SURPRISE AS A SITUATED PHENOMENON

Becattini, Niccolo (1); Borgianni, Yuri (2); Cascini, Gaetano (1); Rotini, Federico (2)
1: Politecnico di Milano, Italy; 2: Università di Firenze, Italy

Abstract

Among the studies dedicated to design creativity, a significant attention is given to the investigation of its dimensions, such as novelty and usefulness. The underlying assumption is that an enhanced knowledge of them is helpful to better understand limitations of current design approaches, and improve methods and tools.
While there is still a lively discussion about these dimensions, some authors highlight that among them surprise deserves to be considered an independent aspect that differs from novelty. In fact, the latter concerns unprecedented peculiarities of an artefact, while surprise tells about the unexpectedness of a feature whatever is the degree of difference with pre-existing ones.
Having observed the lack of reference models to investigate the emergence of surprise when a user first meets a new artefact, the authors propose an original model to describe the occurring cognitive processes. The model exploits some fundamental concepts of Gero's situated FBS framework and represent surprise as a mismatch between the interpretation of reality given by an observer and her/his expectations due to previous experiences. The model is illustrated by means of three examples.

Keywords: Creativity, FBS, surprise, situatedness

Contact:
Dr.-Ing. Niccolo Becattini
Politecnico di Milano
Dipartimento di Meccanica
Italy
niccolo.becattini@polimi.it

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1 INTRODUCTION

The development of new products has to take into consideration several factors to be compliant with norms, so as to ensure, e.g., absence of risks, sustainability and quality. The adherence to strict procedures does not imply however the achievement of success in the market. The features and traits of new products that bring to success or failure are just marginally investigated within engineering design. The scientific community has spent several efforts to study creativity and creative solutions (i.e. characterized by newness and usefulness) within both problem solving and New Product Development. Even if this is seldom affirmed, the basic assumption behind this branch of literature is "the more creative the better". Nevertheless, it can be argued that the fulfilment of the basic requirements that make a product creative are ineffective to ensure market success (Im et al. 2015). Along with the cited work, deliverables with unique and unexpected features are capable of capturing customers' attention and hence augment the probability of thriving in the marketplace. It has to be noticed that such a hypothesis should be rigorously demonstrated, but it is quite intuitive that the claim holds its validity especially in the current industrial era that sees innovation as an essential ingredient for staying competitive.

In these terms, the scope of fostering creativity should be substantially addressed (among the others) to elucidate the mechanisms that spotlight new and useful products. As a result, a major understanding should be provided about surprise, whose role to ensure and increase creativity is noticeably debated (see Section 2). Indeed, as widely accepted, the presence or display of surprise is linked with phenomena of unexpectedness (e.g. O'Quin and Besemer, 2006) with respect to individual knowledge and beliefs. Some scholars identify the interplay between new artefacts and evaluators as the locus in which expectations are violated. Among the others, Wiggins (2006) sees surprise as an emotional reaction of people, emerging as a consequence of novelty or outstanding value. Similarly, Silva and Read (2010) focus on the display of surprise as a resultant of products' creativity, but, from their viewpoint, novelty is the unique source of the phenomenon. According to these readings, the prerequisites of creative products are tailored, at least in some circumstances, to provoke a feeling of astonishment and bewilderment (Boden, 1996).

In this sense, it can be deemed relevant to map with proper means the emergence of surprise aroused in individuals. The task of capturing, describing and provoking emotions is surely not new in the design field and cutting-edge technologies are pushing towards more reliable observations of people's behaviour. The authors provide hereinafter a brief overview of design techniques that support the development of innovative products by exploiting the exploration of people's feelings. A detailed state-of-the-art analysis is however out of the scope of the present work. Kansei Engineering (Nagamachi, 1995) studies the emotional reactions of customers up against descriptions, images, prototypes of new or existing products, their components and features. Experimental studies show that insights in the facial expressions of people observing new products support the application of Kansei Engineering (Diago et al., 2009). Visual responses are widely investigated also outside the traditional domain of Kansei Engineering to reveal the role of aesthetic, semantic and symbolic aspects in design (Crilly et al., 2004). Experiments meant to evaluate candidate new products have however overcome the consideration of traditional involved senses, i.e. visual and tactile experiences, going hand in hand with the birth of the field of "Design for Emotions" (Fenech and Borg, 2007). In this context, interactive virtual prototyping is employed to study user experience and the emotional responses of potential customers (Bordegoni et al., 2014). Even more sophisticated instruments are used within the field of Neuromarketing (Lee et al., 2007; Lindstrom, 2010) to study solicited brain areas, heartbeat and respiratory rate as evaluators interact with new products and advertising messages.

Despite several kinds of feelings are monitored within disciplines that support successful product development, a limited understanding is available with regards to the stimulation of surprise as a separate factor from the general perception and appreciation of products. The objective of the paper is then to build a model that allows highlighting unexpectedness in the evaluation of creative products, so favouring the study of the mechanisms that lead to surprise feelings. A long-term goal of the research stands therefore in fine-tuning design approaches and practices that support the creation of surprising deliverables.

The residual of the paper is organized as follows. Section 2 reviews the meaning attributed by contributions in the design domain to surprise and discusses the available models to represent evaluations and interpretations. The proposed model is described in Section 3 that treasures the terms

introduced within Situated-FBS to represent designers' scopes. The original model is applied to some surprising products, revealing different patterns that lead evaluators towards the perception of infringed expectations (Section 4). Eventually, Section 5 concludes the paper by discussing the findings of the present research and delineating future activities to be undertaken.

2 RELEVANT CONTRIBUTIONS IN THE EVALUATION OF SURPRISE

The present section is divided into three parts. The first one reviews the definition and the characterization of surprise in design creativity. The second one shows the most recent findings about surprise, considering the different perspective scholars have tackled the emergence of creativity with. The third one, in turn, presents a model to describe cognitive processes characterizing the design processes (FBS framework) in a situated context. The authors introduce it here with the purpose of presenting its main constructs and providing the readers with the relevant concepts to interpret surprise as a situated phenomenon.

2.1 Surprise in the field of design creativity

As already outlined in Section 1, the theme of surprise ranges among the hottest topics in the field of design creativity. It can be claimed that two contrasting views are exposed in the literature with respect to the role of surprise in assessing creativity (Becattini et al., 2015).
On the one hand, surprise is considered a particular nuance (Chiu and Shu, 2012) or degree of novelty, e.g. within Creative Product Analysis Model, a formalized technique to measure artefacts' creativity (Horn and Salvendy, 2006).
On the other hand, some contributions identify surprise as an independent dimension to assess creativity. Whereas a novel product is supposed to show unprecedented peculiarities or performances, surprising items deviate from the trends of evolution drawn in a given industry (Maher, 2011). In this sense, proposals to measure surprise are articulated with respect to the identification of brand new product attributes (Maher, 2010) or outliers in proper curves representing the evolution of performances over time (Maher and Fisher, 2012).
Regardless of the consideration of surprise as a cluster of novelty or as a separate factor in the measure of creativity, the scientific community shares the concept that the manifestation of this phenomenon takes place when individuals see or perceive something unexpected with respect to their knowledge and habits. In this sense, the Product and the Person are the main players in the emergence of surprise, if the Rhodes' (1961) 4Ps are taken as reference set of dimensions of creativity, i.e. accounting Press and Processes of a more marginal role for surprise. The contributions described in Section 1 that see surprise as an emotional reaction plainly individuate the interplay between Product and Person as a basic phenomenon to be investigated.
As a result, the purpose of modelling the processes that lead to infringe expectations has to take into consideration the characteristics of surprising products and the way these features lead to human interpretations resulting in a feeling of astonishment.

2.2 Modelling surprise and interpretations

The ways that the most insightful studies have treated the phenomenon of surprise display can be basically subdivided into three groups:

- design practices to generate unexpectedness;
- investigation of product-related factors that drive the emergence of surprise;
- classification of expectations that are deliberately violated.

The present review will be limited to highlight the most recent findings in these three different branches by benefitting of the outcomes illustrated in three different contributions. As shown in the followings, a significant extent of concepts overlap despite the diversified perspectives and objectives.
Rodríguez Ramírez (2014) investigates the approaches followed by outstanding industrial designers in order to create potentially surprising products. The work shows a set of possible strategies that extends the previous sample of well-defined techniques mainly based on generating visual illusions. New tactics include e.g. the use of shapes, components and physical principles that are commonly attributed to different worlds or industries. Unexpected changes in structures and behaviours range besides into the preliminary cluster of factors that originate surprise according to Becattini et al. (2015). The empirical study performed by the scholars pinpoints also phenomena that cannot be directly related to

technical choices, so illustrating examples of intentions to violate (in a positive or negative way) human expectations related to habits, ethics and aesthetics. With a different interpretive key, Grace et al. (2014) characterize expectations relevant to surprise and creativity according to four ways previous experiences are violated. The scheme is exploited in the field of computational creativity with the aim of assessing surprise with respect to the likelihood of contravening given expectations.
The surprise originated by low-probability events is studied from the cognitive viewpoint by Teigen and Keren (2003). The scholars motivate the emergence of surprise also through contrasts with seeded beliefs or in terms of unexplained perceptual distance between expectations and displayed products or happenings. In this context, in order to correctly model the mechanisms bringing to surprise feelings, critical points stand in the interpretation of past experiences and the representation of conflicts occurring between expectations and actual circumstances. The present research can therefore treasure the findings exposed by Kelly and Gero (2014), who widely investigate, although from designers' viewpoint, interpretations of design activities and expectations based on previous experiences. In order to build a model that highlights the emergence of surprise, the next subsection delineates the main features of the situated FBS framework in order to introduce its characteristic constructs, which are relevant to the main research question.

2.3 The Situated FBS framework

In order to shed light on cognitive processes emerging in design, Gero (1990) introduced the FBS framework. It clarifies how the three ontological categories

- F - Function (what the design deliverable is for, what is its purpose);
- B - Behaviour (how the design deliverable, its structure, works [Bs] or it is expected to work [Be]); and
- S - Structure (what the design deliverable is made of, what it is)

are connected to each other in cognition. In other words, it clarifies how the variables related to these domains evolve along the design process. In this framework, cognitive processes as formulating a design goal (F→Be), synthesizing a solution (Be→S), analysing its performances (S→Bs); evaluating its suitability (Bs←→Be) or reformulating a design variable (S→[F; Be; S]) do not take into account that design is a situated activity. Gero and Kannengiesser (2004) extended the application of the FBS ontology to embrace a situated perspective, so capable of explaining the cognitive process of a designer that operates in a context (the external world) and that internally interprets and build expectations (interpreted and expected worlds), about what is (to be) designed, by means of its memory, which progressively constructs itself in a process of knowledge acquisition. To use Gero and Kannengiesser's own words:

- "The *external world* is the world that is composed of representations outside the designer";
- "The *interpreted world* is the world that is built up inside the designer in terms of sensory experiences, percepts and concepts";
- "The *expected world* is the world that the imagined actions of the designer will produce" (it is part of the interpreted world).

These three worlds together contribute in creating what is called *situation.* In the situated framework, the FBS ontological categories exist in each of the three worlds and the connections among them represents a more fine-grained description of how formulation, synthesis, analysis, evaluation and reformulation occur, together with the role of the FBS variable in the specific world of reference.
These connections highlight that cognition in design, and thus the abovementioned high-level cognitive processes, occurs thanks to a small number of cognitive processes also from a situated perspective. The following three cognitive processes are sufficient to explain what happens during formulation, synthesis, analysis, evaluation and reformulation:

- *Interpretation:* what is sensed in the external world is transformed into a concept rebuilt on the basis of what is perceived;
- *Focusing:* what is conceptualized is then used to create a specific set of goals to concentrate the attention on and thus nurture the emergence of strategies to attain them;
- *Action* or *Transformation:* the generation of effects that aim at perturbing the external world, consistently with the above strategies, in order to attain the desired goals.

The process of evaluation of the original FBS framework is the only one that gets unchanged in the situated framework, since it was already linking variables from two different worlds: the behaviour in

the expected world [Be] and the conceptualization of the behaviour of the structure [Bs] in the interpreted world.
Knowledge, to both interpret the world and create expectations out of it, is to be better referred as *knowing* in situatedness, since memory is seen as a dynamic process and not a static state. Constructive memory, thus, is seen as a process that is close to what was above called interpretation. One builds up meaning about what is sensed and perceived by digging its own knowledge in a push-pull process whose detailed dynamics is explained in Kelly and Gero (2014). The push process is initially driven by the data sensed in the external world and the pull process is driven by the previous or updated expectations that determine the way one interpreted what is sensed. This process, indeed, occurs between the external and the interpreted world, as well as in the interpreted world itself, as a result of knowledge retrieval from previously conceived expectations.
It is worth underlying, once more, that both the original FBS and the situated FBS frameworks are proposed to explain designers' cognition or how they think when they aim at creating new operational solutions. The process of surprise emergence appears to be a situated phenomenon as well, even if from a completely different perspective, i.e. from the viewpoint of the product user. The purpose of the authors, indeed, is to clarify if and to which extent the FBS ontology and the three worlds of situatedness can be used to model the mismatch between the interpretation of the external world and internally preconceived expectations.

3 MODELLING SURPRISE EMERGENCE FROM A SITUATED PERSPECTIVE

The authors here propose a model to describe the emergence of surprise as a mismatch between what is sensed and what is expected. The model adopts the three worlds that characterize a situation: the real external world and the interpreted one of the evaluator/observer, which is further distinguished into the interpreted world and the expected world, which is a subset of it. The observer represents the agent in which surprise might emerge after sensing something. Moreover, the three categories of variables concerning functions, behaviour and structure are considered as well, in order to distinguish potential differences in the facets that characterize and trigger surprise emergence. Both the considered worlds and the FBS variables keep the same meaning recalled in section 2.3, as for Gero and Kannengiesser (2004).
Moreover, the authors postulate hereby which cognitive processes might occur to check pre-existing expectations against what is sensed and interpreted, as it should occur when an observer gets surprised. They can be summarized into three main categories.
First, push-pull processes (1, 2, in Figure 1) through which an observer scans her/his memory and builds meaning out of what is sensed in the external world, so as to build an interpretation of the real one. These processes, as for Gero's situated framework, occur just within the same domain of the FBS ontology. In addition, according to the authors' vision, the push-pull processes of interpretation can occur in the FBS domains in which senses operate; therefore, functions [F], which are abstract representations of object's purposes, cannot be sensed. Their interpretation requires the second and next cognitive process.
Second, within the interpreted world (as well as in the subset of the expected world) a different kind of cognitive process occurs to the conceptualization of what is sensed and perceived to fully interpret it. What is sensed with reference to a certain FBS ontological variable can trigger reasoning by deductive inference (Roozenburg and Eekels, 1995 pp. 70-71) in order to define different kinds of variables of the same sensed entity. For instance, seeing or touching a hole in a water basin [S] might let the observer suppose the water will flow out of it [B]. Therefore, these deduction processes (3, 4, in Figure 1) occur between different domains of the FBS ontology and within the same world. Moreover, there is no preferential direction for deductive reasoning between worlds.
Third, the comparison (5, 6, 7 in Figure 1) between pre-existing expectations and what has been just sensed and conceptualized is the cognitive process responsible of surprise emergence. This process keeps the meaning it has in Gero's framework, where it compares [Be] and [Bs]. However, considering the change of perspective from a designing agent to an observing agent, it is reasonable that the observer can compare also structural variables [S] or functional variables [F] (e.g., miniaturized devices might surprise those who have just experienced standard-sized ones).
Considering the dynamic nature of knowing in a situated perspective, both the deduction (11, 12 in Figure 1) and the push-pull processes (8, 9, 10 in Figure 1) might also occur within the interpreted

world and specifically between it and its expected subset. Indeed, this recalls what happens in Gero's FBS framework: after the comparison between what is sensed and what is expected, the designer might need to reformulate the task on the basis of its updated knowledge. As well, with the perspective of an observer that has been just surprised, the mismatch between interpretation and expectation triggers a reaction in constructive memory that therefore needs to be adapted in order to make the different concepts consistent with each other. In turn, these processes concur in building new expectations (e.g., it is more difficult to be surprised for a second time once surprise emerged in a similar situation).
Figure 1 presents the overall model, whereas, for the sake of clarity, the three worlds have been depicted separately, even if the expected world should be considered as part of the interpreted world.

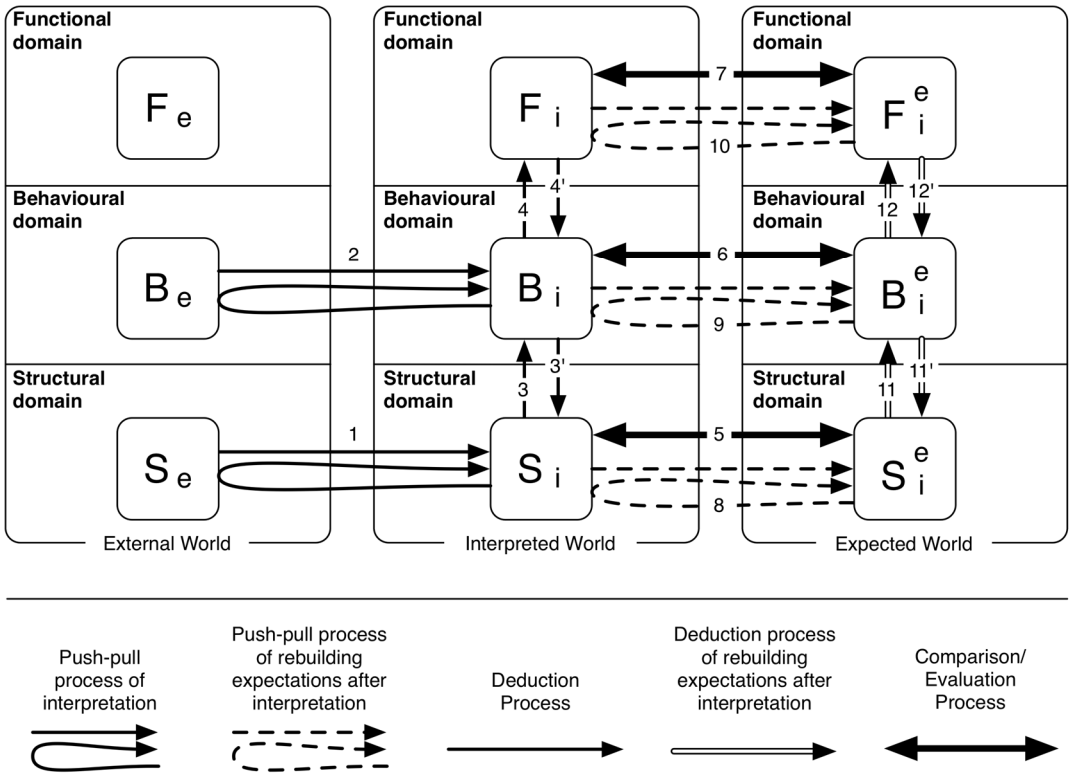

Figure 1. The framework to describe the emergence of surprise as a situated phenomenon and the key of the cognitive processes there considered.

The following section presents three examples of application of the framework to describe the emergence of surprise in a situated context, as a preliminary assessment of its suitability for such purposes.

4 ANALYSIS OF SURPRISE EMERGENCE WITH THE MODEL

This section collects three brief examples of surprising objects that will be modelled according to the above presented framework, thus distinguishing potentially surprising characteristics at the three different domains of the FBS ontology. The description of those variables is carried out purposefully just for the interpreted and the expected world. Indeed, a textual or verbal description of something that is to be sensed is by itself an interpretation which brings redundancy. In order to share at least the visual part of these objects in the external world, the pictures of the three cases are presented in Figure 2.

(a) (b) (c)

Figure 2. Toilet-paper hat (a), the transparent toaster (b), M. Cattelan's "La nona ora" - "The ninth hour" (c)

As already mentioned in Section 3, the observer's viewpoint in surprise emergence requires expectations to be pre-determined according to what has been dynamically elaborated by constructive memory before experiencing and sensing the (potentially) surprising object (or, more in general, entity).
The aim of the following examples is to shed light on what might occur at the cognition level of observers, when the interpretations do not match with preconceived expectations. The cognitive patterns identified in the following examples are not exhaustive; actually, the complete identification of all the potential reasoning steps that might lead to the emergence of surprise goes beyond the purpose of this study that just aims at discussing the applicability of the proposed model.

4.1 The toilet-paper hat

The toiler-paper hat is an odd Japanese invention to let those suffering a cold affection to have ready-to-use paper to blow their nose up. Table 1 collects different FBS variables in the interpreted and expected world that can explain the emergence of surprise.

Table 1. FBS variables in the interpreted and expected world for the toilet-paper hat.

	Interpreted World	**Expected world**	**Potential Mismatch**
Functional variables [F] (related to purpose/intention)	The toilet paper roll on her head is for providing quick help in case she needs to blow her nose up	Toilet paper should be for wiping after a bathroom act	Blowing one's nose up is not a bathroom act.
Behavioural variables [B] (related to the mode of action]	It is not just a strange hat, because she can also take toilet paper strips (the toilet paper rolls over her head)	Toilet paper should be taken from dedicate supports on walls, close to the water closet	The toilet paper can be taken directly from an unconventional place and it is portable (hat vs. support on restroom walls)
Structural variables [S] (what the object is composed by)	A person with a toilet paper roll on top of her head	Toilet paper should be seen in restrooms, or packaged in wholesale shops	Toilet paper appears where it shouldn't be (top of a head vs. restroom)

As shown by the rightest column, surprise might emerge here in the three FBS domains, because of the mismatch between variables in the two worlds. There might also be several patterns of surprise emergence. Among the set of potential cognitive patterns, the authors have identified, among the others: <1, 5>; <1, 3, 6>; <1, 3, 4, 7> (numbers refer to the cognitive processes of Figure 1). The first one reflects reasoning in the structural domain. In the second case, the observer interprets the structure of the toilet paper hat <1> and then deduces its behaviour <3>, which does not match with the expected properties of a hat, nor with a toilet paper holder <6>. In the third example, the structure of the toilet paper hat is interpreted <1> and its behaviour <3> and function <4> are inferred by deduction. Then the comparison with the function of both the hat and the toilet paper roll is mismatching (a hat is not designed to hold a toilet paper roll, nor a toilet paper roll is used to blow someone's nose up) <7>.

4.2 The transparent toaster

The transparent toaster is a device that allows seeing the degree of toasting and preventing over-burnt bread. Table 2 proposes a possible situation of surprise emergence through FBS variables in the interpreted and expected world.

Table 2. FBS variables in the interpreted and expected world for the transparent toaster.

	Interpreted World	Expected world	Potential Mismatch
Functional variables [F] (related to purpose/intentions)	- The two glass walls hold a slice of bread even if there is no apparent purpose behind it; - It is a bread toaster	Two glass walls facing each other should be used as a picture frame	What can be seen as a device for holding photos is actually capable of toasting bread
Behavioural variables [B] (related to the mode of action]	The glass walls are capable of turning the bread surface into something darker than its original state	A slice of bread between two glass walls should remain unaltered or get rotten as times goes by	Glass walls are not usually able of toasting bread surfaces (usually they do not heat things at all)
Structural variables [S] (what the object is composed by)	I see a structure which is made of a support and two parallel transparent glasses	A toaster should have an opaque structure or at least some metallic (non-transparent) heating elements	A transparent toaster should let me see the presence of ohmic heaters, that are, in turn, absent

Potential mismatches between the same FBS domain can emerge in the three cases for the transparent toaster too. Note that if the toaster is not working and there are no slices of bread in it, the observer can just interpret its structure as something recalling a picture frame, without any potential mismatch with the expectations. Among the cognitive patterns potentially involving surprise emergence, it is worth mentioning <2, 6> and <1, 3, 6, 9, 11', 5>. The former follows a straightforward reasoning at the behaviour domain. The latter is more complex and presents a reorganization of expectations by deduction, right after the mismatching comparison. The observer interprets the structure of the transparent toaster <1> and then deduces its behaviour <3>, which does not match with the expected properties of glass <6>. The observer updates his knowledge with the concept that glass can toast bread surfaces <9> and then it can be used as a wall of a toaster <11'>. With this updated knowledge, the observer will be not surprised anymore by seeing two thick and opposed glass walls in a similar configuration <5>.

4.3 Maurizio Cattelan's "La nona ora" (The ninth hour)

This provocative masterpiece by Maurizio Cattelan shows a realistic reproduction of Pope John Paul II under the weight of a meteorite. Table 3 summarizes the potential mismatch between FBS variables in the interpreted and expected world that justifies the emergence of surprise.

Table 3. FBS variables in the interpreted and expected world for "La nona ora" (1999).

	Interpreted World	Expected world	Potential Mismatch
Functional variables [F] (related to purpose/intentions)	The artist might have aimed at showing the great suffering that the man withstood in the last days of his life with a hyperbolic juxtaposition	A religious authority should not be used for artistic purposes	It is shocking to see a religious authority in a hyperbolic and unreal situation out of his context
Behavioural variables [B] (related to the mode of action]	The Pope is oppressed by the large mass of the meteorite but withstands it	A meteorite crash causes an explosion and a large crater; those hit by a meteorite die	No one can survive a meteorite crash but the pope seems to have supernatural powers
Structural variables [S] (what the object is composed by)	A (former) Pope is laying and a meteorite is on his legs	A meteorite should be seen in the space. A Pope should not be close to a meteorite	The combination of elements is very unlikely

This is the most critical example to be interpreted with the proposed model, because the interpretation of the purpose (i.e. the message) of such a piece of art still remains open and very subjective. This said, and given the proposed interpretation, surprise might emerge also in this case at the three FBS domains. Especially in this case, it is questionable where the deductive process that defines the

functional variable starts. Whether it should be mediated by the definition of a behavioural variable or it can originate from a structural one. These reflections will be further discussed in the next section.

5 DISCUSSION AND CONCLUSIONS

This paper presents an original research to define a model capable of mapping the situated cognition underlying the emergence of surprise in an agent that acts as an observer, potentially as an evaluator. The purpose is to propose a model capable of clarifying the phenomenon of surprise, so as to improve the understanding behind it and nurturing further studies capable of supporting the definition of guidelines or strategies for designing surprising products.
Moreover, in parallel with the recent evolution of techniques to record and map emotions with biosensors in product evaluation sessions, a model characterizing surprise emergence would be needed to properly support those investigations from the perspective of cognition. The model works under the assumption that surprise emerges when reality (what is sensed out of it) does not match the observer's expectations, consistently with contributions from literature.
In order to discern the different nature of expectation mismatches that can trigger surprise, the model relies on some of the main constructs of the situated FBS framework by Gero and Kannengiesser (2004). It also embeds an originally reconsidered set of cognitive processes capable of explaining the emergence of surprise in situatedness.
The authors have applied the model to a number of surprising products, such as those mentioned in (Becattini et al., 2015). The results are encouraging: the model allows displaying different ways of surprise emergence for the same object under the evaluator's attention and no specific deficiency of representation arose.
The paper has experimented the model through three examples related to three very different surprising objects: a crazy "invention" (i.e., the toilet-paper hat), a technological innovation radically different from the ordinary products delivering the same function (i.e., the transparent toaster) and a controversial piece of art, which, beyond likes and dislikes, certainly triggers surprise (M. Cattelan's "La nona ora" - "The ninth hour"). As already mentioned, the validation consisted so far only in verifying the capability of the model to represent the way surprise emerged in authors' mind the first time each of them observed the surprising object. Indeed, the variables and processes of the proposed model have suitably represented all the explanations given to describe the arousal of surprise.
However, some issues still require further research. Among the others, the authors never met so far a surprising object such that the observer's reflections directly connect functional and structural variables. This is compliant with the design process from functional to structural variables, but needs to be further checked also in the perspective of an observer facing a new object.
Besides, once the model will be considered robust enough for its purposes, the authors intend to use it to map and analyse the experimental behaviour of users in field tests, e.g. in the preliminary marketing campaign of new consumer products. The ultimate goal is to codify the mechanisms behind the stimulation of surprise and to identify the traits that prompt wonder, amazement, astonishment or curiosity into users.

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