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Product Presentation Strategy for Online Customers

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Abstract: This paper deals with customers' behavior in an online environment. The major hypothesis of this paper is that different online product presentation strategies have a different impact on the customer's choice and that this impact can be measured. The research was conducted using an experimental method based on 6 product groups of 8 products per group. The products were presented with different combinations of several audio and visual elements: text, picture, video, animation, speech, special sound, and background music. The impact of each combination on the customer's choice was tested on a customer sample of 46 examinees. The most important conclusion is that besides text and a picture of the product, it is highly recommendable to include a video of the product in the product's online presentation. Regarding the number of multimedia elements, it is better to include more than less elements in a product presentation on the Internet, in contrast to some findings in connection with e-Learning.

Key Words: Online product presentation, e-commerce, multimedia presentation
Categories: H.4.0, J.4, K.4.2, K.4.4

1 Introduction

This paper belongs to the specific field of research of online customer behavior. This behavior is directly affected by perception of the online environment, or the e-commerce website [Mandel, 02]. Thus, for an online store, the most important thing, apart from what it offers, is the manner in which the offer is presented on the website [Chau, 00].

An e-Commerce environment is characterized by the limitation of the stimulus channels to only visual and audio ones, unlike traditional stores where a customer's experience can also include touch, smell, and taste. Despite these limitations, online environments can provide a rich sensory experience [Kim, 02] through an appropriate

mix of visual and audio elements in the online multimedia product presentation. Multimedia messages also have an informative character and can create awareness and attitudes that lead to a single product choice among all the others [Pavlou, 00]. This reflects the fact that it is necessary to find out what the optimal multimedia combination is in order to accomplish effects such as informative and sensory-rich product presentations that trigger customers to make a purchase.

The authors of this paper consider multimedia content as content that requires multiple senses for processing stimulus, or the use of multiple channels for transmitting messages [Marmolin, 91]. When creating an online multimedia product presentation, the following visual and audio elements are available: (a) text, (b) picture, (c) video, (d) animation, (e) speech, (f) special sound, and (g) background music. In order to carry out a comprehensive study, the authors included all seven of these elements in the research presented in this paper. The main goal of this research is to find out what the optimal multimedia presentation is and to adapt online content, in order to improve customers' perception of the product. The obtained results will serve for further research into the dynamic display of these basic elements in a multimedia presentation, such as flashing, pop-up, mouse-over, moving, and scaling elements.

The organization of the paper is as follows: the problem statement is presented in the next section, followed by the theoretical background and research questions. The research methodology and the details of the conducted experiment are presented, followed by a presentation of results and discussion thereof. The paper concludes with a discussion of the implications of the study from both an academic and managerial perspective and recommendations for further research directions. The list of cited references is provided at the end of the paper.

2 Problem statement

The way a product is presented is one of the most important issues of an online store. The product can be presented in many different ways combining visual and audio effects that are related to Internet medium [Jovanovic, 08].

Most professional and user populations agree that the best product presentations are those which contain multimedia content. It is logical that not all multimedia presentations have the same effects, but none empirical study was found to show which multimedia combination was the most suitable for online product presentation.

Considering different possibilities for an online multimedia product presentation, two issues are particularly important: (1) the number of visual and audio effects and (2) the combination of visual and audio effects. These two aspects will be discussed in the following sections.

2.1 Number of visual and audio effects in multimedia product presentation

In the available literature there are two opposite opinions on the number or amount of visual and audio elements that have a positive impact on users. One group of authors believe that increasing the amount of visual and audio effects presented to a buyer at the same time, within an online product presentation affects the buyer's ability to absorb all the information presented in a single product presentation [Malhotra, 84].

Adzic et al. stated that the relationship between physical and semantic information is not linear or proportional [Adzic, 11]. This means that when increasing the amount of the information presented to a buyer within a product presentation, we cannot indefinitely increase the semantic value of the presentation. This means that the introduction of visual and audio effects increases the multimedia experience and quality of presentation to a certain point, but excessive use of visual and audio effects, adversely affects the buyers concentration and can overload their operating memory.

The other group of authors, among them Jacoby, suggests that it is impossible to overload the customers, because they approach the information offered selectively [Jacoby, 84] and they choose which information to absorb and which to ignore.

2.2 Combination of visual and audio effects in multimedia product presentation

According to their characteristics, all media effects can be classified as shown in Table 1. All the elements in Table 1 are considered in this study as components of the multimedia presentation of the product, not as products per se (e.g. a picture itself may be a product that is sold in an online store, or can be a photo of a product, which is used to depict that product).

<table>
<tr><th></th><th colspan="2">Informative</th><th>Additional</th></tr>
<tr><th></th><th>Verbal</th><th>Nonverbal</th><th></th></tr>
<tr><td rowspan="2">Visual</td><td rowspan="2">Text</td><td>Picture</td><td>Animation</td></tr>
<tr><td>Video</td><td></td></tr>
<tr><td rowspan="2">Audio</td><td rowspan="2">Speech</td><td rowspan="2">/</td><td>Special sound</td></tr>
<tr><td>Background music</td></tr>
</table>

Table 1: Media effects classification in online multimedia presentation

Categorization in Table 1 is in accordance to Chen and Wells categorization of online content dimensions on informativeness, entertainment, and organization [Chen, 99]. Informativeness is a common category, entertainment is analogue to additional effects, and organization is not relevant to this context, because the entire web presentation is not considered here, but only presentations of individual products.

Informativeness is a common category, entertainment is analogue to additional effects, and organization is not relevant to this context, because the entire web presentation is not considered here, but only presentations of individual products.

There are tens of possible combinations of visual and audio effects in a multimedia product presentation on the Internet and it is not enough to say how many visual and audio effects make optimum for an online product presentation. To gain an optimal multimedia presentation, informative and additional effect, both should be included. Presentations that are informative, but do not provide a sensory experience to the buyer, or are visually and audio well-designed but do not provide sufficient information, in most cases will not lead to the desired goal, and trigger customer for the purchase of the products [Jovic, 11].

Combining these elements should also be observed through the context of the channel by which the customer receives a message - audio and visual channel. Thus

when creating a multimedia product presentation, it should take care that both visual and audio elements are represented.

3 Theoretical background and research questions

The authors of this paper are not aware of any existing classification of previous research on the impact of multimedia presentations to customers in an online environment. This is probably a consequence of the fact that this is a newly emerging field which has not yet matured to the level which enables an effective categorization to be established. One of the possible ways to classify some previous research in this field is according to the general attitudes to various visual and audio effects in the online environment offered to the customer.

One group of authors considers that delivering a message in multiple modalities simultaneously makes the cognitive process and information processing more complex and difficult [Christopher, 84, Lang, 00, Milenkovic, 00]. According to this view, the capacity for processing and storing information is limited and multimedia messages lead to spending much of the capacity on the processing of information at the expense of their storage. This implies that the addition of various visual and audio effects to a text achieves better recognition, but poor use of memory [Sundar, 00]. Malhotra concluded that consumers can be overloaded with information only in experimental conditions [Malhotra, 84], and Jacoby suggests that it is impossible in real marketplace, because the customers tend to approach offered information selectively [Jacoby, 84].

A number of studies consider multimedia enhancements as a factor that generates positive impressions of the online environment [Penney, 89, Berry, 99]. Dual coding theory assumes that there are two cognitive systems that work separately with verbal and nonverbal information, which increases the potential of information storage [Paivio, 86, Clark, 91, Milutinovic, 97]. Chau et al. discuss verbal and nonverbal product information and conclude that these two types of information imply different processing mechanisms. Verbal information is processed by "analytical encoding," and nonverbal by "analog knowledge representations" [Chau, 00]. They propose that nonverbal information facilitates a quicker and more precise comprehension of product presentations, because nonverbal information is processed synchronous while verbal information usually requires sequential processing in a specific order, such as reading a text from top to bottom and from left to right.

Similarly to the Dual coding theory, Baddeley suggested that humans have one central executive and two supporting systems: a "visual-spatial sketch pad" for processing visual information and a "phonological loop" for processing verbal information [Baddeley, 92]. He concludes that these two supporting systems process visual and verbal information independently, and the effective size of the working memory may be increased by presenting information in both the audio and visual mode. Lim et al. suggest that verbal and nonverbal information in the same multimedia presentation "do not compete with each other for limited cognitive resources, but rather they are complementary to each other and thereby augment the overall effect of the presentation" [Lim, 00].

The above supports the initial viewpoint of the authors that adding multimedia content to an online product presentation contributes to better understanding of the

characteristics of the product, which further facilitates the customer's shopping decision making.

Some studies separately explore the influence of media effects on consumers. One group of authors considers effects of adding a picture to a text, and while some authors argue that pictures adversely affect the users in carrying out their activities [Zhang, 99], others believe that users can successfully ignore the images in the process of obtaining the necessary information from the text [Diaper, 00]. Larkin and Simon find that the construction is perceived with less effort when viewing a diagram than by reading the text [Larkin, 87].

Lightner and Eastman (2002) conclude that while text may provide detailed product information, graphics can be used to display the product and "add artistic touches". They find that pictures can be used to represent a product in a way that confirms its verbal description and provides more information about the product, but essential details of products such as size, price, material, should be communicated through a text. The results of their research showed that 68% of subjects have higher visual processing score than verbal, 28% subjects have higher verbal processing score than visual, and only 4% of subjects have the same processing score for both visual and verbal information [Lightner, 02]. Most of the authors conclude that adding the picture to the text has a positive overall effect on the consumer [Sundar, 00, Adelaar, 03, Honga, 04, Grujic, 92].

In the product presentation music can be the most important stimulating element of the message and is most often used to highlight the key point of that message [Hecker, 84]. Music is also often used as a side effect that causes positive emotions among users [Park, 86, Stout, 88, Morris, 98]. Alpert and Alpert found that the appropriate music in an advertisement has a strong impact on customer's emotional response, and some empirical research proves that sad music has a stronger influence on purchase intention than happy music, or the absence of music [Alpert, 89, 90].

According to the overall literature review, the authors conclude that an online multimedia product presentation has a predominantly positive impact on customer perception of the product and usually facilitates the process of making decisions on which product to buy. However, only by reading the literature, those who develop the product presentation, cannot conclude which specific combination of visual and audio elements is the best for presenting product online. Thus, the research questions to answer were:

RQ1: Which combination of audio and visual elements is the best for online multimedia product presentation?

RQ2: Which number of audio and visual elements is the best for online multimedia product presentation?

4 Methodology

The following sections give a detailed description of the experimental design and provide details of the research conducted. Prior to conducting the experiment, the sample was selected and the selection of products to be used later in the experiment was made. The experiment was carried out in three separate and consecutive phases: (1) pilot test, (2) obtaining control values, and (3) experimenting with different combinations of multimedia content.

4.1 The sample description

The examinees in this study were 46 students of business administration and computer engineering from two universities, University of Belgrade and University of Ljubljana. Students can be considered as a representative group, because a number of studies have found out that online shoppers are younger and more educated people [Ratchford, 01, Allred, 06] and those are exactly the characteristics of students. Participation in the experiment was voluntary, and the students were motivated to take part as they were offered extra credits in a course in return. All examinees were asked not to discuss the experiment with other participants until it was completed by all examinees.

4.2 Products selection

The product types, number of product categories, as well as the number of different products in each product group were important issues in designing the experiment. Several considerations, preceding the selection of the product types, have been taken into account: (1) avoid products to which customers generally have deeply rooted preferences or biases, e.g. if someone in the early ages fixed BMW as his/her favorite make of car, it is unlikely that any multimedia presentation can change his/her bias, (2) select products whose characteristics can be described using words and pictures, e.g. a perfume would not be a good example, because for the selection of perfume its scent is crucial, and it is almost impossible to describe it using visual and audio elements, and (3) select products that are purchased less frequently and therefore require a careful processing of presented information. This is based on the belief that if products that are affordable and which consumers are more likely to buy are involved, shoppers can afford errors in the selection, reducing the importance of the selection process.

Six product categories were selected among typical household products: glasses, cups, fruit bowls, flower vases, chairs, and kitchen tables. These product types were chosen according to criteria listed in the previous paragraph. For each particular category of products, 8 similar products were selected [Jacoby, 74], all of similar characteristics, e.g., color, material, size, weight, and of only a slightly different quality.

It should be noted that products and their prices, together with other verbal and nonverbal elements of the presentations were mostly taken from the Internet. Since speech was not found on the Internet, it was produced for the purpose of the main experiment. As it was difficult to find eight products of the same price and minor differences for each product category, the original product attributes were adjusted for the experiment. Following modifications were made:

- For products with original prices lower/higher than average in the category, the price was increased / decreased and some product features were changed, which provided matching between product description and a new price.
- To make product features more similar, changes were made to product colors, and to text description such as country of product origin, size and weight of product, (according to recommendations in Liao et al. (2009))

The idea was to reduce the impact of product characteristics on the examinees' choice, and to highlight differences in the varieties of multimedia presentations.

4.3 Pilot test

Before undertaking the experiment, a pilot study was done with the aim to reduce the number of possible multimedia combinations of the selected visual and audio elements, e.g. text, picture, video, animation, speech, background music, and special sound. Since the text is used as a constant, the number of possible multimedia combinations for product presentations can be calculated by the formula for combinations of 6 elements without repeating (1):

$$K_6^1 + K_6^2 + K_6^3 + K_6^4 + K_6^5 + K_6^6 = 63 \tag{1}$$

Due to the large number of possible multimedia combinations (a total 63 combinations), the purpose of the pilot test was to reduce this number, so that the main experiment could be performed in a reasonable period of time.

The pilot test was designed as a list of all multimedia combinations that were evaluated by examinees. The 27 examinees ranked the offered combinations with scores ranging from 1 to 3. Rank 1 meant that multimedia combination was appropriate for online product presentation, rank 2 meant that multimedia combination was appropriate for a small group of specific products, and rank 3 meant that multimedia combination was not suitable for online product presentation at all. Examinees of the pilot test were not involved in the next two phases of the experiment. Having processed the given data, 9 multimedia combinations were obtained to be used in the next phases of the research (Table 2).

No.	Multimedia combinations for presenting products in experiment	Label of multimedia combination
1	Text + Picture	/
2	Text + Picture + Animation + Special sound	A
3	Text + Video + Speech + Background music	B
4	Text + Picture + Animation + Special sound + Background music	C
5	Text + Video + Background music	D
6	Text + Picture + Speech	E
7	Text + Picture + Video + Speech + Background music	F
8	Text + Picture + Animation + Special sound + Speech + Background music	G
9	Text + Picture + Animation + Video + Special sound + Speech + Background music	H

Table 2: Multimedia combinations for product presentations gained from the pilot test

The first combination, consisting of a text and picture as one of the basic and most commonly used forms of a product presentation on the Internet, was separated from other combinations, and used in the first phase of the experiment. This provided results that were used as control variables. The other eight combinations, 2-9 from Table 2 were used in the main experiment.

4.4 Obtaining control values

This phase was organized in order to get control variables to be used for comparison with the results obtained from the main experiment. The idea here was to find out how the products would be ranked by examinees if the presentation contained only a photo and a text.

For the purpose of the experiment, the web presentation was designed in Microsoft FronPage, 2003 software. Pages were written in the combination of ASP and HTML languages and located on the IIS 6.0 web server. The presentation contained 8 pages, where the first page was the application form, the next 6 pages contained products presentations, and the last page was the closing page of the experiment. Each of the product presentation pages (six pages), contained one of the six product categories (glasses, cups, fruit bowls, flower vases, chairs, and kitchen tables), and included 8 different but similar products of one particular product category. The products were presented using a picture and a short text (30 words) [Peng, 04, Gawronska, 05].

Previous studies have shown that the presence of certain colors can affect the consumer's purchasing process [Bellizzi, 92]. In order to avoid influence of color on examinees choices, the background color of presentation was neutral light gray [Wachtler, 03]. The pictures of products had a resolution of 200 x 200 pixels and all had a neutral background, the same as the background of the page. The product description consisted of a short text (30 words) and contained information on the name, price, material, dimensions and weight of products.

In this phase examinees were the students as described in Section 4.1 of this paper. The total number of examinees in this phase was 53 students of business administration and computer engineering from Belgrade and Ljubljana Universities. Prior to undertaking experiment each examinee was instructed what was expected of him/her to do and what the goals of the experiment were. In order to enable the comparison of individual changes in product selection, all examinees were given a unique ID number.

It is important to note here that: (1) all examinees were supervised by two people (one at the University of Belgrade, and one at the University of Ljubljana), (2) examinees were told that they should complete this phase of the experiment without breaks. This is very important, because it prevents external, irrelevant factors to influence the examinees' choice, and (3) exposure of each examinee was conducted in an identical and repetitive way.

The examinees were instructed to fill in the application form, and to rank all products from each one of the following pages, giving ranks from 1 to 8, where rank 1 should be assigned to the best product, and the remaining ranks should be assigned respectively. In order to avoid duplicate rankings on one page of presentation, or leaving the product without ranking, going to the next page of the experimental presentation was not possible if the active page was not completed by giving all of the

products a unique rang between 1 and 8. While the examinees were performing the experimental task, the examiners had no involvement.

The data from the application and the data of product ranking were automatically inserted into Microsoft Access 2003 database, using ADO object and VBscript in ASP.

4.5 Main experiment

The last phase of data collection was the main experiment. For the purpose of this phase, the new web presentation was designed, with the same products as in the previous phase [Sirkemaa, 05]. Unlike the previous web presentation, this had a separate page for presentation of each product and the first and the last page were the same as in the previous experimental phase (total of 50 pages). Justification for this lies in the multimedia presentation forms, that include different sounds, as well as in the fact that one of the objects of our research was to examine the influence of the quantity of multimedia effects in a product presentation. This presentation was also designed in Microsoft FrontPage 2003 software. Pages are written in the combination of ASP and HTML languages and located on IIS 6.0 web server. All presentation pages had the same design; color of background, layout, content position on screen, and the only content difference was in multimedia effect combination of different products. In other words, pictures or videos of all products had the same resolution and position on the screen; the same types of audio effects, such as human speech, music, and sound effect had the same volume level for all presented products.

Each particular product was presented with a text, the same as in the previous phase of experiment, and some products were presented with additional content, obtained by conducting a pilot study described in section 4.3 of this paper. As mentioned before, the characteristics of media effects for product presentation were uniform throughout the entire presentation, and the most important details of each one were:

- Text: short text (30 words) with information on the name, price, material, dimensions and weight of the products, the same as in previous phase described in section 4.4
- Picture: resolution 250 x 250 pixels, JPEG picture format, neutral background and fade-out border- Video: resolution 160 x 120 pixels at 25 frames per second, duration is 10 seconds, the original videos are in WMV format taken from the Internet, and for a purpose of inserting them into the Flash movies, videos were converted into FLV format
- Animation: duration is 5 seconds, animated pictures in the first 2.5 seconds shrink to 40% percent of their original size, and in the remaining animation time they grow back to their original size
- Speech: length of 6-8 seconds, MP3 audio format, recorded in mono technique, with the sample rate of 44.1 kHz and 16 bits per sample
- Special sound: length of 2.4 seconds, WAV audio format, recorded in mono technique with the sample rate of 11.025 kHz and 8 bits per sample
- Background music: length of 10 seconds, MP3 audio format, recorded in mono technique, with the sample rate of 44.1 kHz and 16 bits per sample
- Multimedia content was created in Adobe Flash Professional CS5 program as a Flash movie and as such placed in a Web page in HTML.

Multimedia combinations were assigned randomly to products. Every product from each category received only one combination of multimedia and every multimedia combination was assigned to only one product from that category.

The examinees in this phase were the same students, as in the previous phase of the experiment. Data from students, who participated in the control experiment, and not in the main, are excluded from the final database. In this way 46 examinees were selected. The criteria and the process of giving instructions to the examinees were the same as in the previous phase, described in the section 4.4 of this paper. Prior to undertaking the experiment each examinee was instructed about what was expected of him/her to do and what the goals of the experiment were.

The examinees were instructed to fill in the application forms at the beginning, with emphasis on carefully entering ID number, when they were reminded of their ID number, to avoid a mistake in the application process. Here, again, all experiments were supervised by two people (one at the University of Belgrade, and one at the University of Ljubljana). The examinees were told to complete the experiment without interruption.

The examinees were expected to rank all products from each of the product categories, in the same way as in the previous phase of the experiment. The presentation of each product category was continuous – examinees were exposed to presentations of all 8 products of the category. The exposure of each examinee was conducted in an identical and repetitive way. The products were automatically alternated on the screen, where the duration of each display lasted 10 seconds. After watching 8 presentations of one category, examinees were able to indicate their ranking, or to watch the presentation of the category again [Sedlar, 07]. When the examinee had concluded the ranking of products, the next category presentation would start automatically (Figure 1). In order to avoid duplicate rankings for products of one category, or leaving the product without ranking, going to the next product category presentation was possible only if all of the products of active category were ranked from 1 to 8.

To reduce the influence of external factors, e.g. sounds, lights, the main experiment was conducted in the same room (one in Belgrade and one in Ljubljana), on the same computer and with the presence of one examiner, who introduced the experiment to the examinees and started the presentation for the experiment. While the examinees were performing the experimental task, the examiners were not involved.

The data from the application and the data of product selections were automatically inserted into Microsoft Access, 2003 database, using ADO object and VBscript in ASP [Gajski, 87].

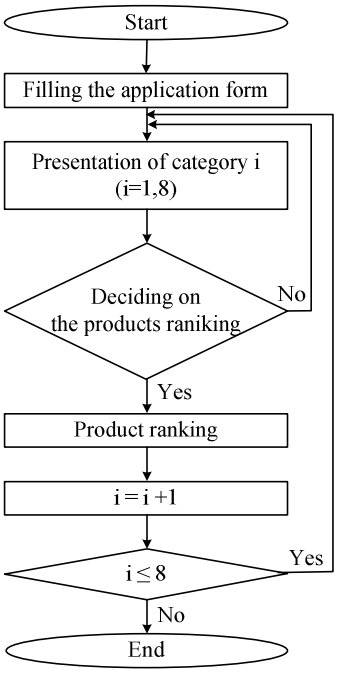

Figure 1: Flowchart of product ranking procedure in the main experiment

5 Results and discussion

This section provides results of the main and the control experiment, and its discussion.

5.1 Main experimental results

A one-way between-groups analysis of variance was conducted in order to explore the impact of multimedia product presentation on customer's preferences for presented products, as measured by the main experiment. Multimedia combinations were divided into 8 groups according to the audio and visual elements they consisted of (Table 2).

There was a statistically significant difference at $p < .05$ level in customer preferences for the 8 multimedia combinations. $F\ (7, 2200) = 90.952$, p=.00
Despite reaching statistical significance, the actual difference in mean scores between the groups was quite small. The effect size, calculated using eta squared, was 0.2

Table 3 provides descriptive data about the multimedia combinations used in the experiment.

Multimedia Combination	Mean	Std. Deviation
A	5.14	1.971
B	6.01	2.047
C	4.37	1.863
D	6.02	2.089
E	4.36	1.823
F	2.99	2.13
G	3.92	2.071
H	3.18	2.155

*Table 3: Means and standard deviations by the multimedia combination**

Note that the lowest rank refers to the best combination, and other ranks refer to the rest of the multimedia combinations respectively

Figure 2 presents means plot of the multimedia combinations used in the experiment. Note that the lowest rank refers to the best combination, and other ranks refer respectively to the rest of the multimedia combinations.

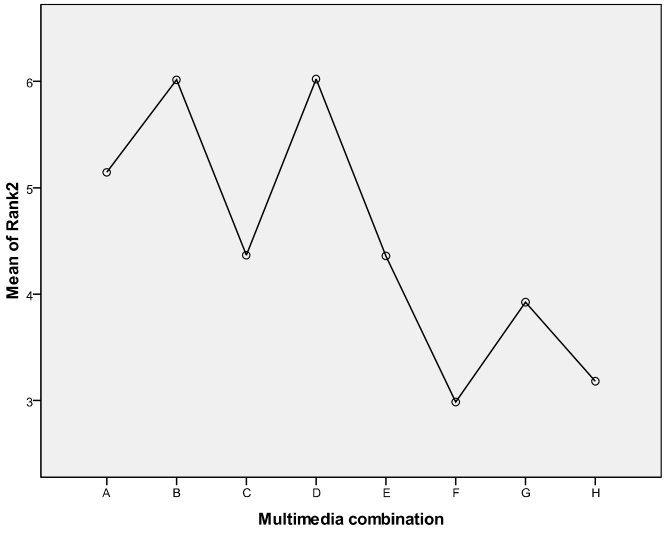

Figure 2: Means plot of the multimedia combinations

Post-hoc comparison using the Tukey HSD test indicated which combinations are significantly different from each other (Table 4).

Multimedia combination	Multimedia combination							
	A	B	C	D	E	F	G	H
A	/	-.870*	.779*	-.877*	.786*	2.159*	1.221*	1.964*
B	-.870*	/	1.649*	-.007	1.656*	3.029*	2.091*	2.833*
C	.779*	1.649*	/	-1.656*	.007	1.380*	.442	1.185*
D	-.877*	-.007	-1.656*	/	1.663*	3.036*	2.098*	2.841*
E	.786*	1.656*	.007	1.663*	/	1.373*	.435	1.178*
F	2.159*	3.029*	1.380*	3.036*	1.373*	/	-.938*	-.196
G	1.221*	2.091*	.442	2.098*	.435	-.938*	/	.743*
H	1.964*	2.833*	1.185*	2.841*	1.178*	-.196	.743*	/

** The mean difference is significant at the 0.05 level.*

Table 4: Summary results from Tukey HSD test

Complete results of post hoc tests are given in the appendix (Appendix 1).

5.2 Results of the main and control experiment comparison

The results obtained show that there is a significant difference in the way customers view and rank products on the Internet depending on how it is presented.

Respondents showed the greatest preference for a product presented using the combination F, i.e. using images, text, video, speech and music in the background. This multimedia combination is represented by five elements, which is the average of the smallest (3 elements) and largest number of elements (7 elements) used for the presentation of products in this experiment. In relation to the combination C that also contains 5 elements (images, text, animation, special sound and music in the background) the combination F got significantly better values. Our conclusion is that this is because the combination F contains a video of products that gives customers a much more realistic picture of the product than just a still picture. This conclusion is supported by the fact that the combination G, which contains all the elements in the presentation, except for the video of the product, although closer to the combined number of elements F, was ranked lower than the combination H that contains a video clip.

By the opinion of respondents the second best combination is H which contains all the elements in the multimedia presentation (image, text, animation, video, special sound, speech and background music). This indicated that respondents prefer a presentation that contains more elements, from which they can extract those that are understandable in terms of their content, and enrich their sensory experience.

Lowest-rated combinations are B and D, despite the fact that these combinations contain the video. The reason for this is the lack of product images, which confirms that the picture, in addition to the text is the elementary part of the product presentation, which should not be omitted.

5.3 Results of the main and control experiment comparison

A paired-sample t-test was conducted to evaluate the impact of adding different elements in product presentation on examinees rankings of the products. The results of the conducted t-test are shown in Table 5.

Multimedia combination	Rank	Mean	Std. deviation	t-test results	Sig. (2-tailed)	Eta squared	Magnitude of intervention's effect
A	1	5.41	2.382	2.315	.021	0.019	Small
	2	5.14	1.971				
B	1	5.00	2.140	-7.431	.000	0.167	Large
	2	6.01	2.047				
C	1	4.72	1.864	2.973	.003	0.031	Small
	2	4.37	1.863				
D	1	4.66	2.329	-7.591	.000	0.173	Large
	2	6.02	2.089				
E	1	4.74	2.152	3.246	.001	0.037	Small
	2	4.36	1.823				
F	1	3.91	2.172	6.473	.000	0.132	Large
	2	2.99	2.130				
G	1	4.09	2.291	1.509	.133	No significant difference	
	2	3.92	2.071				
H	1	3.47	2.369	2.613	.003	0.024	Small
	2	3.18	2.155				

Table 5: Results from t-test

5.4 Discussion of the main and the control experiment comparison

Results obtained from paired sample t-test show that there is significant difference for all multimedia combinations, accept for combination G. This conclusion is not fully in accordance with our expectations that predicted a larger increase in rank 2 over a rank 1 of the combination G. However, when one considers that this combination does not contain video that we previously highlighted as an important element of online product presentation, then the result fully fits.

The largest (negative) difference is for combinations B and D, which was to be expected considering the fact that these two combinations in the main experiment do not contain the product picture. Also, the large effect of the differences obtained for the combination F, was to be expected, because this combination is rated as the best in the main experiment.

With the exception of combinations B and D which are the only ones with a negative score t-test due to the lack of images, all other multimedia combinations are evaluated better in the main experiment than in the control experiment, confirming the

fact that adding audio and visual elements has a positive effect on the presentation of products in an online environment.

5.5 Limitations of conducted research

Limitations of this study are related to the following issues:

(1) The experimental environment differs from the real world in which customers are doing their online shopping. Unlike the experimental conditions described in Section 4, home environment can be and usually is a place that provides additional audio and visual effects, e.g. different sounds, lights, objects near the computer. These effects cannot be controlled, and they affect customers' overall emotional state, and consequently their perception.

(2) The website designed for this experiment is somewhat simplified regarding real e-commerce websites. The simplification reflects in the fact that it does not provide opportunity to search or browse through it, which is the most common activity during online shopping. In research activities like this one, the ability to search and browse through the content would prevent examinees to pass through every element (product) of the presentation and could also influence the examinees' perception, consequently resulting in irrelevant obtained results.

(3) The experimental task is clear and relatively easy to perform, but it differs from real situations, where customers spend certain amount of money. In those cases, they would probably be thorough in reviewing available products and their characteristics.

(4) The participation of students as the only examinees might be subjected to criticism for the lack of generality. However, some surveys show that the perception as a characteristic of people and the most relevant one for this type of research should not be considered as a group but rather as an individual characteristic of humans [Besuijen, 98]. Thus, these results should be considered relevant to different groups of people.

Most of the limitations listed above were necessary in order to ensure the validity of the experiment. However, it would be useful to conduct field research and online stores data processing, in order to validate the data obtained here.

6 Conclusions and directions for future research

Regarding the evolving online market and customers' increasing interest in shopping online, empirical results are required to show how products should be presented on an Internet store.

Clearly, the most important elements of an Internet store are what it offers and the way the goods are presented. In order to explore the best ways of presenting products on the Internet, research consisting of several parts was conducted: a pilot study, two experiments, and an analysis of the data obtained. The pilot study served to reduce the scope of further research phases, the first experiment was used to obtain control values, and the second – the main experiment – served to obtain answers to the questions posed.

The data analysis provided answers to the question concerning the number and combination of audio and visual elements in a multimedia presentation that is optimal

for presenting a product on the Internet. The conclusion is that it is best to combine the following five elements: text, product picture, video about product, speech, and background music.

When selecting the elements for a multimedia product presentation on the Internet, the number of elements should not be considered separately from the types of selected elements. Our conclusion is that in addition to the basic elements of image and text, it is strongly recommended that a presentation contains a video of the product. In terms of audio elements of the presentation, a short speech about the product, as well as background music, can be very effective in product presentation, as shown in our study.

The results of our study also show that it is better to include more elements in a product presentation than to omit one of the important ones mentioned above. This is supported by t-test results that indicate that the ratings of all products that contain additional audio and visual effects increased in the main experiment, except for the products whose image had been removed.

According to the results obtained, we conducted an analysis of the websites of online retailers. We focused on mass merchants, office suppliers, book stores, music and video stores, and IT and electronics stores, as the world's largest online retailers. We found that online stores that offer IT and electronics, usually employ a combination of picture, text, and video, with background music and speech by a person explaining some features of the product. This fits in entirely with our findings, which suggest the use of text, product picture, video, speech, and background music in an online product presentation. Retailers offering music and video are specific in that they offer products that comprise the multimedia elements we researched. Presentations of these products usually consist of CD cover picture, textual description, as well as fragments of music, or video, depending on whether the product is a song or video. Mass merchants, office suppliers, and book stores usually use only picture and text to describe products. One of the main reasons for this probably lies in the fact that they offer a far greater number of different products, making the creation and storage of complex multimedia presentations likely very expensive.

This study opens up various directions for future research to take. The effects of multimedia presentation in this paper were examined in the context of an e-commerce environment. There are numerous fields where similar research is likely to be important, such as: effects of types of multimedia presentation of a company or product, brand image, and others. The identification of the best methods of multimedia presentations in various contexts is important and will certainly uncover some surprises: in contrast to our findings, the book [Hasebrook, 04] shows that in terms of e-Learning, multimedia overload can have negative effects.

In this paper we have not considered at all the question of personalization and recommendation. It is interesting to note that one of the biggest online stores, Amazon, does not use what we have found to be most effective, but relies very much on customer recommendations based on previous purchases or similar products, etc. This seems to imply that in such an environment the role of the multimedia mix is quite different.

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Appendix

Results from Tukey HSD test

Multiple Comparisons

Rank2
Tukey HSD

(I) Multimedia combination	(J) Multimedia combination	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A	B	-.870*	.172	.000	-1.39	-.35
	C	.779*	.172	.000	.26	1.30
	D	-.877*	.172	.000	-1.40	-.35
	E	.786*	.172	.000	.26	1.31
	F	2.159*	.172	.000	1.64	2.68
	G	1.221*	.172	.000	.70	1.74
	H	1.964*	.172	.000	1.44	2.49
B	A	.870*	.172	.000	.35	1.39
	C	1.649*	.172	.000	1.13	2.17
	D	-.007	.172	1.000	-.53	.51
	E	1.656*	.172	.000	1.13	2.18
	F	3.029*	.172	.000	2.51	3.55
	G	2.091*	.172	.000	1.57	2.61
	H	2.833*	.172	.000	2.31	3.36
C	A	-.779*	.172	.000	-1.30	-.26
	B	-1.649*	.172	.000	-2.17	-1.13
	D	-1.656*	.172	.000	-2.18	-1.13
	E	.007	.172	1.000	-.51	.53
	F	1.380*	.172	.000	.86	1.90
	G	.442	.172	.168	-.08	.96
	H	1.185*	.172	.000	.66	1.71
D	A	.877*	.172	.000	.35	1.40

	B	.007	.172	1.000	-.51	.53
	C	1.656*	.172	.000	1.13	2.18
	E	1.663*	.172	.000	1.14	2.19
	F	3.036*	.172	.000	2.51	3.56
	G	2.098*	.172	.000	1.58	2.62
	H	2.841*	.172	.000	2.32	3.36
E	A	-.786*	.172	.000	-1.31	-.26
	B	-1.656*	.172	.000	-2.18	-1.13
	C	-.007	.172	1.000	-.53	.51
	D	-1.663*	.172	.000	-2.19	-1.14
	F	1.373*	.172	.000	.85	1.90
	G	.435	.172	.185	-.09	.96
	H	1.178*	.172	.000	.66	1.70
F	A	-2.159*	.172	.000	-2.68	-1.64
	B	-3.029*	.172	.000	-3.55	-2.51
	C	-1.380*	.172	.000	-1.90	-.86
	D	-3.036*	.172	.000	-3.56	-2.51
	E	-1.373*	.172	.000	-1.90	-.85
	G	-.938*	.172	.000	-1.46	-.42
	H	-.196	.172	.949	-.72	.33
G	A	-1.221*	.172	.000	-1.74	-.70
	B	-2.091*	.172	.000	-2.61	-1.57
	C	-.442	.172	.168	-.96	.08
	D	-2.098*	.172	.000	-2.62	-1.58
	E	-.435	.172	.185	-.96	.09
	F	.938*	.172	.000	.42	1.46
	H	.743*	.172	.000	.22	1.26
H	A	-1.964*	.172	.000	-2.49	-1.44
	B	-2.833*	.172	.000	-3.36	-2.31
	C	-1.185*	.172	.000	-1.71	-.66
	D	-2.841*	.172	.000	-3.36	-2.32
	E	-1.178*	.172	.000	-1.70	-.66
	F	.196	.172	.949	-.33	.72
	G	-.743*	.172	.000	-1.26	-.22

*. The mean difference is significant at the 0.05 level.