E-commerce and Web 3D for involving the customer in the design process: the case of a gates 3D configurator

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ABSTRACT
This paper aims to show to what extent the Web3D is an advantage for Living Lab paradigm. A state-of-the-art of Web3D solutions for e-commerce enabled us to select the most suitable functionalities and properties for designing a gates 3D configurator for person from the general public. This project was done in the context of an Action-Research. Twenty seven participants evaluated this tool. Results show that an interactive 3-dimensional visualization of the object is an advantage for the sale, because a single image does not usually allow user to imagine the product in its future environment. The use of Web3D for e-commerce gives the customer the ability to get involved in the design process. This point is a first answer to a research question on the role and definition of Living Labs.

Categories and Subject Descriptors
H.3.5 [**Information Storage and Retrieval**]:On-line Information Services – *commercial services, web-based services.* H.5.1 [**Information interfaces and presentation**]: *Multimedia Information Systems* – artificial, augmented, and virtual realities, evaluation/methodology. H.5.1 [**Information interfaces and presentation**]: *User Interfaces* – graphical user interfaces (GUI), User-centered design. J.7 [**Computers in Other Systems**]: Consumer products.

General Terms
Design, Economics, Experimentation.

Keywords
Internet, e-commerce, Web3D, Living Lab.

1. INTRODUCTION
1.1 Motivations and scientific interest
Living Lab is an emerging paradigm for fifteen years and supported by the European Commission. Their objective is to engage communities of users as soon as possible in the cycle of R&D projects to co-create, explore, experiment and evaluate services, products or new uses before the realization phase. Their particularity is their strong participatory: the end-user, for whom the new product (or service) is built, is implied in the early stages of the design process, and needs are taken into account throughout the project.

Analysis of information sheets of Living Lab[1] shows that online social networks, permanent high speed Internet, show cities and Virtual Reality are the main means used to facilitate this participatory dimension. Therefore, we assume the E-commerce associated with Web3D technologies facilitates the engagement of customers in all phases of the life cycle of a product from the design to the pricing, through the promotion and the distribution.

After the "Web 2.0", we talk nowadays of "semantic web", described by some authors as "Web 3.0". The latter is characterized by a definition and a structuring of information and services, making possible to answer to any request from users and machines [1]. The web behaves as a large and global database [2]. This new dimension pairs with new technologies or more specifically new informational contents. Thus, the third dimension, which is already very common in our daily applications, is actively supported by the Web3D Consortium[2]. The web is transformed gradually into a set of interconnected 3D spaces [3]. In accordance with [4], it is possible to consider the Web3D as real time 3D (also known as Virtual Reality[3]) broadcasted on non-immersive systems (personal computers) via the Internet medium. The term "immersion" is defined here as the objective and quantifiable description of the degree (e.g., completeness) wherewith the system interface controls sensory input for each modality of perception and action [5, 6]. Even without the immersive aspect, users may still have a feeling of presence in the virtual environment [4]. With the technologies associated with Web3D, users can live new experience. The major advantage of the Web3D is the same functioning as the "classical" web that is a complete independence from the platform: it requires only a standard computer and sometimes a plug-in for the web browser [7].

Thus, if the Web3D has been standardized for several years, the size of files to be exchanged was not compatible with the low speed Internet connections. VRML (Virtual Reality Modeling Language) has become de facto a standard. Today, thanks to the prevalence of broadband or even FTTH (fibber to the home) connections, web can broadcast 3D content. To unify the

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[1] Sheets are downloadable on: www.openlivinglabs.eu/livinglabs

[2] http://www.web3d.org/

[3] Virtual reality is the generation of 3D entities that interact in real time and change according to user behavior [15]

innovations in the field of Web3D, the Web3D Consortium was created with the aim of achieving the specifications of information formats on Web3D and especially the evolution of the X3D format, which is recognized by ISO (Extensible 3D, the successor of VRML language for describing 3D virtual world) [8].

Web3D allows a wide access to benefits and interest of the third dimension. The application areas are in fact very large: learning [9], e-commerce, simulation [10], education, with for example virtual visits of museums, cities and virtual exhibits [11], virtual communities (e.g., Second Life). [12] presents a comprehensive and illustrated taxonomy of these applications. The collaborative and participatory dimension, for example in design activities, can also be greatly facilitated [13]. Now, there are many software solutions allowing distribution of 3D content through the web. For example, 3D application layers are available for the Flash format (e.g., away3D - www.away3d.com). These software solutions also simplify the export of 3D models and environments from professional software to Web environments [14]. The transition from a 2D environment to a 3D environment is not obvious, especially in the case of web solutions where users have no device other than the traditional keyboard / mouse. Interaction techniques have to be adapted to 3D interaction / navigation, as shown in [12] in their comparison of Web 2.0 and Web3D.

The potential of Web3D is important in the field of e-commerce. The third dimension allows users to manipulate, view, or even configure / customize the products they are interested in, as they would do in the real world [16]. Economic perspectives are important: in 2006 it was estimated that over 19% of purchases were made online through e-commerce sites [17]. In [18], authors believe that a platform of e-commerce "*brings advantages to both suppliers and buyers, regarding [...] the use of automated supply procedures, economies of scale, wide access on both local and international markets, dynamic real-time price mechanisms/modules*". However, these benefits could be obtained only through careful design of the website, with a balance between content and functionalities.

The issue of designing and evaluating (from a scientific viewpoint) an e-commerce platform has already been widely discussed in the literature in the case of common products for the general-public [4, 18]. Yet, few efforts have been focused on the contribution of the third dimension in response to the needs of manufacturers for specific products in the field of e-commerce.

1.2 Action-Research in the context of an industrial project

The work reported here aims to give key elements regarding this issue. The context was an Action-Research[4] conducted in the framework of an industrial project initiated by the firm "Groupe Maine", specialized in the extrusion of plastics and PVC profiles. To optimize the management of orders and respond quickly to customer needs, the company made (under AutoDesk Inventor) a parametric model of portal for each range, namely 5 parametric models. This company wants to overhaul its orders management system to provide optimum service to the customer (the buyer of the portal) by allowing him to make his order directly online (currently the customer must speak to a rep). Using parametric models, the user should be able to achieve its own configuration and get the 3D model of the portal suitable for his project. Finally, he will be able to view "his" portal in its future environment, using a picture of his house or his building for example.

The actions realized in this project contributed to the design of a gates 3D configurator which was the support of the empirical study described in this paper. From this work, we also aimed to produce scientific knowledge about the use of Web3D technologies in the industrial field. To sustain this issue and in comparison with previous works, we propose to evaluate a solution dedicated to online sales. After the evaluation, we will be able to define the advantages of the designed Web3D business solution. And thus to provide recommendations for the design of platforms of e-commerce offering advanced features and a high support of the third dimension.

1.3 Objective and paper organization

The aim of this paper is therefore to illustrate the interest of Web3D technologies for a Living Lab paradigm, through a concrete design case of an e-commerce 3D platform allowing gates setup and customization. Through a technological and competitive benchmarck (i.e. the comparative presentation of competing or similar solutions) and the needs of the backers, we selected all the features we have implemented in the functional demonstrator. This one serves as support to the experimentation that we conducted on 27 participants, to assess the interest of 3D modelling in an online commerce site concerning the implication of customers in the sale process. This first experiment does not consist to compare our demonstrator with existing solutions, and it does not intend to evaluate the usability in depth.

The article is structured as follows. In the next section, we describe and compare, according to different criteria, the existing solutions using Web3D technologies in the field of e-commerce and more generally the solutions for viewing and / or exchange of 3D models. The results of this comparison are used to design our application of e-commerce of gates. Features and properties of 3D configurator are presented in Part 3. Section 4 describes the issue we want to answer and the experimentation that we conducted for this purpose. The results, presented in Section 4, are discussed in Section 5. We conclude this section by a summary of results and the perspectives they offer, especially in the field of co-design and more specifically in the field of Living Labs.

2. DESCRIPTION AND COMPARISON OF EXISTING SOLUTIONS

2.1 Description of existing solutions

Several e-commerce solutions exist for the general public and have relative advantages. We propose a comparison of a selection of these solutions in order to present the advantages and disadvantages of each, according to three criteria: the functionalities (e.g., printing, 3D manipulation), non-functional properties (e.g., ease of use) and technical solutions (e.g., Away3D + Flash). From these three criteria we will be able to assess the commercial interest of each one. Among these applications, some have a common a view that augments the real environment of the user by adding a product 3D model.

[4] For a discussion on Action-Research, see [19]

2.1.1 “Cadiou” solution

Cadiou[5] allows customers to configure and view their portal *in situ* using a Web3D application. The client can as well obtain a 2D visualization of the gate in a chosen environment (Figure 1) or in a 3D artificial representation (Figure 2) exported to a *PDF* document (PDF 3D).

This solution provides concrete 2D and 3D views of the gate selected (and sized) by the user. This application uses the solution from *Batitrade* which combines *Flash* environment and a 3D engine. It is directly usable by the client to obtain a quote related to the configuration created. Nevertheless, the 2D models obtained are only a distorted picture of a generic portal. The environment can be modified by importing a photo of the customer's home. The 3D PDF document corresponds to a standard scenario: the user does not visualize its portal but a 3D object taken from the catalogue in a virtual environment. The emphasis is placed on the fidelity of the 3D model, but it is impossible for the client to view the portal on its future site of installation.

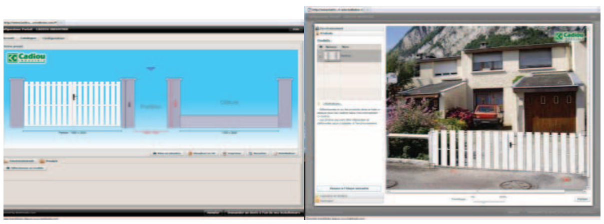

Figure 1. “Cadiou” configurator with 2D results

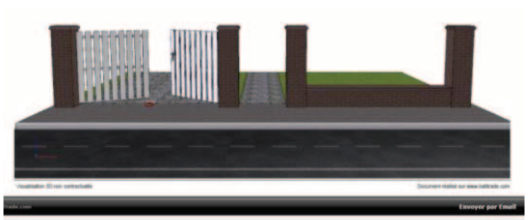

Figure 2. “Cadiou” configurator with 2D results

2.1.2 “Lapeyre” solution

Lapeyre[6] solution offers a preview of 2D objects superimposed on a 2D environment. Figure 3 shows the user interface. This application uses the *Away3D* engine associated with the *Flash* environment.

Figure 3. Lapeyre configurator with 2D superimposition

[5] Cadiou gates configurator: www.batitrade.com/appsBT/site.php?hash=511917bd9d842d18509cd5c06f2fc3d6&referer=http://www.cloturesdiroise.com/

[6] Lapeyre gates configurator: http://ns0.bolero.fr/lapeyre/prod/amenagementExterieur.html

The main advantages are the efficiency of the application, the simplicity of the interface and the realistic visualization. Moreover, it is possible to dynamically change the color and size of available gates and doors. On the other hand, the application needs to be improved because of its slowness and its low reactivity, whereas it is only a 2D visualization. This application allows the user to visually assess the rendering of its portal and its installation in front of his house.

2.1.3 “But” solution

But[7] solution offers a preview of 3D objects in a 2D environment. Figure 4 shows the user interface. The technical solution associates Java runtime environment with OpenGL for 3D.

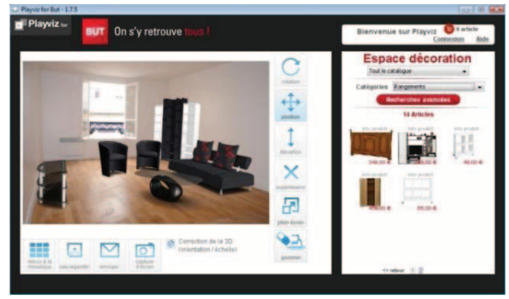

Figure 4. But configurator in augmented reality

The advantage of this solution is the management of the depth: it is possible to add 3D models (i.e. furniture) superimposed on a 2D environment (i.e. the client environment). However, installation of the plug-in imposes a long execution time on the user. Furthermore, this application does not allow users to customize the product offered by the store.

2.1.4 “Homestyler” solution

Some solutions allow users to fully configure a home online (i.e. Autodesk Homestyler[8]). From a plan of an empty environment, users can add walls, doors, windows, appliance and furniture (Figure 5). Once the house or apartment is fully configured, it is possible to visualize it smoothly. Finally, users can share their modelling with friends and family (by email, *Facebook* or *Twitter)*. The configuration can first be made in 2D on a plane (top view), and then viewed in 3D. This application uses the *Away3D* engine associated with the *Flash* environment.

Figure 5. HomeStyler: 3D configurator of interior fitting-out

[7] But configurator: www.but.fr/animations/realite-augmentee.html

[8] Homestyler configurator: www.homestyler.com/designer

2.1.5 Tracepart and Content Central websites

Some solutions are non-commercial or less oriented to direct sales. These ones are related to CAD (Computer Aided Design) field, where it is possible to view and download 2D and 3D parts (for free or not). These sites are *Tracepart*[9] and *Content Central*[10] from Dassault Systems. The application *Tracepart* is developed with the Java environment; *Content Central* is developed with Viewpoint media player.

Figure 6. Tracepart and Content Central websites

2.1.6 "Sketchup" solution

Other sites and solutions concern the sharing of 3D models. For example, Google offers a library of 3D models for its *SketchUp*[11] solution. Like the previous examples, this large database offers 3D visualization before the download of the model (Figure 7).

Figure 7. Sketchup object

2.1.7 Zoomlion website

Finally, some websites allow only visualization of 3D objects, which is out of our scope. These visualizations can involve multiple areas such as Zoomlion[12] website (i.e. works sector). This website allows to visualize construction equipment (excavator, bulldozer ...) online (Figure 8). This site is characterized by its high framerate.

Figure 8. Zoomlion website

[9] Sharing site of CAD elements: www.traceparts.com/fr

[10] Sharing site of CAD elements: www.3dcontentcentral.fr

[11] Sharing site of graphic design parts : sketchup.google.com/3dwarehouse/?hl=fr

[12] Sharing site graphic design pieces: web.icm.cn/zoomlion/case.htm

2.2 Comparative evaluation of existing solutions

Table 1 provides a summary of the more interesting applications relatively to our objective: In this table, ★ represents very bad, ★★ represent bad, ★★★ represent medium, ★★★★ represent good and ★★★★★ represent very good.

Table 1. Comparison of web3D solutions for commercial purposes

Solution	2D or 3D	Properties	Engine	Mark
Cadiou	3D and allows disposition of the gate (3D PDF or 2D superimposition)	Explicit visualization Concrete interest	Batitrade (Flash)	★★★★★
Lapeyre	Only 2D	Explicit visualization Concrete interest	Away3D (Flash)	★★★★
But	Concrete 3D perception	Weight use Limited interest	Java3D	★★★★★
Homestyler	Excellent 3D visualization	Long loading time Limited interest	Away3D (Flash)	★★★★

For a more detailed taxonomy of 3D formats and API dedicated to the web, the reader may refer to [20] and [21].

3D provides a very interesting gain but requires more resources and increases load time. Via the Internet, 3D visualizations may have a lack of fluidity. This results in a small gain for the user because features and potentialities of the third dimension are not in line with marketed products. Moreover, adding a new dimension to representations must be made with special care. In fact, according to [22], cognitive abilities (especially spatial skills) are a major factor of inter-individual differences. Designers should keep in mind to target the largest audience especially as we make an e-commerce application, that is to avoid penalizing users with low cognitive abilities, : we clearly situate in a compensatory strategy [23], in the sense that we want to weaken the impact of inter-individual differences.

It is necessary to develop an application using the advantages of the solutions listed above without their drawbacks. Firstly, our application has to offer the same framerate and the same quality as classical software running on a computer. This implies a light and optimized application. The application have to allow the user to choose a model and its design and then to visualize the product in its "future" environment. Finally, the application must provide a cost estimation of the final product taking into account the personalized configuration. As demonstrated before, no solution brings together all of these features. Moreover, to our knowledge, no research work was focused on demonstrating the value of this kind of platform of e-commerce. In addition to our research question, the review of the existing solutions allowed us to define all the properties and functions of the gates 3D configurator for *Groupe Maine* Company.

3. FUNCTIONNALITIES AND PROPERTIES OF THE GATES 3D CONFIGURATOR

The configurator developed for online sales of Group Maine's gates is compatible with the most common browsers (Internet Explorer, Firefox, Chrome, and Opera). It was realized with

Unity3D software which allows to create web applications in 3D dimensions. Figure 9 shows a 3D model of the product that the user has selected, sized and positioned in front of a customizable image that corresponds to the environment where it will be placed in the real world.

Figure 9. 3D Configurator of gates of Groupe Maine in a predefined environment

Figure 10. 3D Configurator of gates of Groupe Maine: an environment imported by user

The user can access to the interface via its personal login and password and see the product for which he requested a quote. The user can change the environment by choosing an environment among those predefined or by importing a personal image via the importation form at the bottom of the page. Finally, the user can drag and drop the product in its environment and then finely position (rotation and depth) the gate through the scroll bars. The user can also change the colour of the gate.

For our configurator, we choose the solution of a 3D model superimposed on a picture rather than real situations. Even if the second category allows to obtain a good size, a correct position, and a proper measure, it has two major drawbacks. Firstly it is more difficult to personalise the environment of the gate (house, trees ...) with a 3D model which is generic by nature (the case where the user has a 3D model of his house is quite rare). Secondly, having a photorealistic 3D model of a house and its environment could cause problems regarding real time rendering, especially with online applications.

In the following section, we present methodology and results of the empirical study based on the evaluation of the gates 3D configurator.

4. EMPIRICAL EVALUATION

4.1 Objective

The objective of the empirical study based on the configurator we developed is to show that providing 3D visualization of products is an advantage for the implication of customers in the sale process.

We assume that the use of a Web3D application with a high fidelity model (close to the real object) allows a better visualization for the customer than the current 2D solutions (VD1) and encourages the purchase (VD2). The two operational assumptions are:

- a web3D application allows to improve the visualization of a product (VD1) on Internet;
- a web3D application allows to encourage the purchase of a product on Internet (VD 2).

To assess these two operational hypotheses, we ask participants to use and evaluate a gates 3D configurator during a “normal” session as if they want to configure their “own” gate. The session aims to explore all the functionalities of the 3D configurator we developed (for Groupe Maine): moving the product, changing its colour, customizing the background image and uploading a personal photo.

4.2 Methodology

4.2.1 Participants

This study involved 27 participants, 12 women and 15 men, aged between 15 and 50 years (average = 24.6 years; S.D. = 9.75 years). The profiles of participants have been defined according to their skills in computer science: all people use computers every day but were not systematically initiated to interactions with 3D objects. Participants are representative of target users. Table 2 summarizes participants’ profiles.

4.2.2 Equipment

The equipment was made up a computer, a monitor, a mouse, a keyboard and a web access (8 Mbit/s). We provide the participants with a web browser compatible with the needed plug-in (i.e. Unity Web Player). Identification questionnaire and the evaluation questionnaire of the configurator were used to elicit profile and preferences of the participants.

4.2.3 Data collection

Participants were completely autonomous. Time was not limited but the recommended minimum time was 2 minutes. The experiment took place in a unique, isolated and quiet room at Ingénierium - Arts & Métiers ParisTech in Laval. Participants were able to visit to the website through the computer at their disposal. In addition, participants could take breaks and stop the activity as they wish.

At the beginning of the experiment, participants were provided with two documents: a questionnaire for identifying their profile, and a document which presents the experimentation and some general guidelines related to the task to achieve. The experimental time was not directly taken into account in data analysis. However, to obtain an estimation of the necessary time to achieve the task, we note the start time and the end time of achievement task (and the potential breaks).

We invited users to explore the various functionalities offered by the application: moving the product, changing its colour, customizing the background image and uploading a personal photography. To simulate a real situation of use, we told each participant that the product was already custom-built and quoted. Thus, participants must access the command through an identification phase with provided login / password.

At the end of the experiment, each participant must complete a questionnaire used to elicit his comments and subjective preferences on the application. These answers were the basis for our qualitative analysis concerning the contribution of Web3D for online purchase.

4.2.4 Collected data

Collected data were 27 filled in participants' identification questionnaires and evaluation questionnaires. The data were composed of answers to yes-no questions, measurement of execution time and participants' commentaries.

4.2.5 Quantitative and qualitative analysis of data

Quantitative analysis of data was performed using standard descriptive statistics (e.g., mean, percentages). Qualitative data are used only insofar as they illustrate, support and explain the statistical results.

4.3 Results

4.3.1 Participants habits

Table 2 summarizes the habits of participants. We observe that online shopping sites are widely used because more than half of the participants have a regular practice. These results are consistent with those related in [17]. In the evaluation questionnaire, participants indicated that shopping on the web is "*quick*", "*accessible*", "*often less expensive*" and "*allows [them] to find products not available in traditional stores*". However, the lack of security of some web sites and the inability to touch or try the products explains why that this way of buying is still not predominant today.

Table 2. Profiles of participants (1 = never; 2 = once a quarter; 3 = one a month; 4 = once a week; 5 = almost everyday).

Questions	1	2	3	4	5
Do you use a computer?					100%
Do you play with 3D games?	11%			44%	45%
Do you use CAD or computer graphics software?	34%	11%	22%	22%	11%
Do you use tools to create 3D interactive scenes?	44%	11%		33%	12%
Do you buy products online?	11%	34%	22%	33%	

	Yes	No
Have you already seen or manipulated 3D objects on internet?	22%	78%
Have you already seen your purchases in 3D on e-commerce web site?	78%	22%

We observe that a great majority of participants have already used 3D applications, and that 3 out of 4 participants have already viewed a 3D object on Internet. The Web3D is already a reality; however few participants have reported its use in the field of e-commerce.

4.3.2 Ease of manipulation of 3D objects

During the discovery of the application, we observed that participants found easily the different functionalities: identification and access, positioning, choice of colour, depth moving and customization of the environment. It was quite natural for them to manipulate 3D objects and interact with the environment around the product. The literature also shows that the third dimension allows a better spatial representation and makes navigation operations easier. In addition, studies have demonstrated that a 3D representation can improve significantly spatial memory [24]. That may be interesting, for example, in the case of 3D virtual shops, compared to classical websites.

Figure 11 shows the distribution of time required for positioning the 3D gate in front of the environment composed of a house photography previously downloaded by the user. To achieve it, without assistance from the experimenter, the participant had to perform the insertion of the image file of the house, adjust the gate and move it in depth. The distribution of the time is very large because of the disparity of participants' profiles (see Table 2) according to their experiences with 3D games, CAD software, virtual reality software, e-commerce websites based on 3D objects.

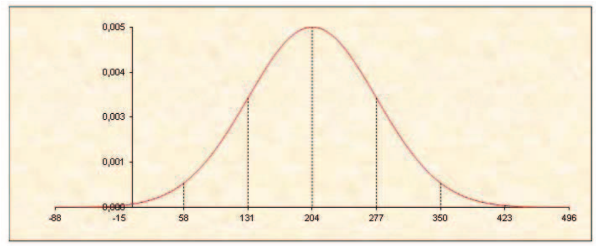

Figure 11. Distribution of time needed to explore completely the application (seconds)

Participants needed an average of 3 minutes 34 seconds to correctly position the product in the environment of their choice. All participants found the Web3D application intuitive and easy to use (100% of the participants). The Web3D technology seems to be easy to grasp by the user.

4.3.3 Advantages of web 3D on e-commerce

We wanted to know if the Web3D presents an advantage or not for e-commerce. Table 3 summarizes the participants' answers to questions about the association Web3D and e-commerce.

3D visualization provides a distinct advantage to the buyer according to participants, because 89% of them position themselves favourably. The answers to the questions presented in Table 3 also suggest that a simple static visualization is not enough: 89% of the participants judged that interacting with the 3D object is important. Moreover, if the manipulation tasks can be enough for standard products (clothing, Hi-Fi product, etc...), more complex tasks are necessary when the users have to insert virtual products into their "future" environment. The designed prototype offers an easy way to perform allows this kind of interaction. The online sale is less used than the traditional sale because products cannot be physically manipulated. Having a quasi-real view of the object is an advantage for sale. Several participants suggested visualization similar to reality.

Nevertheless, the Web3D does not seem to be absolutely necessary for Internet users. Indeed, only 2 out of 3 participants think that 3D visualizations for online sales are required. On the other hand, users said that "*3D visualization has the advantage when objects could be placed in a chosen environment*" (a kitchen, a gate or clothing). For basic products such as food or simple and common products, an image is enough and 3D representations seem to bring nothing more.

Table 3. Questionnaires on the contribution of Web3D

Questions	Yes	No
Is the possibility of 3D interaction is important for the buyer?	89%	11%
Does a 3D visualization of the product (and not an image) is a plus for the buyer?	89%	11%
Does 3D visualization for sale online is necessary?	67%	33%
Does the Web3D improve the view of the product?	89%	11%

5. DISCUSSION, CONCLUSION AND PERSPECTIVES

This empirical study highlights some of the advantages of the Web3D for e-commerce. We confirm the hypothesis that the use of a Web3D application with accurate 3D models allows better visualization than current Web3D solutions and encourages the purchase. These results are in line with observations of [4]: in the case of e-commerce, the third dimension "*allows people to visually assess product performance and aesthetics prior to purchase*". This first "augmented" contact with the product tends to reduce the perceived risk before buying [25]. Nowadays, it remains important to configure / customize the desired product(s) using sale-commerce web sites. The configuration of its own product is also seen as a major component of success in terms of financial performance and productivity [4]. These configurators are in full expansion as illustrated in Section 2. We can strongly suppose that the sale of products which have to be integrated in our personal environment will soon be exclusively proposed in 3 dimensions. In [7], authors have mentioned that virtual environments dedicated to learning make users more curious, more interested and more joyful. Our study suggests that these benefits can be transferred to the field of e-commerce, with an ability to attract new customers [20]. However, it would have been relevant to conduct a comparative study with other existing web sites to better position the contribution of our 3D web configurator.

Thus, the use of Web3D on E-Commerce will assign the customer a strong capacity to get involved in the design process. This feature is compatible with the Living Labs approach. In this paper, we showed that the Web3D for e-commerce is a perspective that remains to be explored to better integrate the users in a participatory way, that is to say to involve them in the decisions making process about the transformation of the artefact [26] and the definition of its usefulness [27]. Research works like [13] are a first step in this direction by illustrating how to go to a simple configurator to a user-centred design tool. From an industrial point of view, this configurator is a continuation of the website "LaFraise.com" which allows the creation of virtual t-shirts, and of Fiat and Ferrari which allows their customers to evaluate the designs of vehicles representing the future evolutions of the brand.

A drawback of e-commerce sites is the absence of the feeling of presence, especially in the case of products which are generally sold exclusively through shop assistants. Another perspective of the study concerns the addition of avatars to guide the user through the configuration of the portal as avatars have the advantage of introducing a social dimension [7].

Finally, the area of augmented reality opens new and promising perspectives. Emerging technologies such as smartphones and digital tablets like "iPad" are increasingly used to surf on the internet and are featured with at least one camera, which makes them ready for augmented reality applications. Currently, we find lot of applications coupled with GPS, as for example helps in finding shops or restaurants in the street by adding contextual information to the real environment. Moreover these devices could extend the uses of such web configurator to an in situ gates' configuration. The remaining problem is to develop robust and simple to use markerless solutions compatible on one hand with internet constraints (bandwidth) and with low computation capabilities of mobile platforms on the other hand.

6. ACKNOWLEDGMENTS

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