Standardizing the presentation layer in B2B system

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Abstract

The aim of this article is to present the results of the analysis on the possibilities of standardizing the presentation layer in a business-to-business (B2B) system based on Internet technologies as part of a scientific project within a Research and Development department. In this article, all issues that are essential in the design of the user interface of the B2B system, in both theoretical and practical contexts, are discussed. Moreover, the methodology of the research is being presented. This article also includes a sample project of a user layer that has been developed by the researchers, engineers, scientists, and members of IT department.

Keywords: B2Bsystem, standardization, user interface.

Introduction

The structure of the currently developed B2B systems is complex, because its main objective is to enable the implementation of many business processes and associated functionalities. The structure is based on Service Oriented Architecture (SOA). It consists of logically related layers that are communicating with each other in a clearly defined way, using pre-established rules and tools of information technology design (Savidis & Stephanidis, 2004). Each layer has a number of components by means of which the functionality of a given layer is implemented. In B2B system design, one should take into account the needs and resources of an enterprise, the number of its cooperants and users that have an impact on the architecture of the physical division of the system into layers, and the use of appropriate tools and IT technologies.

The Presentation layer consists of functional components that are implemented in such a way that makes it possible to properly display the user interface and manage user interaction with the application (Scott & Neil, 2009). There are three major elements when it comes to defining interaction design: technology, user behavior, and social aspects. What is common about all these elements is that the interaction design is seen as an applied art (Saffer, 2009). Therefore, when designing the presentation layer, one should take steps to ensure that all the vital conditions are met in order to freely develop the architecture of the entire application. The first and most important thing is the correct identification of the user, user expectations, and the usage requirements of the interface (Dillon, 2001; Norman, 2002). This, in turn, influences the choice of the appropriate application to be used in the process of constructing the system. One should also take into account the manner and format of data presentation and determine the strategy for data integrity by protecting the application against malicious third party actions. The correct definition of business logic allows separating it from the code of the presentation layer. The important thing is to conceptualize the mode of communication between other layers of the system. In the case of a system with an isolated presentation layer from the business logic layer (BLL), (responsible for the enforcement of business rules) and data access layer (DAL) (responsible for communication with the database), the development of the communication between the layers can be crucial in achieving optimal operation as well as data integrity. All

these decisions involve the selection of appropriate and proven solutions concerning the presentation layer to ensure trouble-free functionality of the application in the B2B system by means of an easy-to-use and user-friendly interface.

In the following sections, the research methodology is first described, followed by the standard components of presentation layer construction, presentation layer design patterns, patterns used during the construction of the application navigation system, and patterns used during the construction of forms. Each section has a review of relevant literature and conclusions in correlation with B2B system. Finally, practical implications of the study are presented in section 'elements of predefined graphical templates'. At the end of the paper, there are a summary of the results and directions for the future research.

Research methodology

The goal of this article is to present the results of the analysis of the possibilities of standardizing the presentation layer in a B2B system, which was carried out as part of the fourth stage of the project entitled: "Development of state of the art and advanced B2B system based on Internet technologies as a result of research and development works" (Łobaziewicz, 2014; Łobaziewicz, 2015).

A user interface project has been developed based on the results of the aforementioned analysis, and is implemented into a prototype of a B2B system.
The following methodology has been applied:

a) The analysis of the results of the third stage of research: "Developing a model of separating user interface layer from database layer, and identifying the most important data sources for the system as well as defining data exchange standards." (OPTeam, 2014);
b) The characteristics of standard elements of the presentation layer structure;
c) The analysis of designing patterns used in the project that dedicated to the presentation layer;
d) The analysis of patterns used while constructing the navigation system application;
e) The analysis of patterns used while constructing forms;
f) The analysis of web site components common for a group of enterprises - customers of OPTeam S.A.;
g) On the basis of the research, designing a project concerning predefined graphical templates and elements presentation – presentation layer standard for B2B system user.

Standard components of presentation layer construction

There are a few typical elements that should be considered when creating a user presentation layer (Reeves, et al., 2004) in B2B system.

A. Caching

It is a mechanism that is perceived as one of the most effective, because one is able to increase the performance and optimum functioning of the application in the presentation layer. This mechanism is mainly used to optimize data search as well as to optimize the load balance and recurrent processes. It is not advisable to cache perishable data and to use them to cache memory by replacing them with special objects used for the detention of data. Moreover, one should not cache sensitive data, except in certain cases in encrypted form.

B. Exception Management

When designing the B2B system, one should develop a special mechanism for exception and error management that can handle such events. One should avoid a situation when the exceptions in one layer have some effects on the correct operation of another layer. The presentation layer has a special role here because it needs to be designed so that it is user-friendly, while presenting an appropriate range of information. A good thing is to design a global exception-and-error-managing rule that would display error information or a message for all unsupported exceptions and errors. The system should distinguish between system exceptions or errors that are the consequence of incorrect operation of business logic. In the case of business mistakes, one should provide a user-friendly message, allowing the user to repeat the last activity. In the case of system exceptions, one should check whether the exception was caused by a database or system failure. One should not use the exceptions to control the logic of the system, because this reaction may cause a disturbance of the correctness of its operation.

C. Input data

At the level of making assumptions, one has to design the way of collecting the data through the user interface. During such analysis, one should take into account the guidelines for the collection of input data, such as the following:

- For the normal collection of data, one has to use a method based on a form with appropriate indexes for the type of data.
- For the collection of data in the formats of specified documents, one has to use a mechanism based on the nature of the document, e.g. Microsoft Excel, XML, etc.
- For more complex and inter-dependent data, during the process of collecting it, it is advised to implement a wizard-based method.

One should consider enabling users to enter input data by different methods, and to facilitate the process by implementing the following: text-to-speech, text zooming, function based keyboard options, and input manipulation using various pointing devices.

D. The user interface layout

When designing the interface, it is advisable to maintain the uniformity and coherence of all screens by using a set of templates. It is important to adjust all the interface elements (controls) to work with appropriate input devices, such as touch screens, styluses, etc. For web applications, one should use cascading style sheets (CSS) in order to centralize the definition of individual interface components and their easier modification.

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E. Navigation

Elements that serve the purpose of moving between application screens are a very important part of the user interface. When designing the presentation layer, one has to ensure the uniformity and consistency of these elements. Properly designed navigation in a clear way can hide the complexity of the application, making it easier for the user to access the desired functions. Moreover, thematic grouping of functions that the application offers in toolbars and grouping the menu items allow the user to quickly and easily navigate the user interface. Navigation type elements are also of great importance in the design wizard navigation screens, because inputting large amounts of data must be adjusted and streamlined to fit the decisions of a user throughout the process. In web applications, such navigation forces designers to control the whole process of moving between screens, and even screen sessions.

F. Request Processing

Despite the fact that modern applications process huge amounts of data, downloading them from external sources, while creating the presentation layer, one should remember about adequate and smooth processing of requests. To avoid blocking the user interface during long operations, one may run asynchronous operation or a separate thread, if possible. This involves isolating necessary activities connected with the processing of the application logic code and preparing to display the user interface after the occurrence of interdependent events in the application.

G. User Experience

The user experience has a significant influence on the design of the interface, both in terms of time and functionality. When developing a Rich Internet Application - RIA, one should avoid synchronous processing of data in every possible place, because it results in more efficient and smoother operation. The use of asynchronous JavaScript and XML mechanisms (AJAX technology) significantly improves the perception of the user interface by the end user through reducing the reloading of each page of the application (postbacks). Using thematic grouping of individual sections of the interface controls and the use of clear paths enable the user to reach a specific goal faster. Moreover, the interface would not be overloaded and be too complicated for the user. If it is possible, one should consider transferring the visual functionality of the personalization of the application to the end user, because it gives an impression of a friendlier and more flexible design, (although performing predetermined tasks, business logic).

H. User interface elements components

Interface components include controls and all other components that organize the appearance of the presentation layer that are used to display information to the user and to download data for validation by the user. It is important to use the implemented functionality of data linkage on a used control. If the default options in programming environment are insufficiently functional, user controls and components need to be created. Creating one's own components should be based on extending functionalities of existing controls. At the same time, one has to remember about providing support for such components for an easier management and development of their functionalities.

I. The processing of user interface components

The processing of the user interface components should be performed only when it has a meaning in the further course of the action of the application. This should be done by making appropriate settings of the values of the presentation layer control variables. It is important not to combine business logic and presentation logic inside the interface component processing. Instead, the processing should be focused on organizing an interaction of the user with the application through a complete user interface.

Interface processing is used mainly to provide the communication of the presentation layer with other application layers, Business Logic Layer (BLL), and Data Access Layer (DAL). Using the interface processing, one should consider the use of an architecture pattern that serves the purpose of organizing the structure of the application, based on the following three separate components, which are integral to each other:

   a) A model which is a representation of the problem or the application logic;
   b) A view which describes the way of displaying a certain part of the model, as part of the user interface, consisting of subviews, which are responsible for various smaller parts of the interface;
   c) A controller that receives the input data from the user in response to the user's behaviour, managing the model's update and the refresh of the views.

If the processing of the interface depends on variables and application start-up time, one should consider using patterns of abstraction, such as dependency inversion principle. In contrast, the individual layers should be dependent on the abstractions.

J. Validation

When designing the input data validation mechanism, one must remember about few things. If it is possible, one should validate the input data on the client side, providing support for any errors related to the interaction, because this will reduce the number of errors caused by incorrect data input. There are special technologies that are possible to implement, such as process-controls designed for this purpose, known as validators. Using them requires little effort related to configuration. You should not rely solely on client-side data validation mechanisms. Always use server-side validation, because this is safer both in terms of proper functioning of the application and in terms of solving errors.

The problems related to the design of the presentation layer discussed so far are key categories for which design patterns are created. The choice of appropriate patterns during the design process of the application has an impact on its visual appearance and operation, and each category will be described separately.

Presentation layer design patterns

Design patterns are of particular importance in the context of web applications, since the designers frequently encounter the same or similar architectural problems (Leonidis, Antona, & Stephanidis, 2012). Most often, the pattern is defined as a three-part rule that represents the

relationship between the problem, the context in which the problem occurs, and a proven solution.

As a structural or preservative factor, the patterns that are used positively influences the frequency and ease of the interface, website, or object-oriented program usage. Patterns do not constitute solutions directly prepared to implement. Their implementation is always adjusted to a given problem, and it is always done in a different way. Each pattern is based on a set of rules, which clearly define the way in which users work with the selected type of tool. Patterns describe the relationship between elements, but they are not descriptions of individual elements. After implementing chosen patterns in the application, the designer is forced to match them to the application as a whole. Here, it is interesting to note the outcome of a research made among websites visitors. The results of research examining the degree of trust to a particular website, or lack of it, show that the factors that make the users think the website is credible include the description of a particular company's achievements, customer service, sponsorship, and advertisements. However, the most important is, for the majority of visitors, a professionally looking design.

To conclude, the design of an application creates the first impression, therefore, it is crucial. If the designer makes proper decisions about the interface and its basic components (such as colors, font type, content, images, background, texture, etc.), it would be possible to create an application suitable for multi-website purposes.

Patterns used during the construction of the application navigation system

The disposal of user interface components serves the purpose of directing the user's attention to the so-called interaction points on the screen. In order to focus the user's attention, one has to use some techniques to attract eyesight to certain points of capture. From the point of view of a conceptual designer of a graphical layout, he/she must arrange areas that would enable the users of the application to focus and distinguish between elements (Tidwell, 2011).

According to the concept of visual hierarchy, the user should be able to come to the conclusion subconsciously about the informational structure of the website being watched based on its interface structure.

A. The degree of importance of elements

Various techniques are used to achieve the importance of a particular component. One of them is "text highlighting," making it respectively larger or smaller, the other includes using different colors or fonts. By separating more important content from the rest of the text and adding additional space between words, the author creates an impression of significance (Turk, 2004).

In the case of texts grouped in blocks (main text, links, or reference sections), and located close to each other, there are several features by means of which the designer may manage their visibility: density, background color, arrangement, size, and rhythm (visual sequence that properly, symmetrically chosen may attract the reader's attention).

Research carried out as part of this project showed that using large, clear website headers is a good practice. The main reason to determine this rule was the clarity and readability of the website. Users understand the context-relevant information presented to them. The second reason is the fact that a header is a regular part of each website, a return-point, a characteristic feature of an application. Moreover, any form of content presentation requires a consistent structure that suits the entire application. This is the reason why the styles, colors, sizes, and labels of the content are always coherent and more often standardized. A uniform pattern of presentation may serve as a pattern of rules for further use, e.g. as a contact form pattern.

B. The relationship between graphical arrangement of elements

One of the easiest ways to give a relationship between elements is to separate them by adding some space. This simple action gives an impression of creating groups of elements, or even sections. This method is characterized by "closeness" and "completion" features. One the other hand, ''similarity'' features lead to an easier connections, links between elements, while "continuity" features allow one to present a set of adjacent elements through a visual line with an indicated sequence of viewing. Examples of such usage include alternate colored backgrounds in grids, bullet icons, and navigation menu with special graphics. A good way to indicate the inferiority and superiority of elements on a website is to use of outdenting and indenting functions, while any kind of frames, or using areas with outlined backgrounds are used during the nesting of related elements.

C. Sight flow

Sight flow (Tian, Kanade, & Cohn, 2001; Turk, 2004) is the distance the user's sight covers while using the interface. This distance is closely related to the visual hierarchy of elements. The designer of an interface is able to control the process of sight focus through using special graphical elements as well as to control the time the sight takes to move from one element to the next. There are points, mentioned earlier in this article, on which the users holds his/her sight a little bit longer than on others. However, at a single website, there should not be more than five such points. Their outnumbering diminishes their importance and strength. In an application as a whole, the number of points from which the user may move his sight is large. However, the designer should specify the order of systematically watching them. It is the designer's duty to apply the sequence of moving-watching process and time the user spends on each part of the interface.

D. The use of dynamic elements

The designer of the presentation layer of web applications must take into account the fact that the interface is a dynamic system. The interaction with the user is important. Today, each application must be adjusted to various types of computer screens (desktop, laptop, smartphone, and tablet). They are diverse in terms of size, colors, and behavior. The most common element used during the process of "handling the screen" is a scroll bar. It allows the user to "move" into the next section and may be easily configured. However, it is used only for vertical elements, using it for horizontal parts causes distraction and is not practical. Another way is to separate different content within a group is by using an accordion-style dropdown menu or dropdown or movable panels, giving the user the impression of the control of information flow.

Patterns used in the construction of the navigation application system

Requirements of the construction of a navigation system of web applications for the needs of the B2B system are complex. Specialist literature provides guidance on how to build such a system (Alur, Malks, & Crupi, 2003; Kalbach, 2012; Tidwell, 2011). The guidelines include the prompts about the number of links in the menu section, the way of grouping menu items in sections, and the optimization of the consistency of menu panels. Such tips are valuable, but they are not sufficient for designing a B2B system based on a web application.

One has to take into account that navigation must be adjusted to the specifics of the application, resulting from the method of using it by the end users. Using the navigation should be intuitive enough to move without having too much eyesight focus, doing one activity after another. Thus, while designing the navigation system, one has to keep in mind the principle of "less is more," trying to limit the amount of the necessary steps the user has to do to move between subpages.
In order to build a well-functioning navigation system that would facilitate the work of the user in a web application, the designer needs to understand the functions and purpose of the navigation elements. The existing navigation types and models are divided into the following main categories (Kalbach, 2012):

1. *Structural navigation* connects one page to another based on the hierarchy of the site. It allows the user to navigate amongst elements of a website (headings, text blocks, form controls, links, lists landmarks, separators, and anchors, etc.). It gives the user the opportunity to move from master to subordinate elements and transfer to different locations in the site hierarchy.
2. *Associative navigation* connects pages with similar topics and content, regardless of their location in the site. Its task is to ensure dependencies between different levels in the hierarchy of the application. It allows the user a simultaneous access to different content.
3. *Utility navigation* connects pages and features that help the user use the site itself; these may lie outside the main hierarchy of the site, and their only relationship to one another is their function, e.g. links that do not lead to any part of the site but perform certain functions in relation to the site or application, (logout or change in size of font). Utility navigation is generally smaller than primary navigation mechanisms and appears on the top, sides, or bottom of the page. With the help of utility navigation, the user is moved to the part of the website that serves a particular function or sees other options after log into the application.
4. From the perspective of R & D project, the utility navigation is very useful, since it includes important elements of the platform such as the following:

    - A link to the cart details (in a shop) that includes a general description of its contents,
    - A panel with elements of the transition to the advanced search of a product list with filter or criteria to be set by the user,
    - Functions using the logout link and transferring to the login form.

The use of such options and their correct arrangement on the sample page of the application is a very important aspect in user service.

5. *Internal navigation*. User interface designers try to avoid too long pages dense with information. They apply pagination, that is dividing the whole content into specified number of lines. This gives the user greater readability, reduce data redundancy, increases optimum display and does not force the user to perform a continuous roll up and down.

The designers may implement in-page navigation when they come across a situation where it is not possible to apply the above solutions. In-page navigation is a navigation to content that exits within the same page. In-page navigation should be used in situations where it helps improve the readability and learnability of the website. It includes links to each section and allows one to switch between them, in a similar way as it is done in a table of contents, without having to refresh the page. It allows the user to scroll the page, by jumping to the following or preceding sections, which can be regarded as a local visual navigation. However, this type of navigation has several constraints: special formatting, the possibility of a situation where the first link leads to a section that is already visible on the screen, the loss of control by the designer on the capacity of the content, using at the bottom of each page an "up" link (this may result in the use of unnecessary elements).

In the designed B2B system, assumptions were made for a navigation mechanism resulting from the analyses that were made on the visual part of the application. In "lists of products" and "search results," there were applied paging mechanisms and grid controls. Websites that required the presentation of much data were separated according to their subject.

Patterns used during the construction of forms

In the majority of applications, there is a need to get the input data from the user and process it for the needs of the application. Such input data includes, for example, username and password given by the user during the authorization process, the number of products in a shopping cart, and a method of their delivery, the company data to issue an invoice, etc. For this purpose, the designer of an interface needs to develop a tool and choose appropriate controls for the collection of the data.

Every designer should keep in mind that forms are a form of dialogue between a user and the application, which is why their design must be based on a few principles:

1. The size of the forms should be reduced only to essential questions.
2. The order of the questions and fields should ensure the users freedom. Here, it is advised to apply an inverted pyramid principle, (in which most important info are asked to be provided by the user first, then important details and then other general info) in the process of data collection by means of a form.
3. For easier form filling, the fields should be grouped in thematic sections.

4. If the form, which is a collection of well-designed controls to be filed in the application by the user, is too large to fit one page, one should divide it into sections or sub-themes that group similar information.
5. Labels that describe a given box in the form should be located on the left of or above the box. This principle stems directly from the reading of the text direction.
6. Controls to retrieve data from a user should be skillfully adapted to the type of information that the user wants to give. An incorrect choice of controls may result in chaos in the answers the users give. On the other hand, correct choice of them brings order.
7. Descriptions of the fields in the labels should be simple, concise, and intuitive. One should not put words associated with specialist terms or marketing slogans. A brief description of the expected data or their format should be used.
8. One should not depend on having all field of the form filled in. Using a character of '*' one many indicate whether a required fields is necessary. Other "unmarked" fields may be left blank, treated as optional or left for complementation later. While using an external source, e.g. a database, to collect data, one should remember about determining default values (when the information by the user is not provided).
9. Validate information: Validation of input data into specific fields is very important, because it is important for their approval, recording, and processing.
10. Security of collected data: Many forms collect from users of very detailed data. Not adequate safety rules on their storage or use may lead to unexpected consequences of legal nature.

In a B2B system, each page is a form with specific controls by means of which the user performs certain actions. The appearance of a page does not resemble a traditional form, only the functionality of the page can be compared to it in its technological aspect. In the B2B system created in ASP.NET technology, each page is like that. The user follows "the path," does tasks for which it was designed, subsequent application pages appear that include the described controls and, in particular cases, elements exist that are designed to perform specific tasks in a given context.

In B2B system, in order to work more efficiently and more effectively with the end user, designers use third-party controls in forms (business partners) to handle input data, adjusting their appearance and form to the whole project. Using sets of controls, the designer may create a unique user interface, dedicated to specific companies cooperating with each other in the B2B system. The results of research carried out under the project have shown that it is advisable to implement a set of additional controls. Using them improves the visibility and availability of specific, which is important when working with the application, information for users, compared to the controls normally available in this technology. Their use had a positive impact on increasing the functionality of the created B2B system.

Elements of predefined graphical templates

The research among customers of OPTeam SA, the analysis of possibilities discussed by graphical user interface designers and, tips on how to create the presentation layer of a web application in B2B system allowed us to form some basic standards for this type of web work.

An interface prototype was developed that is easy to use, practical, and aesthetic. Rules adopted during the process and widely recognized design patterns meet the expectations of future and target users of the application. The interface itself has been assessed as an intuitive, user-friendly, simple, and transparent. Significantly, the functionality of the interface leaves space for its extension. The designed B2B system is highly scalable. It is able to grow with increased workload. Extensions are possible to be implemented in a relatively simple and efficient manner. Already proven design patterns for the user interface designers, which were being followed in our B2B system, cause that it maintains a high level of professionalism. The presentation layer is characterized by an attractive visual appearance and usability.

The prototype of B2B system built in ASP.NET technology is going to adopt the design pattern presented in Figure 1. The sample website (template) defines a graphic frame for the application and uses it as a page template for websites.
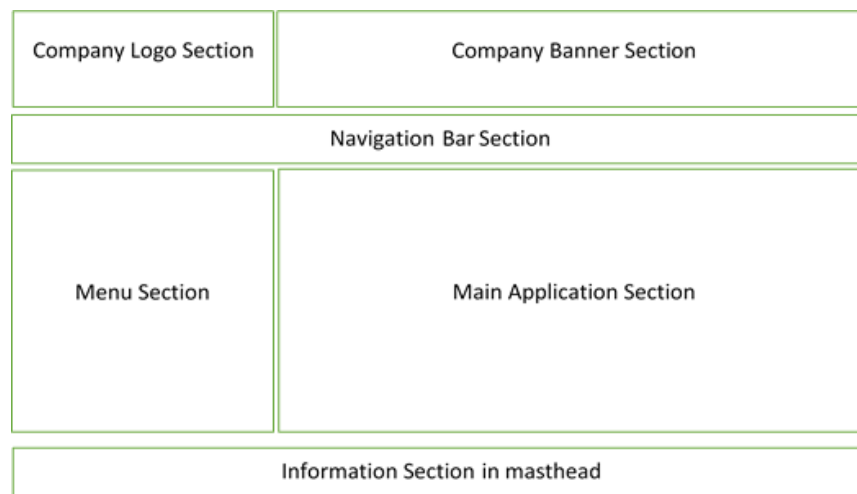

Figure 1. Graphic interface sections of a basic website template

After defining the basic website layout and determining the style of all its components, the outline of particular sections has been discussed. Here, the analysis was required on the future user (company) choice of colour scheme and elements visible on other company's websites. The comparison allowed determining the elements' features (such as colors, fonts, and data display format, etc.).
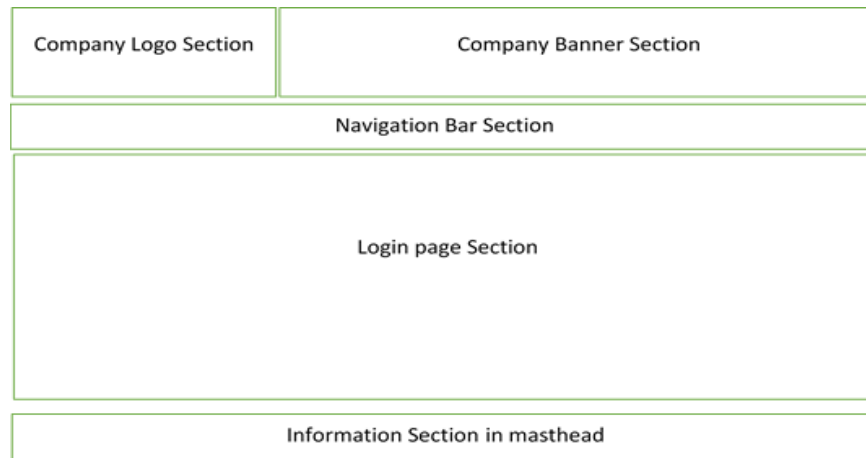
Figure 2. Graphic interface sections of a website template with login sections

Once the designed graphical frame was used as a template for subpages, all subpages functionalities were determined based on the scope of ASP.NET technology.
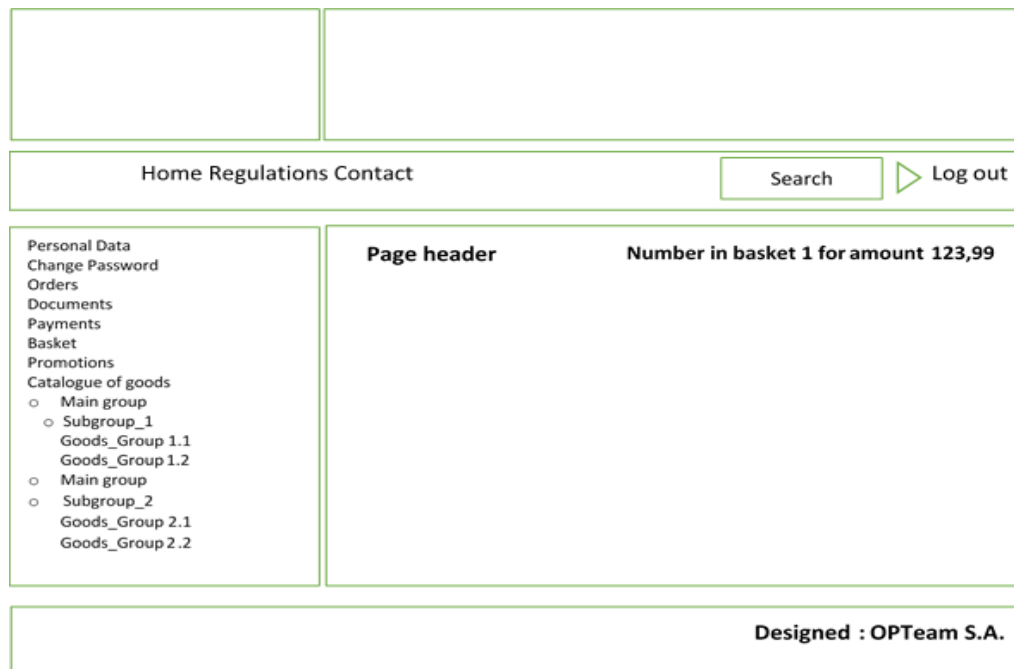

Figure 3. A project of a website based on the layout of the main website template

When determining the graphical interface section of the user, following the analysis of available websites of the company's customers for which this project was created, the position in which the logo and graphical marks will be placed are selected. The entire application navigation system depends on the information that is collected during the user login process to the system. Therefore, the main website template, which has implemented navigation, is used by all application pages, except the login form.

Figure 4. Template used by the majority of websites

Table 1. Description of fields on the basic website template - pattern for all other websites

Component name	Purpose	Field type	Editable
Home	Link to the application home page	Link	No
Terms of use	Information on terms of use of the application	Link	No
Contact	Link to website that enables to send e-mail messages	Link	No
Search	Field to enter the name of the searched item	Text field	No
Graphic – triangle	It starts the procedure of item search based on the phrase being entered.	Picture button	No
Advanced	Link to page with advanced search panel	Link	No
Log out	Starting the procedure of session end by the user and redirecting to log in page.	Link	No
Items in cart	Redirecting to cart details page	Link	No
My data	Redirecting to page with information about logged contractor	Link	No
Contractors	Redirecting to page with a list of contractors, in the mode of sales representative	Link	No
Change your password	Redirecting to page that enables password change	Link	No
Orders	Redirecting to orders list	Link	No
Documents	Redirecting to list of transaction documents	Link	No
Payments	Redirecting to list of documents concerning payments	Link	No
Complaints	Redirecting to list of complaints	Link	No
Service	Redirecting to list of service orders	Link	No
Cart	Redirecting to a website with ordered items details - cart	Link	No
Newsletter	List of messages – newsletter available only for logged in contractors	Link	No
Newsletter Configuration	List of all defined messages for users with special privileges	Link	No
Special offers	Redirecting to list of promotional items	Link	No
Product catalogue	Hierarchic products group available as a hierarchical navigation	Hierarchical navigation	No
Implementation	Redirecting to website of a company that extends the functionalities of the application.	Link	No

As part of the R & D works, there was an alternative version of the website also developed. In the same way as presented above, patterns for subsequent pages and descriptions of fields have been designed.

The solutions adopted in the project are characterized by intuitiveness, ease of use, simplicity, and transparency. They do not adversely affect the functionality of the application in a B2B system. It must be stressed that the application design makes it possible to extend its functionalities in a relatively simple and efficient manner.

Conclusion

This article presents the outcome of research carried out as part of the next stage of a project that concerned the development of state of the art and advanced B2B system based on Internet technologies. This time, the main focus was on the presentation layer, which is more closely related to the user of the application. Through the functions of the interface, the end user is able to perform certain tasks using elements that are in such a layer, known as controls. The components of the presentation layer fulfill functions connected with making it possible for the user to interact with the application via the user interface functions. The mechanisms of the application that enable the interaction with the user are also responsible for data formatting, their form of display, checking, and data validation. The second group includes elements that facilitate the process of interaction. They serve the purpose of synchronization support and arranging such communication.

Further, research that had been completed while designing the B2B system included developing standards of reporting systems in B2B via www, developing a model of an interface of B2B adjusted to work on mobile devices (Android), developing a model of an interface that integrates the B2B system with system of the ERP class and other external devices, and developing safety standards for information that are made available by the system and their storage in the database. The results of these works will be discussed in future publications. Currently, the project is on the stage of the development of the prototype of state-of-the art B2B system.

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