with special interest on open innovation, technological entrepreneurship and new product development.

PAULO CARLOS KAMINSKI holds a degree in Naval Engineering (1986), he has a master's degree and a Ph.D. in Mechanical Engineering (1992) from Escola Politécnica da Universidade de São Paulo - EPUSP. He is also graduated in Business Administration (1990), and was a post-doctoral researcher at the Technical University of Darmstadt with fellowship from the Alexander von Humbolt foundation (1993-1994). Since 2009, he is a Full Professor of the Mechanical Engineering Department from EPUSP.He has experience in research and teaching in the Mechanical field, acting on the following topics: product engineering, design methodology, continuing education and internationalization of engineering.

SAMUEL BASSETTO is the founder and director of the CIMAR Laboratory that develops continuous improvements and control methods to enhance performance of organizations. Samuel Bassetto is associate professor at Polytechnique Montreal in the department of mathematics and industrial engineering. His research is funded by the Canadian Natural Science and Engineering Research Council (NSERC) as well as private companies. He has directed more than 100 Masters and PhD students and co-authors of more than 50 papers and conferences in industrial and system engineering. Prior to this position, he served as associate professor at Grenoble-InP (France), school of Industrial Engineering and worked as Process Control Engineer for a major semiconductor company. Samuel Bassetto has a Bachelor of Mechanical Engineering from ParisTech(2001), a Master Science in Computer Science-Artificial Intelligence from Nancy University (2001). He earned his PhD from ParisTech in Industrial Engineering (2005).

• REFERENCES •

ABREU, F.S. (1997) "QFD: Desdobramento da Função Qualidade: estruturando a satisfação do cliente". Revista de Administração de Empresas 37(2) 47-55.

BALDISSERA, A.P. (2012) "Aplicação do Desdobramento da Função Qualidade (QFD) para melhoria da qualidade em um restaurante self-service". Trabalho de conclusão de curso de graduação em Engenharia de Materiais - Faculdade de Engenharia de Guaratinguetá – FEG/UNESP, 93p.

BROWN, T. (2009) "Change by design: how design thinking transforms organizations and inspires innovation", HarperBusiness, 272p.

CHENG, L. C.; MELO FILHO, L. D. R. (2010) "QFD: Desdobramento da Função Qualidade na gestão de desenvolvimento de produtos". Editora Blücher, 539p.

DATORRE, C.C.J; HERMOSILLA, J.L.G; SILVA; E.C.C. "Aplicação do método Quality Function Deployment no desenvolvimento de produto em uma empresa fabricante de produtos agrícolas". FTT Journal of Engineering and Business 1(1) 7-25.

DOSI, G. (1982) "Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change". Research policy 11(3) 147-162.

DRUCKER, P.F. (2008) "The essential Drucker: the best of sixty years of Peter Drucker's essential writings on management". HarperBusiness, 368p.

GALVANI, L.R.; CARPINETTI, L.C. R. (2013) "Análise comparativa da aplicação do programa Seis Sigma em processos de manufatura e serviços". Production Journal 23(4) 695-704.

GRÖNROOS, C. (1990) Service management and marketing: customer management in service competition" Wiley, 496p.

KOTLER, P.; KARTAJAYA, H.; SETIAWAN, I. (2010) "Marketing 3.0: from products to customers to the human spirit". Wiley, 208p.

OSTERWALDER, A; PIGNEUR, Y. (2010) "Business model Generation: A Handbook for Visionaries, Game Changers, and Challengers". Wiley, 288p.

OSTERWALDER, A; PIGNEUR, Y; BERNARDA, G; SMITH, A. (2014) "Value Proposition Design". Wiley, 289p.

PRICE, A.J. (2012) "The dangers in design thinking". Australian Confederation of University Art and Design Schools Conference.

QUEIROZ, V.J.; MELLO, L.T.C.; QUEIROZ, F.C.B.P; FURUKAVA, M. QUEIROZ, A.F.S. (2011) "QFD na tradução dos requisitos dos clientes em qualidade dos serviços nos postos de combustível". Revista Ciências Sociais em Perspectiva 10(19) 45-63.

ROWE (1987) Design thinking, MIT Press, Cambridge, 229p.

VIZIOLI, R.; KAMINSKI, P. C. (2014) Evolução do 'Design Thinking' e suas ferramentas. In: Anais do VIII Congresso Nacional de Engenharia Mecânica. Rio de Janeiro: ABCM.