# The use of external stimuli as inspiration sources in design: preferences and forms of use from the perception of Portuguese designers.

O uso de estímulos externos como fontes de inspiração no design: preferências e formas de utilização a partir da percepção de designers portugueses.

**Priscila Zavadil Pereira**

PhD in Design, Federal University of Rio Grande do Sul
Department of Design and Graphic Expression, UFRGS.
priscila.zavadil@ufrgs.br

**Régio Pierre da Silva**

Ph.D in Production Engineering, Federal University of Santa Catarina.
Postgraduate Program in Design (PGDESIGN),
UFRGSregio@ufrgs.br

# ABSTRACT

Designers resort to external stimuli as sources of inspiration in the creation process, using images, texts, or other media as triggers for generating new ideas. Although there are several studies on this subject, there are still few conclusions about how these stimuli work in the creation process. In this sense, this article aims to verify what types of stimuli designers prefer, at what moments of the project they usually use, and how they can contribute to the creation process. To this end, professionals from nine Portuguese design studios were interviewed, totaling 17 design professionals, most of them with significant experience in the area. The results confirmed some aspects of the theory, such as the preference for visual stimuli, and brought others, such as three-dimensional representations. In addition, other relevant aspects were found, such as the importance of inspiration sources in the communication process between the team and the client and the constant search for references in the construction of the individual repertory.

## KEYWORDS

Creative process; Design process; Inspiration sources.

## RESUMO

No processo de criação, os designers recorrem a estímulos externos como fontes de inspiração, utilizando imagens, textos ou outros meios como gatilhos para a geração de novas ideias. Embora existam diversos estudos sobre esse tema, há ainda poucas conclusões a respeito de como esses estímulos funcionam no processo de criação. Nesse sentido, este artigo tem como objetivo verificar que tipos de estímulos os designers preferem, em que momentos do projeto costumam utilizá-los e como podem contribuir no processo de criação. Para tanto, foram entrevistados profissionais de nove estúdios de design portugueses, totalizando 17 profissionais de design, a maioria com grande experiência na área. Os resultados confirmaram alguns aspectos da teoria, como a preferência por estímulos visuais, mas também trouxeram outras informações, como o uso de representações tridimensionais. Além disso, foram encontrados outros aspectos relevantes, como a importância das fontes de inspiração no processo de comunicação entre a equipe e com o cliente, e a busca

## RESUMO

constante de referências na construção do repertório individual.

## PALAVRAS-CHAVE

Processo criativo; Design; Fontes de inspiração.
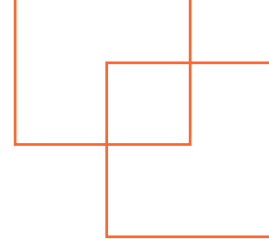
# INTRODUCTION

Creating new design solutions is a complex process involving intrinsic aspects of the individual, communication issues between the team and the client, and aspects related to the external environment. All these factors interfere with the creative process and the individual's thinking, and the originality, fluency, and flexibility of idea generation (AMABILE, 1989; KNELLER, 1978; TORRANCE, 1969).
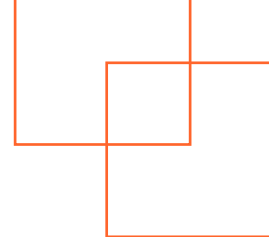
Originality is directly associated with creativity (GUILFORD, 1967; MARÍN IBAÑEZ, DE LA TORRE, 1991). However, it is a broad concept because most of the ideas and solutions generated are not entirely new but are formed from the relation of existing concepts, association and analogy with other references.

Analogies help the development of abstract concepts and the retrieval of knowledge stored in memory and its application in the design task, especially analogies formed between different fields of knowledge. Thus, analogical thinking is combinatory, associative thinking and is part of the synthesis process in design (DOUMAS et al., 2008; GENTER, SMITH, 2012, KAO, 2014). It also depends on perceptions, the ability to perceive helpful information in external and internal stimuli, and the analytical procedures performed. According to Tschimmel (2010), analogical thinking relies on visual, symbolic, or imaginative thinking, highlighting the importance of perception and associations by similarity and conceptual differences.

Thinking by analogies also activates perception, and vice versa, retrieving knowledge and establishing associations in new relationships - the mental leap, the bridge between problem and solution - at different project stages (DORST, CROSS, 2001; NAGAI et al., 2009).

One of the ways to incite thinking by analogies is through sources of inspiration, external stimuli that serve as references, solution principles, or triggers for the activation of knowledge stored in memory. Many studies have been conducted in this context, seeking to understand the preference and how these stimuli are used in the design process. However, there are still no definitive conclusions on the subject.

Given this scenario, this article aims to investigate how design professionals perceive the use of external stimuli as sources of inspiration in their projects and the main difficulties and facilitators of the creative process. The goal is to find notes on what types of stimuli are used, at which

moments of the project they are applied, and how they can contribute to creating solutions.

The article is structured with the theoretical foundation about external stimuli as sources of design inspiration (topic 2), followed by the methodology of this research (topic 3), which includes interviews with professionals at different levels of experience working in design offices in Portugal. In topics 4, 5, and 6, the data collection, analysis, and results of the interviews are presented. Finally, on topic 7, the article brings the final considerations of this work.
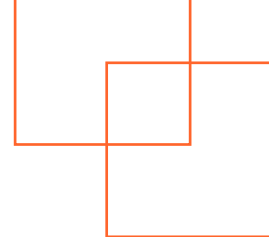
## 2 THEORETICAL BACKGROUND

A stimulus can refer to any source of inspiration, whether mental, internal representations, or external sources such as pictures, words, sounds, or three-dimensional representations (EASTMAN, 2001). Furthermore, these sources can differ concerning how close or distant they are from the context of the problem.

Inspiration, in design, is a process that integrates the use of these reference sources as a way to stimulate the creation of solutions. This process can be active, from searching for sources of inspiration on websites, books, or other means, or passive, when references are found randomly. Any representation can become a source of inspiration in the creative process. Therefore, designers continuously build their databases containing sources that they keep in physical and mental collections (ECKERT et al., 2000; GONÇALVES et al., 2012; 2014).

Some works, such as the one by Gonçalves et al. (2014), investigated what inspiration sources designers prefer during the idea generation process. In this study, through a questionnaire, the authors compared the results with different levels of expertise. Gonçalves et al. (2014) identified that both students and professionals use images more often than text, but novices tend to use more textual representations as sources of inspiration than experts.

Another relevant issue of the study by Gonçalves et al. (2014) is that using three-dimensional representations (such as mockups, prototypes, and commercial products) as inspirational stimuli is much more performed by professionals. This issue can be explained by the financial resources available to professionals to acquire products and have access to

prototyping, the objects accumulated over time by experts, and, above all, because the results, for students, are conceptual representations of possible solutions, while professionals seek real solutions that are feasible to produce. Three-dimensional models allow thinking about mechanisms and principles of the solution, physical attributes, among others, and, as in the case of texts, can be better explored as sources of inspiration.

In another study on the use of different analogies in the creative process, Casakin and Timmeren (2014) explored verbal and visual analogies in the early stages of design, with novice designers (students) working alone in teams. Their results confirmed the relevance of visual analogy for problem definition, clarification of ideas, and solution evaluations. Verbal analogies were meaningful in helping to generate a large number of ideas and therefore tended to enhance creativity. However, both contributed to the originality and the aesthetic outcome of the solutions evaluated in the study. Moreover, an essential factor is that regardless of the kind of analogy adopted, and teamwork was fundamental to enrich different aspects of the design activity.

Regarding the different stimuli, Gonçalves et al. (2012) also agree that textual or pictorial can contribute to the creative process and the creation of analogies. In their experiment with design students, the researchers tested four different types of stimuli: textual distant from the problem; textual not related to the problem; pictorial distant from the problem; and pictorial not related to the problem. From distant or unrelated sources, both textual stimuli performed better or equal than the pictorial stimuli in terms of fluency, flexibility, and originality of the ideas generated.

Another critical piece of information from the study by Gonçalves et al. (2012) is the role of abstraction in using inspiration in design. The use of sources of inspiration distant from the context of the problem contributes to the creative process in design, compared to close analogies. But as the level of abstraction of the source increases, the relationship to the problem becomes vaguer, limiting the use of this stimulus. In other words, according to the study, the abstraction of the source should have a balance point that promotes its exploration in the process but provides enough clues to establish relationships between the source and problem.

Texts are more abstract types of representation, and using them as a source for analogies can be more complex, besides demanding more time than images (GONÇALVES et al., 2012). However, how designers use texts
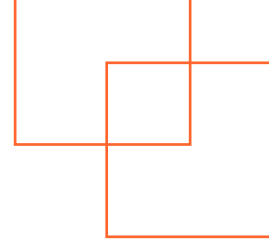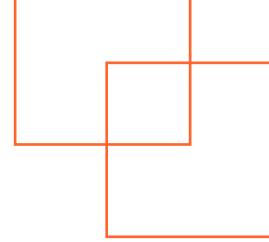
can be improved for the creative process, increasing its potential as a source of inspiration. Goldschmidt and Sever (2011) showed the positive effect of texts for the generation of ideas, concluding that they can be interesting stimuli because they are versatile and allow different interpretations.

Specifically, about visual analogies, the use of this type of cognitive procedure improves the results of the process, especially when designers still have little project experience. Several studies indicate the relevance of images and pictorial stimuli in the idea generation process, especially regarding the originality of the created solutions (CASAKIN, GOLDSCHMIDT, 2000; GOLDSCHMIDT, SMOLKOV, 2006; SARKAR, CHAKRABARTI, 2008).

This relevance and preference for images are natural, given the very activity of design and the prominence of visual information in the design process. Designers think visually, which means that the representations they use to think are not only verbal but consist of shapes and configurations (GOLDSCHMIDT, SMOLKOV, 2006).

The prominence of the search for pictorial representations by designers is also highlighted by Cardoso and Badke (2011), highlighting the search for images of existing concepts. These sources can generate adverse effects in the process, with excessive repetition of the main attributes of the source of inspiration for the solution, such as the main characteristics of the object, causing fixation in the generation of ideas. Of course, this is related to the type of image adopted and the types of sources and analogies - close or distant, between different domains or within the same problem domain. But this statement leads to the questioning about what moment and with what purpose the exposure to similar products, in the creative process, becomes effectively valid for the development of new solutions.

In contrast, Sio and Kotovsky (2015) report the positive effect of examples as stimuli for idea generation. In their analysis investigating whether examples generate inspiration or fixation, the researchers identified that the novelty and quality of ideas increased with these stimuli, but variety decreased. Individuals tended to copy ideas or part of the ideas contained in the examples, which was seen as positive. The more they copied ideas, the fewer alternatives they generated. However, the authors argue that the presence of examples can change the solution search

strategy from a random search to a more focused one, developing ideas for a specific aspect of the problem (SIO, KOTOVSKY, 2015).

In more recent studies, Dankfort et al. (2018) report that using stimuli with sources of inspiration in design teams also improves communication between professionals and contributes to designers sharing the same frame about the problem. According to the authors, stimuli trigger inspiration for the individual and, in group work, these sources help designers express their ideas, which leads to new inspirations among the team.
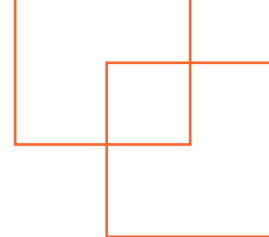
Borgianni et al. (2020) reported a study with groups of designers who aimed to generate solutions to a specific problem and observed that pictorial stimuli significantly increased the non-obviousness of ideas but did not affect the quality, originality, or quantity of the proposals. Meanwhile, Perez et al. (2019) used physical cards containing design principles, with a textual description of the principle, a visual representation, and an example of an existing application, as design stimuli and conducted a study with 61 participants. The authors observed improved quality and novelty of the ideas generated when designers used the cards.

In summary, from the reported studies, one can infer that there is a preference for using pictorial stimuli to aid analogical thinking and the creative process in design. However, text, three-dimensional objects, or other stimuli can also result in (deep) structural analogies and original solutions. It is not only the type of representation that affects the variety and originality of the ideas generated, but also the relationship of the source to the problem - whether it is distant or close, concrete or abstract, between different domains or in the same field - the moment of the project, the experience of the designer, and the type of problem.

The very ability to recognize a helpful idea as a stimulus requires creativity (CASAKIN, GOLDSCHMIDT, 2000). In this sense, external sources can influence the generation of new ideas by identifying characteristics not yet perceived, stimulated by the dialogue between designers and their internal representations (CAI et al., 2010).

Especially for designers with little design experience, as in the case of students, difficulties are recognizing proper stimuli to the project and transposing them to the activity in question. Therefore, encouraging thinking by analogies is of great relevance, so that new designers learn to

relate stimuli to the project activity, whether visual or linguistic, whether from the same scope of the problem or external to the project, transposing characteristics to the creation of new solutions (BONNARDEL, MARCMECHE, 2004).

The most experienced designers possess tacit knowledge that is often difficult to make explicit. However, the use of stimuli as sources of inspiration is something recurrent in the creative process, as demonstrated by the various studies referenced. Therefore, to clarify how this process occurs, the designers' preferences and how these stimuli are used in the project are relevant to the understanding of design processes and their possible improvements.

## 3 METHODOLOGY

For this investigation, the methodology adopted was based on the qualitative approach, seeking to understand, describe, and discuss phenomena from analyzing individuals' or groups' experiences through knowledge and reports. Qualitative research aims to investigate how people construct their reality, what they do, and what happens to them through different methods that enable the researcher to develop models, typologies, and theories (partially generalizable) to describe and explain social and psychological issues (GIBBS, 2009).

For this, the selected method was a semi-structured interview with specialists to investigate the designers' understanding of the individual and group creative process, as well as the difficulties and facilitators of creative thinking, identifying which stimuli they use and how they can be applied to aid thinking by analogies and the creative process.

The expert interview is a specific way of applying semi-structured interviews, with less interest in the individual himself but instead focusing on his mastery of a particular subject or field of activity. This type of interview is integrated into the study, not as a single case, but as representing a group of experts (MARTINS, THEOPHILO, 2009).

In this research, design professionals in Portugal were selected by intentional sampling to compare data with Brazilian professionals in the future. The subjects were selected through a virtual catalog of designers and Design studios in Portugal, with free consultation through the virtual site and application. In this catalog, there were 95 projects and designers.
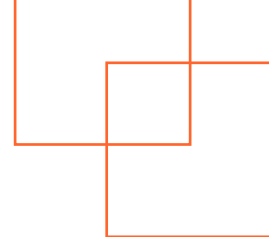
From this listing, the author made an online search about 95 projects and designers. From this, those that corresponded to an autonomous designer were excluded. Thus, 27 design offices remained, 14 located in the capital city, Lisbon, 09 to the town of Porto, and another 04 offices in the interior of the country. Among the contacted offices, 09 offices accepted the invitation, totaling 17 professionals interviewed.

The interviews were recorded and transcribed, and then the author analyzed the response patterns from these categories identified through the literature review. After transcription, a step toward analysis is coding, which involves identifying and recording text passages or other data as parts of an overall picture that exemplify the same idea. There is open coding, in which the text is read reflectively to identify relevant features (GIBBS, 2009). In addition to the description obtained, patterns and relationships are sought among the data, checking for categorized differences and similarities and arranging them in comparative tables.

Each interview was analyzed individually, classifying the data according to the categories identified. In addition, the documents generated by the interviewees were examined, and, finally, all responses were classified according to the patterns found for each category, forming a synthesis of the primary information obtained through the 09 participating offices.

## 4 INTERVIEWS WITH DESIGNERS

For the data collection of this research, semi-structured interviews were conducted with Portuguese specialists, as specified in the Methodology of the article. The objective of the interviews was to identify how designers' creative process occurs in design practice, as well as to research the difficulties and facilitators of the creative process and the strategies and mechanisms that can help thinking by analogies in design.

With the selected offices, 27 design studios were contacted, of which 09 responded positively to the interview, 05 in the city of Lisbon, 02 in Porto, 01 in Matosinhos, and 01 in Vila Nova de Gaia, in Portugal. As explained in the methodology, when contacting the studio's partners, they were allowed to conduct the interview individually or in groups. Thus, a total of 17 professionals were interviewed.

The interviews followed a semi-structured script, with the flexibility to
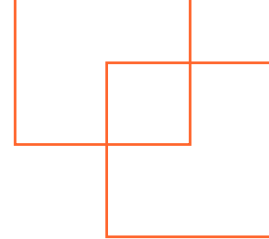
change the order of the questions and insert new ones, according to the interviewees' answers. Thus, the conversations dealt with the designers' creative process, asking them to comment on how it occurs, how they structure, which methodologies they apply, leading to specific questions about the use of stimuli in the project, as well as the difficulties and facilitators they perceive in this process.

The interviews began with a conversation about the studio's history, the interviewees' profiles, and their creative design process, leading to the following questions in the script.

The first question aimed to investigate how often, for which projects, in which situations, and at which stages of the project designers use external stimuli as sources of inspiration or as triggers for the creative process.

The next question dealt with the types of representations that designers use most frequently. For this purpose, an instrument was used, consisting of a set of cards, each containing the different kinds of stimuli/representations adopted in the process. The cards exemplified the following representations: (i) pictorial - images not necessarily directly associated with the project theme; (ii) pictorial - images of solution principles; (iii) pictorial - images of similar products; (iv) verbal - texts, not necessarily associated with the theme; (v) verbal - keywords; (vi) physical objects, three-dimensional, from other contexts; (vii) physical objects - similar products; (viii) physical objects - mockups; (ix) audiovisual/sound (Figure 1).

In the sequence, the other question was conducted from the previous answer, asking how they perceived the influence of the stimuli they selected in their process and their solutions. In this case, another resource was also adopted, a qualitative scale in which respondents could mark the relevance of these representations for the originality of the solution; the flexibility in generating ideas; the applicability/adequacy of the ideas to the problem; assisting team communication and the realization of the design process as a group; and assisting communication with customers, users or other audiences linked to the project.

Finally, the last questions were about the difficulties and facilitators that professionals perceive in the individual and group creative process.

All interviews were recorded, and the audio was later transcribed for information analysis.
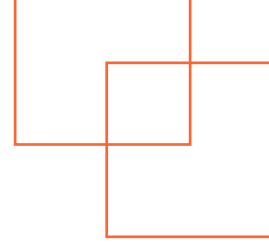
**Figure 1 –** Use of instruments in the interview.
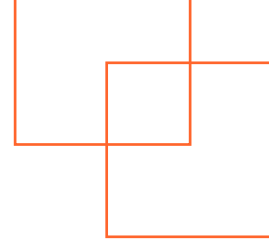


Source: Image taken by the authors

# 5 DATA INTERVIEW ANALYSIS

As reported, the interviews were conducted in 09 design offices, adding up to 17 professionals. The name of the office and designer was replaced by a corresponding letter and number to maintain the respondents' anonymity and preserve their identity. The profile of the interviewees is summarized in Chart 1.

**Chart 1:** Profile of the offices and designers interviewed.

| Studio | Number of interviewees | Offices profile | Interviewees profile |
|---|---|---|---|
| A | 2 | Atelier was born in 2006 with four partners. Focus Editorial, Exhibitions, Print Design. Main clients related to culture. | A1: BA in Communication Design, MA in Editorial Projects. Experience since 2006. Professor of Editorial Design.<br>A2: BA in Communication Design, MA in Communication and New Media. Experience since 2006. |
| B | 2 | Office founded in 2011. It works mainly in the areas of branding and the web. There are two partners and two to four collaborators. It has many international clients. | B1 and B2: BA in Communication Design They have been working in design since 2008. |

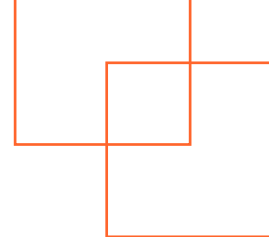| Studio | Number of interviewees | Offices profile | Interviewees profile |
|--------|------------------------|-----------------|----------------------|
| C | 3 | Existing office since 2009/2010, founded by the three partners. There are six members in the current team, plus external collaborators. It works in Communication Design for print and digital media. | C 1: BA in Communication Design (2009). Works in branding, visual identity and web design. Project planning and management.<br>C2: BA in Communication Design (2009). Works in webdesign.<br>C3: BA in Communication Design (2009). Works in print and digital media. |
| D | 1 | The Atelier was born in 2006, but the partners already owned another studio before. The focus is on projects for environments and exhibitions. There are four partners and three collaborators. | D1: Bachelor of Fine Arts in Lisbon<br>The other partners have degrees in Architecture and Design. |
| E | 1 | The studio is ten years old, focused on architecture and urbanism, with projects involving the design of equipment, furniture, and environments. They work a lot in public spaces. There are seven collaborators. | E1: BA in Architecture and Urbanism. |
| F | 4 | According to the project, the studio was established in 2000 and currently has four partners and collaborators. It works in Communication Design in projects of various scopes. | F1, F2, F3 and F4 are communication designers. Two of them are professors in the Master in Design at the University of Porto. |
| G | 2 | Atelier was founded in 2012 with three partners. They have other design interns. | G1 e G2: BA in Communication Design (2012). |

| Studio | Number of interviewees | Offices profile | Interviewees profile |
|--------|------------------------|-----------------|----------------------|
| H | 1 | The Atelier has two people, but they work with other professionals in collaboration. It has existed since 2012, working in several areas of Communication Design. | H1: Graduated in Communication Design, with brief experience in other offices, before starting the studio. |
| I | 1 | The studio was formed by two partners and was founded in 1995. They specialize in Communication Design, graphic projects, and environments. | I1 e I2: BA in Communication Design and Master in Fine Arts in Barcelona. |

Most of the interviewees are experienced in the area, several with more than ten years of experience. In addition, most of the offices focus on Communication Design in its various areas, such as branding, print, editorial, web, and digital, among others. Two offices, however, also had industrial designers in their internal team because they are focused on environmental design, architecture, and urbanism.

Despite the specific comments in each interview, it was possible to observe several response patterns concerning the creative design process and external stimuli for idea generation.

The search for references for sources of inspiration is a continuous activity, independent of a specific project. And this was a process reported by most of the Portuguese designers interviewed as a daily practice. The collection of physical materials, with the cataloging and organization of these sources in libraries, collections, holdings, as well as the creation of digital reference catalogs, libraries by clients, shared file folders, and the use of virtual tools to search, organize and share visual references emerged in all the interviews.

It was also mentioned that the search for these references does not occur without a purpose, unexpectedly. First, there are discussions among the team, together with the client, to resort to references they have already collected because they remember these sources or seek new external stimuli specific to the project in a later research phase.

In other words, these stimuli are not as an initial input to the project but as mechanisms that can help transpose concepts into visuality or expand the idea previously discussed, for example. Their perceived contribution is in breaking mental blocks after the beginning of the project and aiding flexibility in generating ideas, expanding the possibilities.
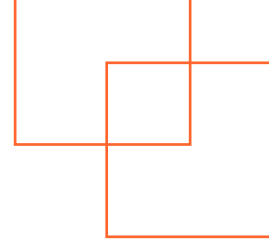
These stimuli, especially the images, help form the project's universe to visualize the context in which the solution should be inserted, developed through conceptual research. Many interviewees said they avoided using similarities in this research, preferring more abstract references in contexts more distant from the theme, not from the same area of design or project. The similar is considered necessary, but in another moment, to know what already exists and not produce something similar.

Besides conceptual research, designers also emphasized a kind of technical research with references to materials, finishes, experiments with materiality, physical resources, reproduction processes, and even the use of mockups and prototyping. Experimentation as part of the process and "provoking chance," a term used in one of the interviews, was considered essential for developing the projects.

Thus, in the view of most of the interviewees, these stimuli can strongly contribute to flexibility in the generation of ideas and communication among the team and with the client. On the other hand, originality was questioned as something that should not be a goal of any project.

Communication was a valued aspect in many interviews, both among the team and with the client. The role of the client in the process proved to have great relevance, especially in the initial moment of the project, for the precise and adequate problem formulation, providing information for the project, and exchanging references for the construction of the project universe, that is, for the definition of the path, conceptual and visual, to be followed.

Many of the difficulties cited also have their origin in communication, either with the client or with the team itself, such as interpersonal relationships, the problem of communicating and expressing an idea so that everyone understands it in the same way, and being open to listening, at the same time that it is necessary to be critical. Other difficulties are also related to the lack of information, motivation, and translating the unknown into something familiar, besides the decision-making process when faced

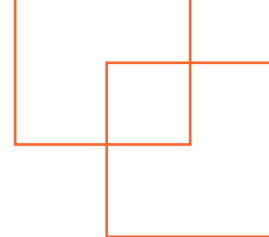with the alternatives generated and the path to be followed.

The facilitators of the process are access to information, precise briefings from the client, integration among the team, and motivation with the project. The individual repertoire of each designer, their knowledge and experience, the mental images stored in their memory, and their cultural baggage were also recurrently mentioned. This individual repertoire and the different personal interests of the designers will be complementary in the team process, as the individual interests will also form one's approach to the project. The integration of technical and personal skills was an essential point in the interviews, considering the team's diversity a positive aspect, as long as there is the ability to work in groups. Another relevant issue was the time, which must be adequate for the project and allow incubation during the process. There is a distancing from the project and a critical view of what is being produced.

About the process, although some aspects have been frequently commented on, such as initial meetings between the team in an accessible format, with the use of brainstorming to discuss the first information and ideas before the research itself, the development of the project in a collaborative way among designers and the use of visual and mental maps, among others, for the visualization of the project, it was possible to realize that in most cases there is no clear view about the creative and design process. Or rather, the interviewees do not perceive the existence of systematized processes. There are more recurrent working methods and procedures, but there is little clarity about how they occur. It is tacit knowledge, which became difficult to express in the interview.

However, external stimuli are indeed used constantly. In some cases, there is a preference for words, or verbal stimuli, to start with, and tools such as synonym banks, mind maps, and concept maps were cited as essential tools. But images, photographs, and drawings, not necessarily of the same context as the problem, were the most relevant representations to create the visual universe of the project, with references from several areas, outside design, and the interest for detail, for something that has not yet been perceived.

Besides images and keywords, the recurrently mentioned sources were images of solution principles, similar ones (although in some cases they are not used in this initial moment of the project), texts, and, less frequently, three-dimensional objects from different contexts and
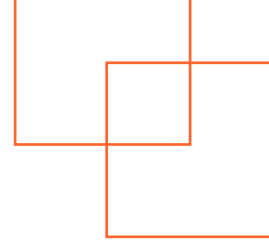
mockups.

Most of the interviewees recognize the importance that tools, games, toolkits, and other instruments can have for the process but are unaware of examples and do not use them, except for reference sites and virtual tools for the selection, organization, and sharing of images, or virtual disks for the exchange of reference folders and files. An example of a game with cards to change the perspective of the solutions being generated was cited and mental and visual maps of the project.

One can deduce from this that they need to be uncomplicated and agile to use to adopt tools. Of course, it is also necessary that they realize the purpose and the possible results of their use and consider open forms of application, which designers can adapt according to their needs. From these conclusions, the main results of the interviews regarding the use of stimuli in design were organized in Chart 2.

**Chart 2:** Summary of the interview results.

| Investigated Theme | | General Conclusions |
|---|---|---|
| **About the use of stimuli in the project** | Situation | In almost all projects.<br>It also depends on how much time they have. |
| | Important Comments | In general, there are initial meetings with the client and among the team for free discussions. Then there is the initial research, in which stimuli, references, and information about the context of the project are sought. This is conceptual research to create the project's universe, which is usually done based on a concept, on discussed ideas. It is also used specifically in the generation of alternatives and to gauge the final result. |
| | Perceived Contribution | By the majority average, first for flexibility in generating ideas, followed by communication among the team. Next comes communication with the client, the solution's applicability, and finally, originality, which was questioned in several cases. |
| **About the type of stimulus** | Selected Representations | Pictorial stimuli - images (photographs and drawings), not necessarily directly associated with the theme (cited by all).<br>Mockups (although many said they used them later, and not to generate ideas specifically) and verbal |

| Investigated Theme | | General Conclusions |
|---|---|---|
| | | stimuli - texts (cited in 5 cases). Images of solution principles, Keywords, and three-dimensional objects from other contexts than similar products (cited in 4 cases). |
| | About abstraction/source-target distance | Preference for more abstract sources, but often still in the context of the product/theme. They avoid similar sources, in most cases, in this initial moment but consider it important to know what exists. |
| | Important Comments | All types of stimuli were seen as a potential, depending on the project. Importance of the individual repertoire that is built daily, of mental images that are retrieved in memory. Importance of having standard references with the client. Abstraction in the references to define the concept, the universe of the project, and the solution itself so that there is a story to be told so that it can be interpreted. It is essential to take advantage of materiality as well. Not to have only digital research and references. The "thinking with your hands," visualizing the collected information, the references, all simultaneously, in the physical environment where they are. |

# 6 DISCUSSION

As can be observed in the sample interviewed, professionals work with more abstract stimuli, such as texts, keywords, and images from contexts different from that of the project, avoiding similar ones in the early stages of the process.

In addition, the professionals realize the potential of these sources of inspiration for communication among the team and with the client to help formulate a more precise briefing. In addition to the inclusion of the client, the communication process among the group was also a highly highlighted aspect, which corroborates with the study by Dankfort et al. (2018), which suggests the contribution of external stimuli to the exchange of information and ideas among the team.

Another relevant factor is the individual repertoire shared among the
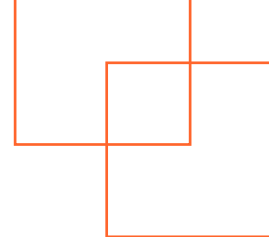
team during the project. This was a factor evidenced in all interviews and ways to foster it, such as the constant research of references and the creation of libraries, collections, physical and digital, not only for a specific project but as something to be done constantly. In other words, the external stimuli must be frequently apprehended by the designers. They will be used as sources of inspiration when the problem spaces of a given project trigger these references in the memory.

This is an essential factor that differs from most theoretical studies presented in the rationale. In most studies, cases are analyzed from sources of inspiration provided for the specific problem. However, in practice, the interviewees stressed the importance of forming a repertoire of references independent of the accumulated project that can be activated at each creative need. It is clear that the search for specific references also occurs. However, it is essential to emphasize that a particular stimulus, analyzed alone, may not bring results consistent with reality because its contribution will also depend on the designer's previous repertoire and the associations that the individual will make from his references.

About the preferences, as in theory, the use of pictorial sources of inspiration was quite recurrent. But the professionals also highlighted the use of mockups, three-dimensional objects, and keywords that can trigger new ideas. This was also an aspect considered in studies of the theoretical foundation, which point to using these stimuli by professionals with more experience about students and beginners.

In this sense, it is worth noting that many concept generation techniques, such as moodboards, mind maps, and concept maps, emphasize the use of images and words. But other types of stimuli, such as physical objects or audiovisuals, can be just as helpful and inspirational.

Another relevant question refers to the abstraction of the source of inspiration. The professionals said they prefer more abstract sources. The use of similar ones, in general, was not placed as cheerful as a reference, but only after the initial phases of the project, after the first ideas have been generated. Although there is no consensus on this aspect, in theory, most studies agree that similars can bring fixation in the generation of ideas, in agreement with the opinion of professionals.

All these aspects are not conclusive, given the limitation of the sample. Still, they are relevant data that primarily meet the theoretical studies and
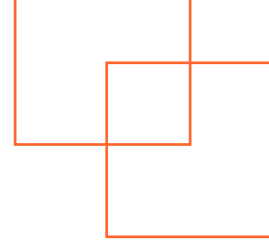
can contribute to the understanding of designers' creative process.

Thus, the interviews were fundamental to deepen these questions and investigate how the creative and design process occurs in the designers' practice, especially concerning the use of sources of inspiration in real project contexts.
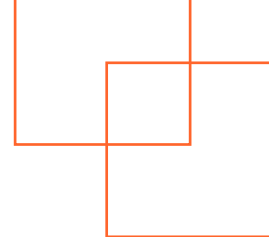
# 7 CONCLUSIONS

Experienced professionals, in general, are very efficient in developing their projects and end up carrying out their work processes and methods. However, this process is hardly ever systematized or even made explicit. It is a tacit knowledge, which is often lost with time or even with the exchange of team members. For this reason, studies that seek to analyze these aspects are essential to the knowledge about the design field.

However, studies about the creative process and the use of sources of inspiration have an evident limitation, which concerns the related internal and external factors. In other words, the preference for a type of representation, the way it is applied in the project, and the perceived contribution are only one aspect that influences the creative process and the result of the solution. But the way these connections are established for the ideas generation depends on the designer's repertoire, the references stored in their memory, the communication among the team, the sharing of their ideas, and external factors related to time, environment, leadership, among others.

However, this does not reduce the relevance of these works. On the contrary, understanding how stimuli become sources of inspiration in the creative design process may help develop new methods and tools that help designers in their projects or improve existing methods to optimize design processes.

In this sense, this article contributes to the theoretical studies, ratifying that the use of sources of inspiration that help thinking by analogies in the individual, the expression and communication of ideas among team members, as well as the generation of ideas collectively, facilitate the creation of solutions, especially concerning the fluency and flexibility of ideas.

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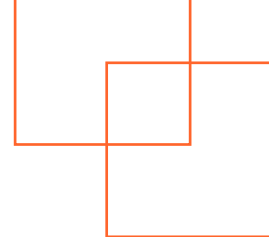
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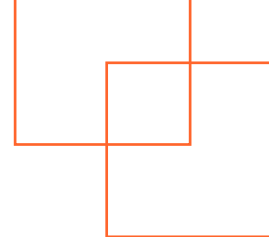
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Laboratório de Orientação da Gênese Organizacional - UFSC

## Priscila Zavadil Pereira

Professor at the Department of Design and Graphic Expression at the Federal University of Rio Grande do Sul (UFRGS). PhD in Design from UFRGS, with a Sandwich Doctorate at the School of Arts and Design in Portugal (UFRGS, 2016), Master in Design (UFRGS, 2012), Specialist in Product Design, Graphics and Information (UniRitter, 2009) and Graduated in Social Communication from UFRGS (2004). Professional experience in the areas of Visual Communication and Design. Professor in the Visual Design and Product Design courses (UFRGS). Vice-coordinator of Post-Graduation (Lato Sensu) in Graphic Design (UFRGS). Researcher at the CoCreation Lab project at the Federal University of Santa Catarina, in the area of methodology for business and entrepreneurship. Interest mainly in the following subjects: design and creativity, creative process and design methodology; and applied studies in graphic design, printing processes and graphic memory, illustration and stamping.

## Régio Pierre da Silva

Professor at the Department of Design and Graphic Expression at the Faculty of Architecture of the Federal University of Rio Grande do Sul (UFRGS). Permanent Professor of the Postgraduate Program in Design (PGDESIGN) at UFRGS. He holds a PhD in Production Engineering in the area of Media and Knowledge at the Federal University of Santa Catarina (UFSC) in 2005. He has a Master's in Production Engineering in the Transport area at UFSC in 1991. Degree in Civil Engineering at the Federal University of Santa Maria ( UFSM) in 1987. Has experience in Media and Knowledge with an emphasis on Instructional Design and Interaction Design, working mainly on the following topics: descriptive geometry, meaningful learning, concept maps, product design, virtual product development, assistive technology and Research Methodology. Professor of the Undergraduate Courses in Product Design and Visual Design at UFRGS.