

ABSTRACT

This article presents a study that focuses on the creative process for pendant jewelry design. As a stimulation tool, it was used the 6-3-5 Brainwriting technique. In 30 minutes, 18 participants (separated in 3 groups) generated 324 ideas for a pendant with the "autumn" theme. The "voting" and the "evaluation matrix" were two adopted methods that selected the participants ideas. The voting was adopted in order to elect the six best ideas. More refined drawings of the selected ideas were elaborated for the next evaluation. The Evaluation Matrix was adopted in order to execute a systematic selection of product opportunities. A product opportunity proposes a new product that is close of an ideal product (Baxter, 2011). Attributes of an "ideal product" were defined and separated on the following categories: semantic and symbolic attraction of the product, way of using, materials/cost and ergonomics. The evaluation consists on individually judging if the alternatives attend to the intended attributes. In case if it express the intended attributes, it gets a positive grade; on the other hand, if the alternative express an inadequate attribute, it gets a negative grade. After facing all the alternatives and criteria, it was calculated the individual scores and the one with better score was considered the selected idea. Posteriorly, a final rendering of the jewelry was developed along with the technical detailing and the definition of materials and the jewelry manufacturing process.

Keywords: Jewelry design, creativity, selecting the best idea

1 INTRODUCTION

This article presents a practical approach concerning creativity in the jewelry design environment. A projectual practice is brought in order to create a new jewelry – an industrial product with high aesthetic and symbolic appeal. It is noted that creativity constantly stands by the whole development process of this new product and not only in the ideas generation step. More relevant than the final result is the own description of how decisions are taken and the reasons that support choices until the configuration of the final product.

This study's structure follows this line: section 1 brings a panoramic vision about the subject. Section 2 argues about themes such as creativity and design. Section 3 talks about the creative process in jewelry design: initially, the industrial jewelry and jewelry design scenes are presented. Section 4 describes: the 6-3-5 Brainwriting technique; the methodology; the participants; the design problem; results' presentation and analysis; the selection of ideas through voting and the Evaluation Matrix; analysis and definition of materials; finishing

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with rendering and technical specification for jewelry manufacturing process. In section 5, final considerations are made.

2 CREATIVITY AND DESIGN

In modern society, those who have been standing out in the competitive business market are professionals that present a more accurate potential for creativity. Creativity is a quality required for every professional, in all working environments. However, to a designer it is an essential attribute. "To solve projectual problems is, undoubtedly, an eminently creative task. It is a human and rational attitude, which not even all technological advances together can replace". (Lima, 2013)

According to Löbach (2001, p. 139), "[...] the industrial designer's creativity appears when, based on his knowledge and previous experiences, he is able to associate a certain information to a problem and establishing new connections between them"; also considering creativity as a variable factor which is possible to be improved, according to the experiences development and of acquisition of professional knowledge. Adding to this point of view, Gomes Filho (2006, p. 231) affirms that "[...] this quality is attached to the person's cultural and technical repertory, as well as professional accumulated experiences; the more the person has it, it's likely that he presents more inventive capacity".

According to Bürdek (2006, p. 225): "design is an activity that is directly connected to creativity concepts, cerebral fantasy, invention and technical innovation senses and, due to that, it is expected that the design process is some kind of cerebral action".

To Baxter (2011, p. 85) "creativity is the heart of design, in all project stages. The most exciting and challenging project is the one that demands actual innovation – the creation of something radically new, that does not seem like anything you can find in the market". The author points the relevance of creativity for current markets: "[...] With fierce competition, there is not much opportunity for price reduction. [...] There is, for the fact, another solution: using design in order to promote product differentiation. [...] And this requires the creativity practice in all stages when developing a product, since the identification of opportunities until the production engineering". (Baxter, 2011, p. 85)

3 JEWELRY DESIGN

"To talk about human ornamentation origins is the same as talking about the own human being origin" (Codina, 2000, p.8). Human beings have always adorned their bodies, regardless of sex, culture or period, as figure 1 shows it.

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Claudia Regina Batista



Figure 1 – Human adornments through times. Source: Batista (2012, p.5).

The most appreciated and valued human adornment of all times is jewelry. In the past, as well in current times, jewelry are wore in order to satisfy vanity, represent wealth, show power or simply by symbolism or superstition. Jewelry can also mean status, beauty and sentimental aspects from people. (Batista, 2004)

Jewelries are made with very noble materials (usually with noble metals¹ and gemstones²), utilized for personal adornment (aesthetic function of product) or to express a meaning (symbolic function of product). (Batista, 2008)

Brazil has a rich abundance of materials to produce jewelry. According to the National Bank of Economic and Social Development – BNDES, Brazil is responsible for around 1/3 of gemstones production from all over the world, and is also one of the main gold exporters. Considering that the golden jewelry aggregates around ten times the value of the metal used on its production, the Brazilian government, through the Ministry of Development, Industry and Foreign Trade, has been encouraging the jeweler section in producing jewelries, semi-jewels (veneers) and polished stones.

The differentiated design and high production quality have been introducing Brazilian jewelry to international markets. As a consequence, it is noticeable an increase of exports in this sector. (Souza, 2006)

¹ Are called noble metals those that cannot be damaged by acids or salts; they do not oxidize, are quite rare to find in nature and always remain pure. As noble metals, are classified Gold, Silver and Platinum. (Schumann, 2001)

² Gemstones: Also known as precious stones, they are minerals or substances of organic or biologic origin, and due to its typical properties (structure, color, shine, hardness, perfection, rarity and durability) they are used specially in personal adornments and art pieces. (Schumann, 2001)

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Considering the fierce international competition, the Brazilian jewelry industry invests on innovation and originality on its pieces; also recognizes design as a master spring of business competitiveness strategies. According to IBGM (2012): "The Brazilian jewelry design is, at the same time, contemporary and innovative, resulting in pieces with unique designs, very casual and with strong visual impact. It shows personality and values based on authenticity, multiculturalism, innovation, femininity, imagination, naturalness and sensibility.

These characteristics have made Brazilian designers stand out in international competitions and an expressive increase of the national product consumption both in national and international markets".

To the Brazilian Institute of Precious Gemstones and Metals: "Design is, essentially, concept and innovation. Its function is to shape the product, aggregate value to creation processes in order to differentiate the final object; also to make them more efficient, attractive, close to the needs and expectations from those who recognize the product and relate to it through personal visual identities". (IBGM, 2012, p. 3)

The Jewelry Design is an activity that involves research, creativity, planning the serial production of jewelry pieces, focusing on the aesthetic function, comfort (ergonomics) and durability. In other words, it is a set of tasks established by the designer, who always takes in consideration the generation of new concepts, the material selection, the piece's visual aspect, practicality, even before taking it to the production line. (Batista, 2004)

3.1 THE ACT OF GENERATING IDEAS: THE PRACTICAL CREATIVITY TABLE HEADINGS AND TABLE CONTENTS SHOULD BE FORMATTED USING THE APPROPRIATE STYLES. TABLE CAPTIONS SHOULD BE FORMATTED USING THE CAPTIONS STYLE.

According to Alencar (1996) and Oech (1999) it was scientifically proved that everyone has a creative potential; however, it is normal to people have difficulties on presenting creative solutions. The reasons that generate these difficulties are generally called blockers. To Adams (1994, p. 25), these blockers are "mental walls that block people from understanding correctly a problem or conceive a solution to it". Everyone has mental blockers that inhibit or block completely the free development of creative potential. Considering that each person has a certain quantity and intensity, it might result in perceptive, emotional, cultural, environmental, intellectual or expressional blocks, among others.

The unlockers are all resources and natural or artificial conditions that allow the development, the cultivation and flowering of creativity, both individually and socially (Alencar, 1996 and Oech, 1999). Besides the mental release, there are also ways to stimulate creativity. Baxter (2011, p. 86) affirms: "the creativity mechanisms are not completely known yet, however there are several techniques that induce its development". The techniques that stimulate creativity provide contributions during the development of a product, where "many times the designer finds himself in situations or problems where all the conventional solutions are unsatisfactory. Yet this designer appeals to his accumulated experience of previous activities and makes bibliographical researches, the problems still remain with no answer [...]". (Bomfim, 1995, p. 26)

In literature it is possible to find several techniques concerning the creativity stimulation. Baxter (2011) brought some key-elements of several creative

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process steps and organized them according to the table 1, by pointing the respective helping tools (techniques).

KEY-ELEMENTS FROM THE CREATIVE PROCESS' STEPS		TOOLS
Preparation	<ul style="list-style-type: none"> • Explore, expand e define the problem; • List all the existent solutions. 	<ul style="list-style-type: none"> • Parametric Analysis • Problem Analysis.
Generation of Ideas	<ul style="list-style-type: none"> • Think only about ideas –leave practical restrictions to another step; • Search for ideas outside the usual comfort zone; • Use techniques to: <ul style="list-style-type: none"> – Reduce the problem; – Expand the problem; – Digression the problem. 	Procedures: <ul style="list-style-type: none"> • Collective notes; • Brainsforming; • Brainwriting; • Sinetica. Techniques: <ul style="list-style-type: none"> • Permutation of characteristics; • Analysis of the product's functions.
Idea Selection	<ul style="list-style-type: none"> • Consider both good and bad aspects of all ideas; • Combine ideas by taking the good side of each one of them. 	<ul style="list-style-type: none"> • Voting; • Evaluation Matrix.
Revision of the creative process	Evaluate the process of problems solution.	Integrated phases of problems solution.

Table 1 – Key-elements of practical creativity. Source: Baxter (2011, p. 95).

From the existing techniques to stimulate creativity, there is a group of them that is applied more frequently in product projects and which the utilization ways are nor very complex (BOMFIM, 1995). Among them, the Brainwriting 6-3-5 technique stands out, considering that the ideas explorations can be made through drawings.

The 6-3-5 Brainwriting (also known as method 635) is a creativity technique that can be executed in groups, commonly used in marketing, design, publicity and other areas; originally developed by the professor Bernd Rohrbach in 1968. Based on the Brainstorming concept, the objective of 6-3-5 Brainwriting is to generate 108 new ideas in thirty minutes. Similar to Brainstorming, it does not matter the quality of the ideas, but the quantity. "6" participants are needed, that collaborate with "3" ideas (in each round), when "5" minutes is the time to register the ideas: that is the origin of the name 6-3-5. (Rohrbach, 1969; Bomfim, 1995; Baxter, 2011)

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4 **CASE STUDY: CREATION OF A JEWEL FROM THE
THEME AUTUMN**

4.1 APPLICATION OF 6-3-5 BRAINWRITING TECHNIQUE

In order to stimulate the students' creativity³ during the process of ideas generation, it was applied the 6-3-5 Brainwriting technique. In sequence, the creative process for a jewel conception is described, starting from the ideas generation, followed by steps of systematic selection of ideas and refinement of the chosen option until the product configuration.

4.1.1 *Technical Methodology of 6-3-5 Brainwriting*

- Example of The technique involves a group of 6 participants that sit around a table with the objective of generating ideas concerning a theme that was previously established and are supervised by a moderator (that controls the round periods)
- Each participant thinks of 3 ideas and has exactly 5 minutes to register them in a spreadsheet like the one represented by figure 2.

Método 635

P	Ideias	
1		
2		
3		
4		
5		
6		

Figure 2 – Spreadsheet to apply 6-3-5 Brainwriting technique.

³ Jewelry Design Course – Module 1: Creating and Rendering, in the Federal University of Santa Catarina, Brazil.

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- By the end of the time, each person passes the sheet to the participant who's next and the process of register 3 ideas in 5 minutes will be repeated.
- Each one reads/observes the previous ideas and use them as inspiration for more ideas.
- The participants are encouraged to write/draw another inspirational ideas, stimulating the creative process.
- When completed the 6 rounds of 5 minutes each, all the sheets must have neatly circulated between the 6 participants, considering that each participant contributed with 18 ideas (3 in each sheet). 30 minutes is the time for 6 rounds and, during this time, the group has presented a total of 108 ideas.

participants x 3 ideas	=	18 ideas per sheet
sheets x 18 ideas	=	108 ideas
5 minutes per round x 6 rounds	=	30 minutes

Table 2 – Productivity summary of 6-3-5 Brainwriting technique.

4.1.2 Participants

The 6-3-5 Brainwriting technique was realized with 2013-1 class from the extension Jewelry Design Course – Module 1: Creating and Rendering. Figure 3 shows the students participating. There were 3 groups, in a total of 18 students.



Figure 3 – Participants making the 6-3-5 Brainwriting technique.

4.1.3 A Design Problem

The design problem to be solved by the students was the creation of a new pendant model concerning the theme: "Autumn".

The choice is related to "Natureza de todas as coisas" (Nature of all things) – one of four inspirational gateways presented by "Preview Design de Joias e Bijuterias 2012", a publication that points fashion tendencies directions in this business. This inspirational gateway brings all the natural life repertory and can be considered as a "true investigation lab to jewelry production". (Machado, 2011, p. 36)

When the activity was released, there were no orientations concerning materials to be used nor a semantic panel, in order to not influence on students' decisions.

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4.1.4 Results

Each group had 108 ideas in 30 minutes; considering that there was 3 groups, there was a number of 324 ideas for a pendant with "Autumn" theme, according to figure 4.

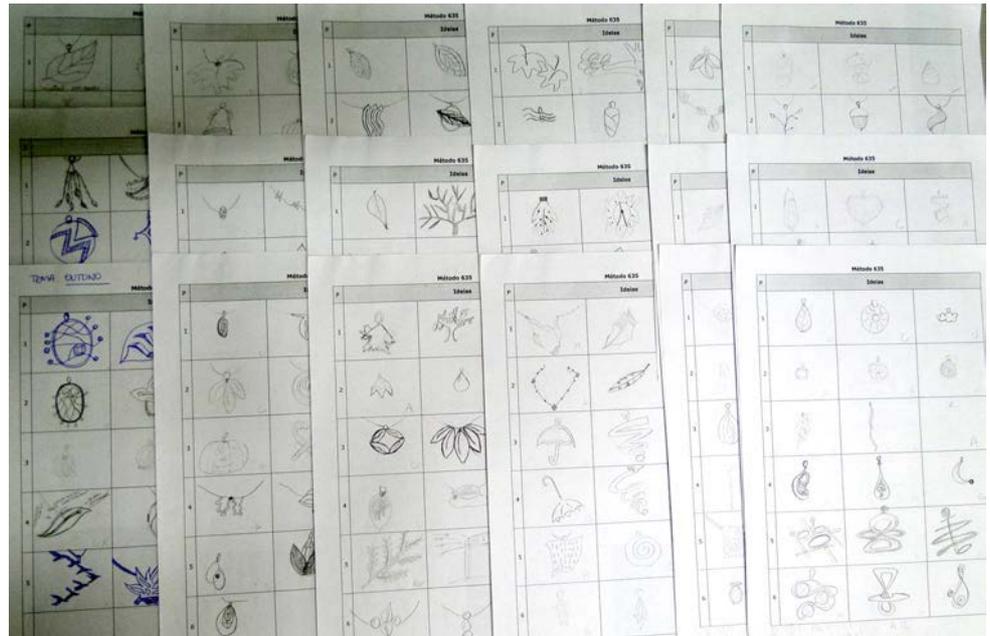


Figure 4 – Spreadsheet with ideas registered during 6-3-5 Brainwriting technique.

The ideas were separated in 3 main categories: leaves (141 ideas); abstract (85 ideas), and figurative (98 ideas) as it is presented in chart 1.

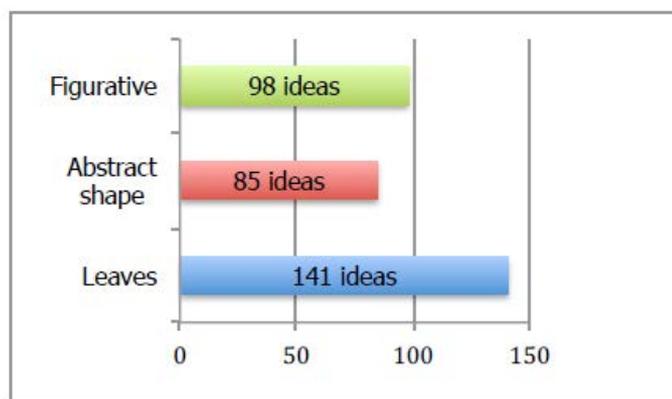


Chart 1 - Results concerning generation of ideas to a pendant design.

4.1.5 Results analysis

Autumn is the season when trees lose their leaves. It cannot be denied that in most people's mind the dry fallen leaves represent autumn. Because of that, from 324 ideas, 141 are drawings of leaves in several shapes and graphic styles. Among the 141 leaf drawings, there were: 66 compositions with one single leaf,

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14 compositions with 2 leaves, 36 compositions with 3 leaves and 25 compositions with more than 4 leaves, according to chart 2.

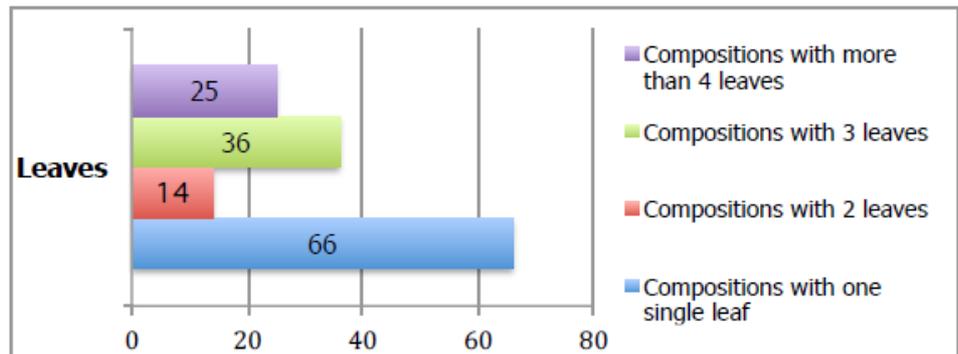


Chart 2 - Different compositions with the idea "leaves".

Some of these graphical representations of leaves present similarity, others have diverse shapes; it is noticeable that some drawings tend to be realistic representations and in others the useless details were discarded in order to preserve the primary form; common ideas were also presented, as well as original alternatives. There were also alternatives already known in jewelry context, considering representations of gemstones polished and inserted in the pieces.

There were 85 abstract drawings. In some of them it is noticeable geometric shapes; others were made from organic lines and shapes. On both of them there was not an explicit meaning. Some alternatives showed originality.

The 98 figurative drawings represented analogies to the theme "Autumn" practiced by the students. In some cases, it is possible to relate with the theme "Autumn"; in others, ambiguity is noticed.

The description of several representations and the number of their appearance are represented by chart 3.

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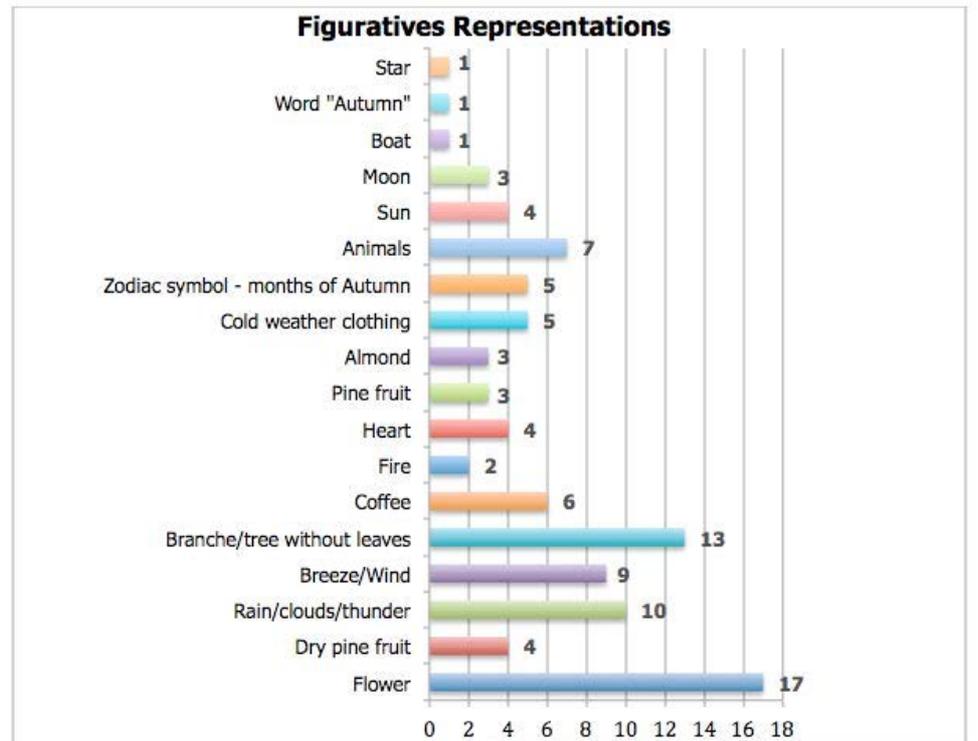


Chart 3 - Ideas with figurative drawings.

In this group it can be noticed both realistic and stylized graphical representations. Common ideas were also presented, as well as original ones. There were also alternatives already known in jewelry context, considering representations of gemstones polished and inserted in the pieces.

4.2 EVALUATION AND SELECTION OF IDEAS

An evaluation is the judgment of negative and positive qualities of something through specified observations. According to Baxter (2011, p. 102): "The objective of generating ideas is to produce every single possible solution. The selection will try to find the best of them. [...] Many people think the creative part of the problem ends up on generating ideas and the following selection is a simple and usual task. It is not always true, since it is necessary to be creative also during the selection. It is on that stage that ideas are possible to be expanded, developed and combined in order to get even closer to the ideal solution".

Baxter (2011) presents two methods to select ideas: voting and the evaluation matrix. Both were adopted to select ideas in this study.

4.2.1 Voting

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Voting is a simple and democratic way of selecting the best ideas. It was adopted with the objective of electing the best idea from each one of the categories: composition with one leaf, composition with 2 leaves, composition with 3 leaves and composition with more than 4 leaves, composition with abstract drawing and composition with figurative drawing. In sequence, the elected alternatives are presented.



Figure 5 – Composition with one leaf.



Figure 6 – Composition with two leaves.



Figure 7 – Composition with tree leaves.



Figure 8 – Composition with four leaves.

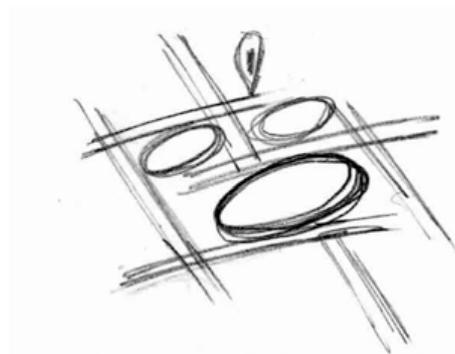


Figure 9 – Composition with abstract drawing.



Figure 10 – Composition with figurative drawing.

The drawings represented on figures from 5 to 10 went through a refinement process; after this step, new drawings were made and the original elected ideas were kept, which expressed the jewelry structure, as it can be seen in figures from 11 to 16.

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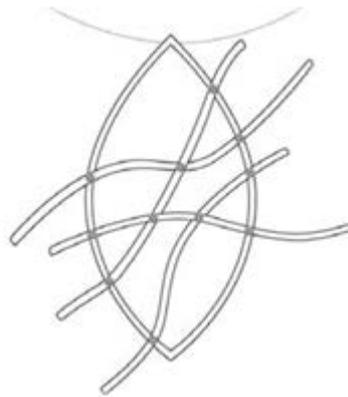


Figure 11 – Leaf Pendant (alternative 1).



Figure 12 – Two leaves Pendant (alternative 2).



Figure 13 – Tree leaves Pendant (alternative 3).



Figure 14 – Four leaves Pendant (alternative 4).

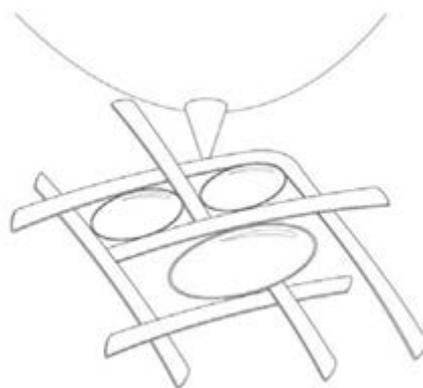


Figure 15 – Abstract Composition Pendant (alternative 5)



Figure 16 – Time to Migrate Pendant (alternative 6)

The process of graphical improvement of pendants became necessary to allow the other step of ideas selection: the Evaluation Matrix, presented in sequence.

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4.2.2 Evaluation Matrix

The evaluation matrix was adopted in order to realize the systematic selection of product opportunities; an opportunity that proposes a new product that is similar to an ideal product. (Baxter, 2011)

On the evaluation matrix there are specified criteria to select proposals/alternatives. Those criteria must go along with the company's interests, marketing strategies, the followed segment, target public, productive capacity, the use of materials, cost, profit and others.

As a didactic activity from the extension course Jewelry Design Course – Module 1: Creating and Rendering⁴, it was defined the attributes of an 'ideal product' – the new pendant about to be launched on market –, which simulates a real situation lived by the manufacturers on each products launch. These attributes were taken as evaluation criteria of 6 elected alternatives by voting. In this case, the evaluation judged, individually, if the alternatives correspond to the intended attributes. If the alternative corresponds to the intended attribute, it gets a positive grade; if not, it gets a negative grade. After making the correspondence between all criteria and alternative, it is necessary to sum all grades from each alternative and the one with best score is considered the selected idea.

In this case, the "ideal pendant" has attributes distributed in 4 categories: semantic and symbolic attraction of the product; way of using; materials/cost; ergonomics.

- a) Semantic and symbolic attraction of the product⁴: the pendant expresses the theme "Autumn" (collection title) (+1) / does not express (-1); is elegant/refined (+1) / reminds of bad taste/rudeness (-1); is clean⁵ (+1) / presents excess of details (-1); is original (+1) / its shape is common in market (-1).
- b) Way of using: the pendant is neutral/flexible (harmonizes with different styles and clothe colors) (+1) / is restrict to one single style or clothe color (-1); allows plurality of use (+1) / focuses on special or formal occasions (-1); is timeless (jewelry do not have the ephemerality of clothing, shoes and other accessories; it crosses generations) (+1) / belongs to a specific trend (-1).
- c) Materials/cost: the pendant has light structure, small gemstones or lack of gems (quantity and quality of materials interfere on the product's price) (+1) / has bold structure and big gems (increase the product's price) (-1).
- d) Ergonomics: the pendant is comfortable (+1) / is uncomfortable (-1); is safe to wear (+1) / might hurt, stick or break (-1).

The selection results according to the evaluation matrix are presented on table 3.

⁴ The semantic attraction concerns the product's visual image, literally, is the product's meaning. The symbolic attraction represents personal or social values and emotions from costumers.

⁵ Clean style: exclusion of excessive adornments; the essential shape is valued.

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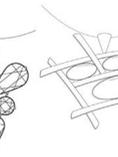
ATTRIBUTES			ALTERNATIVES					
								
Intended (+1)	Undesirable (-1)		1	2	3	4	5	6
Semantic and symbolic attraction	Expresses the theme "Autumn"	Does not express the theme "Autumn"	1	1	1	-1	-1	-1
	Elegant / refined	Bad taste / rude	1	1	1	1	1	1
	Clean	Details excess	1	-1	1	1	-1	-1
	Original	Common	1	-1	-1	-1	1	-1
Way of using	Neutral (harmonizes with different styles and colors)	Restrict (to one single style or color)	1	1	1	-1	-1	-1
	Plurality of use	Formal occasions	1	1	1	-1	1	1
	Timeless	Trend	1	1	1	1	-1	-1
Materials/ cost	Light structure	Bold structure	1	1	1	1	1	1
	Small gems / lack of gems	Big or many gems	1	1	-1	-1	-1	1
Ergonomics	Comfortable	Uncomfortable	1	1	1	1	1	1
	Safe	Hurts/ sticks/ breaks	-1	1	1	1	1	-1
TOTAL			9	7	7	1	1	-1

Table 3 – Evaluation matrix.

Alternative 1 had the best score. It can be described as a feminine pendant; expresses one leaf and dry branches, but it can also be seen as the different directions the wind blows through the leaf; the composition is elegant and refined; the pendant is clean, since it represents the shape itself and useless details were discarded; the pendant's shape is original; the jewelry can be combined with different styles and colors and can be worn in several occasions; the style does not reflect vague trends, and consequently the piece does not depend on current fashion trends; the piece's structure is light and does not require plenty of metal; there are small gems; the piece is comfortable since it is not heavy, the corners are rounded, so there is no risk of injuring the person who's wearing it. The alternative had positive graduation in almost all attributes, except from being "safe", considering that the curves are quite delicate and can

be twisted/smashed/broken. However, this negative aspect is possible to be improved by adopting solutions in order to strengthen the piece's structure.

4.3 TECHNICAL SPECIFICATION

The jewel (figure 17) has little gemstones in Round Brilliant Cut and bezel setting that holds a gemstone with safety (figure 18).

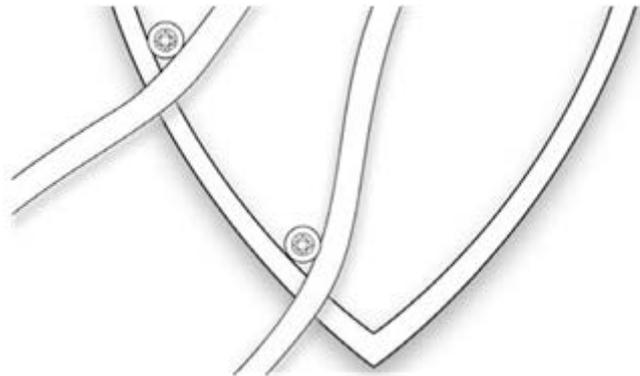


Figure 17 – Amplified pendant detail focusing on the gems.

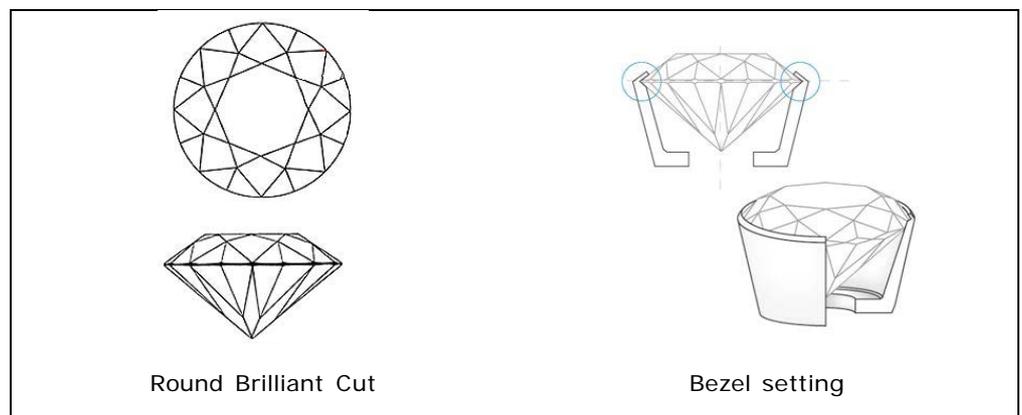


Figure 18 – Bezel setting. Source: Alexander Jewelers (2013).

A research was made in order to define which gem would be used on the jewelry. First it was settled a color palette based on the theme "Autumn". Images that express the theme were searched and 2 tonalities were predominant as represented in figure 19. In sequence, it was identified the gems that correspond to these tonalities from the color palette. The gems are: smoky quartz and citrine gemstones.

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Color Palette for the "Autumn" Collection



Figure 19 – Gemstones colors.

In sequence, a comparative analysis was made with different gold colors⁶ in order to observe and choose the best possible combination (see figure 20).

⁶ Gold has a yellow color, however it is not hard enough to be supportive in a jewel structure. In order to improve the gold's property, it is mixed with one or more metals, and become a more efficient material. The color of the metals used on the mixture interferes on the final result, for example: Yellow gold (750 parts of pure gold + 250 parts of silver [2/3] and copper [1/3]); White gold (750 parts of pure gold + 250 parts of palladium); among others.

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Figure 20 – Gold colors.

It is noticeable the white metal seem to clear the gems tonalities. The contrast with the yellow metal appears more interesting, since it accentuates warm tonalities such as smoky quartz and citrine gemstones and makes these minerals even prettier. Based on these observations, the chosen combination was yellow gold with smoky quartz and citrine gemstones to produce the “Autumn” pendant, presented on figure 21.



Figure 21 – “Autumn” Pendant – version in smoky quartz and citrine gemstones.

The jewelry manufacturing process indicated for making the “Autumn” Pendant is Lost Wax Casting.

5 FINAL CONSIDERATIONS

When starting a project, every designer knows there is still a long way to go, considering the development of a new product is a complex task that requires a lot of effort and disposition in order to explore the several possibilities found.

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Knowing that is necessary to overcome all the existing products in market and present something original generates anxiety and psychological tension.

During the creative process, the designer cannot remain passive and wait for the best solution to appear as magic. It is necessary to adopt an active, restless, unresigned posture, willing to try the uncommon; it is necessary to constantly search for information, to modify thoughts, exercise imagination, intuition and freedom. Obstacles such as functional fixity⁷, self-censorship⁸ and frustration⁹, are common to designers; they firstly need to accept them as factors in the creative process and learn how to deal with them, which consequently will led the designer to be successful in his work.

To Brazilian jewelry companies, innovation is being the key word. Knowledge renovation or retraining is being required from Brazilian designers, which will also have the benefit from new technologies applied in their product. On the jewelry production environment, design generates new concepts, styles and quality in order to attend the costumers' demands and requests.

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⁷ Functional Fixity: is the routine trap that makes we "[...] see only the obvious ways to face a problem, which is the same comfortable attitude that we always repeat." (Goleman; Kaufman; Ray, 1998, p. 14)

⁸ Self-censorship: is about the professional insecurity regarding his ideas and productions, which is defined by "[...] that judgement inner voice that confines our creative spirit to the boundaries we consider acceptable." (Goleman; Kaufman; Ray, 1998, p. 14)

⁹ Frustration: "[...] appears when a rational, analytic mind searches laboriously for an answer and reaches the limit of its capacity" (Goleman; Kaufman; Ray, 1998, p. 14). The frustration obstacle is what makes people fail by giving up before time, establishing the problem as something without possible solutions.

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