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WSDM-lite: A Lightweight Web Design Methodology for Web Shops

*Master thesis submitted in partial fulfilment of the requirements for the degree of Master
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Abstract

A large number of web shops exist today, but it remains a question how effective these web shops are, i.e. realize a significant increase of profit by selling products and/or services on a global scale. Some of the reasons for not being effective are identified to be the struggle of a small to medium business to achieve a strong brand identity in addition to the use of obsolete technology, bad design choices, complex navigation and the fact that no project plan was followed in order to design the web shop. A business that is not accurately or completely reflected on the web may result in a poor outcome. In this research, we aimed at providing means that can help small to medium businesses to set up a well defined web shop that correctly reflects their business.

Web design methodologies can contribute to the proper design of a web site, i.e. content categorization, content representation, navigation and structure of a web site, by collecting and modeling all the necessary information and functionality which needs to be included in this web site. Therefore, applying a specific methodology to design a web shop, can lead to a better web shop and as a result allows to achieve its objectives better. This thesis suggests that the audience driven Web Semantics Design methodology (WSDM) which has as a priority the target users, in combination with a Web Content Management System (WCMS) framework can produce an efficient and practical solution for designing web shops which will come closer to achieving their goals. On the one side, the WSDM design methodology will guide the developer through the steps of user classification, requirement specification, information modeling and navigational design, all of which are important factors contributing to a good design. On the other side, a Web Content Management System will facilitate the implementation of the design into the virtual representation of the business without *necessarily* requiring from the developer any level of programming awareness.

1. Introduction

Currently, the vast majority of businesses already have an online presence or become more and more interested in obtaining one. In addition, all major corporations already conduct their business in the internet market. In Belgium, the number of active web shops for March 2012, was estimated at over 5.000 according to the web site of bme.be¹. At the same year, the number of web shops in the Netherlands was more than double, according to CBS (HBD)² they were 16.400. That is a huge increase since only in January of 2010 the number of web shops in the Netherlands was only 7.100

Online presence these days does not only mean a stand alone web site; it includes the cases where the web shop is incorporated within a social networking site like the ‘Pages’ of FaceBook where a business can not only advertise their products but also create offers for those products. For several businesses in fact, over 25% of their product sales are “attributable to FaceBook”³.

While in the past, developing a web site was a very complex and time-consuming task, creating one has become much easier since there is a vast amount of Web Content Management Systems (WCMS) and other services which offer a platform and turnkey solutions for almost anyone to create their own website. Most small to medium size businesses in fact use these services and WCMS solutions to create and publish their content on the web. The use of such systems undoubtedly offers numerous advantages, the most important of them being the opportunity to effortlessly create and maintain a web site with no need of specialized knowledge from the side of the developer. However, using these types of solutions without the use of a proper design methodology is not advisable. Some goals and aspects of the business could not be supported or even considered. Therefore, at least a thorough analysis of the goals and content of the website is still required to obtain a consistent, usable, and maintenance low web site.

¹BME - E-Commerce: <http://www.bme.be/E-Commerce-feiten-in-belgie/#> [Last Access Date: 15-07-2013]

²Statistics Netherlands: http://www.hbd.nl/pages/14/Aantal-webwinkels/Webwinkels.html?branche_id=41&hoofdonderwerp_id=26&displayBrancheDropdown=false [Last Access Date: 15-07-2013]

³ Facebook Success Stories: <https://www.facebook.com/business/success> [Last Access Date: 29-07-2013]

1.1 Problem Definition

The main principle of each business and consequently of each electronic business is *to achieve maximum profit at minimal cost*. However, an online presence does not always guarantee success or any significant increase in sales. The online presence, i.e. web site, need to be engineered with care to achieve the desired outcome. We can consider it as setting up a market campaign and a shop at the same time.

In the Web Engineering field, several design methods exist to assist in the design of a web site. However, these design methods were developed in early days of the web when little supporting tools for web development were available. They target large and complex websites and are intended to be used by professional and skilled web engineers. The continuing evolution of the web in combination with the emergence of new technologies and platforms has resulted in many easy to use tools to set up a web site. Examples include moonfruit⁴ and wix⁵.

However, we are convinced that even with the use of this new turnkey solutions, it is necessary to do a thorough analysis of the goals and the content of the website. This can be achieved with providing a simple to use web design method, i.e. a web design method that is usable by the same type of people that will use these turnkey solutions. Therefore, the purpose of this thesis is to show how a particular methodology, the **Web Semantics Design Method** (WSDM), can be adapted into an easy-to-use methodology for web designers and advertising specialists, to construct a web shop or even update and modify an existing one. This lightweight method will be applicable in combination with a number of the most popular Web Content Management Systems for the implementation part. We have opted for WSDM as starting point because of its audience driven approach, which puts the requirements of the audience of the website central in the development process. This approach fits well with the targets of a web shop, i.e. to increase sales, and do to so we have to take the needs and the characteristics of the potential buyers into account (we elaborate on this motivation further on). The aforementioned targets result to the following problem definition:

“How can the WSDM method be adapted for the purpose of developing an optimal web shop for small-medium enterprises by medium ICT⁶ schooled people, using a popular WCMS of choice”

It is necessary to explain the terms *optimal* web shop, *medium ICT schooled people*, and *adapted* method in the problem definition. An *optimal* web shop is considered to be one that has all the required characteristics to achieve its goals. *Medium ICT schooled people*, are those people who have knowledge on Information Technology

⁴ moonfruit <http://www.moonfruit.com/> [Access Date: 29-07-2013]

⁵ wix <http://www.wix.com/> [Access Date: 29-07-2013]

⁶ ICT: Information and Communication technology

and Communications but did not receive an in depth schooling about Web Engineering. An *adapted* method is the modification of an already existing method.

In this case specifically, the WSDM method (De Troyer, Casteleyn & Plessers, 2007) is going to be adapted and applied amongst several other design methods that exist. The reason for using WSDM is because it is an audience-driven web design method. Since web shops are data intensive, one may raise the question of why we didn't opt for a data-driven methodology instead. An additional argument is that a data driven methodology would be most appropriate for the optimization of product categories which are an essential part of any web shop.

As mentioned earlier the main goal of each business is to increase profit. A way to succeed in that is as follows:

- To be able to increase the number of customers (increase of sales)
- To be able to built a good relation with the customer base (maintainable profit)

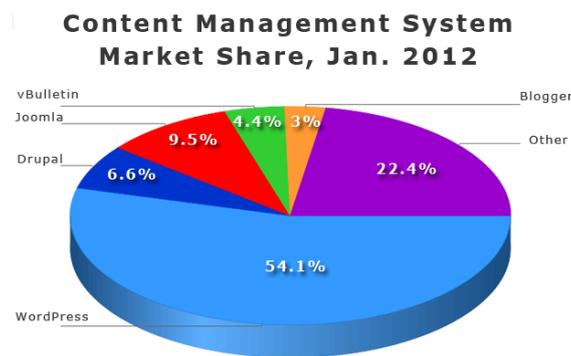
As such, customers are very important and should be given **special attention** when designing a web shop. Therefore, the focus is on the customers who should be able to find the product they are looking for in a fast and efficient way in the web shop, without being presented to information irrelevant for them and which will frustrate them and drive them away. For a web shop, the customers or the potential customers are the **users**, also called the target audience, of the web site. Therefore, an **audience driven** methodology such as WSDM is the most appropriate to be applied in the creation of a web shop in order for it to be effective and at the same time well designed.

In addition, we will focus on small-medium enterprises for several reasons. Firstly, large corporations, such as SONY or Apple, already have achieved brand awareness and have a broad customer base that trusts them even on the internet where concerns of security and data protection can arise. Although 'trust' and 'popularity' are not necessarily equivalent to a good design as defined in the engineering domain, these type of web shops have already achieved their goals to a great extent. In contrast to this, small to medium enterprises often lack the resources or fail to understand the necessity of properly designing their web site. Most small to medium businesses want to get on the Internet market **fast** in a **cost effective** way and often using freelance developers, graphical designers, or one person companies to create their web sites. These people may master the technology to create a web site but are usually not schooled in proper software or web engineering methodologies. As such, the resulting web site may be of doubtful quality, which on its turn will result in a struggle to achieve increase of sales, to inspire trust, to attract more customers and therefore achieve the objectives.

Content Management Systems (CMS) provide the possibility to create, archive, search, control and publish information in a flexible and integrated environment (Burzagli et al., 2004). When the functionalities of a CMS are available for the web ,

then it is called a *Web Content Management System (WCMS)* which is defined by K. Roebuck as “*A web content management system (WCMS) is a software system that provides website authoring, collaboration, and administration tools designed to allow users with little knowledge of web programming languages or markup languages to create and manage website content with relative ease*” (Roebuck, 2011). There are several WCMS available to choose from in order to implement a web shop and for the implementation part of this thesis the following were selected:

- Wordpress⁷
- Joomla⁸
- X-Cart⁹



Source: w3techs.com

Figure 1.1: Market Share of WCMS [source: w3techs.com]

The figure above, Figure 1.1, demonstrates the market share of the different WCMSs. The selection of Wordpress and Joomla for the implementation phase of this thesis, at this point, was based on their popularity while the selection of X-Cart is based on personal experience with this particular E-Commerce software. Wordpress and Joomla, are likely to be chosen also in practice and are not solely chosen for research purposes, that in addition offers a pragmatic solution.

⁷ Wordpress: <http://wordpress.org/> [Access Date: 29-07-2013]

⁸ Joomla: <http://www.joomla.org/> [Access Date: 29-07-2013]

⁹ X Cart: <http://www.x-cart.com/> [Access Date: 29-07-2013]

1.2 Structure of the Thesis

In this section, an introduction of the thesis topic and the problem definition is given. In addition, the terms which are included in the problem definition were introduced and were briefly explained for the reader. This particular research question is raised firstly on personal experience and a general research interest. In addition to that, one can observe the constant need for more effective web sites and the need to investigate to what extent the various existing solutions offer the creation of such web sites.

The following chapter provides the background of the related concepts of this thesis. The chapter begins with a description of the Web Semantics Design Methodology and is followed by the state of the art of Web Content Management Systems. A more specific description of the systems selected for the implementation part of this thesis is given for Wordpress, Joomla and X-Cart. After that the background of E-Commerce is explored, the genre of websites that is the focus of this thesis.

In the third Chapter, we describe the adaptation of WSDM to WSDM lite (**limited technology**). At this point, certain sub-phases of WSDM are being unified, excluded or made simpler to better its purpose. In addition an extra sub phase will be introduced, that is the ‘WCMS Specification and Social Media Integration’ phase which was not present in original WSDM method.

In the last Chapter, we will demonstrate how the WSDM lite methodology can be applied using two different WCMS frameworks and a software package system to demonstrate the solution.

2. Background

This chapter includes the background on the concepts which are connected to this thesis. We begin with the Web Semantics Design Method (WSDM), which is the foundation of this research. After that, a brief description of the Object-Role Modeling method and Navigational Design method is given, both are used during the development process of WSDM but also of WSDM-lite. Furthermore, the background concerning Web Content Management Systems will be explored and an introduction of Wordpress, Joomla and X-Cart; the frameworks which are used for the implementation part of this research will be provided. The chapter will be concluded with the background on the E-Commerce web site genre.

2.1 Web Semantics Design Method (WSDM)

Originally, WSDM was an acronym for Web **Site** Design Method, a user centered method developed by De Troyer and Leune (De Troyer, Leune 1998). Initially, this method was used exclusively for the creation of web sites that only provided information, called kiosk web sites. However, since then, the web has significantly evolved and at the same time, WSDM has evolved as well. For WSDM, this was realized with the introduction of new phases in the design process, and most importantly by including the “web of data” in the method, i.e semantics.

This led to renaming the method into Web **Semantics** Design Method (WSDM), an audience driven method that provides a systematic way to develop any kind of web site, without excluding from its process the modeling of the plethora of user requirements (information and functional). These user requirements are represented in the structure of the resulting web site. This way, developers avoid presenting on the web site data that is created for the sake of internal use in the organization. Usually, this data is structured in a way that is meaningful only for that organization but not necessarily for the end users of the web site. Due to the audience driven nature of WSDM, the main concern is the needs of the target users and in this way this method leads to a web site designed for and adapted to the target users.

WSDM consists of five phases, each of which produces a specific outcome which is used as an input by its subsequent phase(s). These are namely the following phases:

1. Mission Statement
2. Audience Modeling
3. Conceptual Design
4. Implementation Design
5. Actual Implementation

Some of these phases are further decomposed into sub phases, as it will be presented in more detail in Chapter 3. The WSDM phases provide a clear separation of audience classification, conceptual design, and the graphical representation of the web site. This allows the developer to model the requirements necessary for the user but also

provides flexibility as more than one presentation design, i.e a design template, can be applicable for the conceptual design (we explain how this is possible in Chapter 3).

For a more detailed description of WSDM, we refer to (De Troyer, Casteleyn & Plessers, 2007). In the next subsections, we describe briefly two important modeling techniques used in WSDM. Section 2.1.1 describes ORM used for information modeling in WSDM, and section 2.1.2 describes the modeling of the navigational design in WSDM.

2.1.1 Object-Role Modeling

Object-Role Modeling (ORM) according to orm.net¹⁰, is a method in which we can model the information of our system in terms that are easily understood by non-technical users. “ORM began in the early 1970s as a semantic modeling approach that views the world simply in terms of objects playing roles” (Halpin, 2001, p.8). The Web Semantics Design Method, uses the Object-Role Modeling approach, not only to model the users’ information but also the functional requirements during the Conceptual Design phase. In this section, we will briefly explain the notation that is used in WSDM to create, so-called object chunks.

An object, or *object type* is an entity representing a concept included in our system, which is graphically represented in a circle along with its related *entity type*(*between brackets*). An *entity type*, is a way to uniquely refer to the different instances of the particular object type. Consider for example a product in a web shop; this product has a Stock Keeping Unit (SKU), a number that uniquely identifies it. In this example, the product is the object type and the SKU is its entity type. On the other hand, a *data type* is a string or number which does not need a unique reference and is represented with a dashed circle. An example of a data type is the name of a product that is simply a string. See Figure 2.1 for an illustration.

An object type can be connected to another object type or to a data type to represent a *relationship*. That happens through the *roles* each object type plays in the relationship. For example, *a product belongs to a category and that category contains a product*, in which case the object type “product” is connected with the object type “category” through their respective roles “belongs” and “contains”. Consider also that, *a product has a name and that name is of a product*, in this case the object type “product” is connected to the data type “name” through their respective roles “has” and “of”. A role is represented with a box that is connected to the object type it belongs. An example of this is given in Figure 2.1:

¹⁰ Object Role Modeling web site: www.orm.net [Access Date: 4-08-2013]

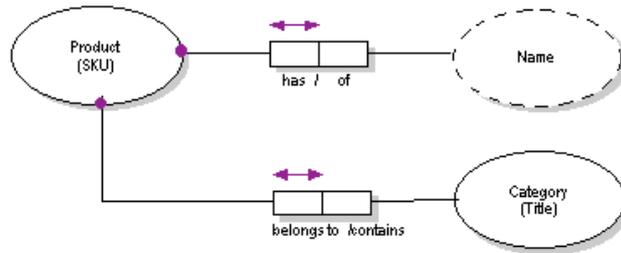


Figure 2.1: ORM model for “Product has a Name and Product belongs to a Category”

An object type can be a *supertype* of one or many *subtypes*. This allows multiple inheritance of attributes from the supertype to its subtypes and at the same time prevents the creation of an exhaustive conceptual model. For example, ‘Clothing’, ‘Shoes’, and ‘Accessories’ are all categories of products. Instead of modeling relationships between a product and all the possible types of categories, we can model these categories as subtypes of one supertype ‘Category’. This way, the multiple categories inherit all the attributes of the supertype ‘Category’. The relationship between supertype and subtype is represented by means of an arrow as illustrated in Figure 2.2:

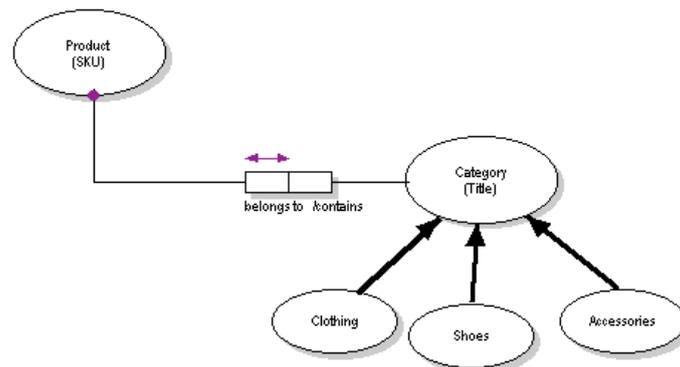


Figure 2.2: ORM Model Category Supertype and Subtypes

Last but not least, with the ORM notation we can model several constraints:

- *The mandatory constraint*, represented with a dot to its corresponding object type which expresses a mandatory relationship. For example, in Figure 2.2, a product must belong to a category. The same is not necessary for a category; the list of products belonging to a category can be empty.
- *The uniqueness constraints*, are represented with arrows on top of the corresponding role and express which roles must have unique entries. For example, in Figure 2.2, a product belongs to one category.

All of the aforementioned constraints and characteristics are used in WSDM for the creation of object chunks. For a detailed description of the ORM modeling method, refer to the “*Information Modeling and Relational Databases*” book by (Halpin,

2001). For a more detailed description of the ORM variant in WSDM, we refer to (De Troyer, Casteleyn & Plessers, 2005)

2.1.2 Navigational Design Method

Navigational design, in the context of Web Semantics Design Method is a sub phase of the ‘Conceptual Design’ phase. This sub phase, includes a method in which we create navigational tracks for each of the audience tasks, which are modeled with the CTT notation (Paterno, 2003). These navigational tracks, contain the functionality and information needed by each particular audience class. After that, the audience tracks are combined with *structural links* to provide a *basic conceptual navigation structure*. The outcome of this phase is an overall *Navigational Model*.

A navigational model in WSDM consists of components, “conceptual navigation units that group the information and functionality of one or more object chunks” (De Troyer, Casteleyn & Plessers, 2007, p.25) and the links between these components. WSDM, distinguishes between four types of links, which are:

- *Structural links*, which combine all audience tracks together and define the structure between these audience tracks (See Figure 2.3 for a graphical representation of these type of links).
- *Procedural links*, which express the workflow between components or the invocation of external functionality, i.e a web service. (See Figure 2.4 for a graphical representation of this).
- *Semantic links*, which are created based on the semantic relationships between objects, as they are defined in object chunks (See Figure 2.5 for a graphical representation of this).
- *Navigational aid links*, which are shortcuts provided to ease navigation and enhance usability (See Figure 2.6 for a graphical representation of this).

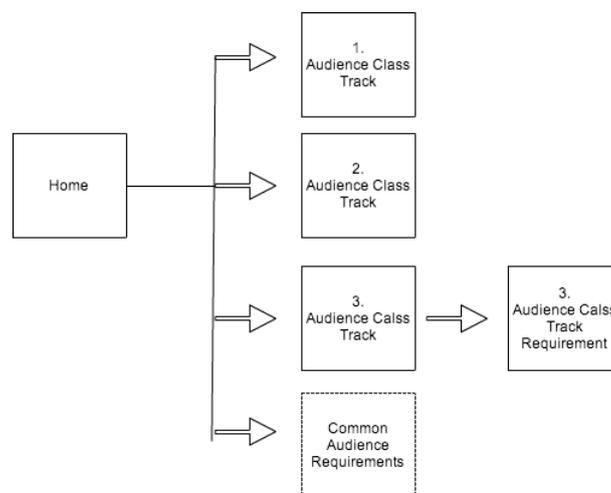


Figure 2.3: Structural links example in an abstract Navigational Model

A *procedural link* can be further on defined as a one-to-one link, meaning that one component links to another component. A one-to-many link, which means that one component links to more than one component. A many-to-many link, which means that many components link to many components. A conditional link, which means that one component can lead to another component when a certain condition is satisfied. And a parameter link, which is a link with a parameter. The graphical representation of the different kinds of procedural links, is represented in Figure 2.4. Note that parameter links and condition links can be used with one-to-one, one-to-many, many-to-one, and many-to-many links.

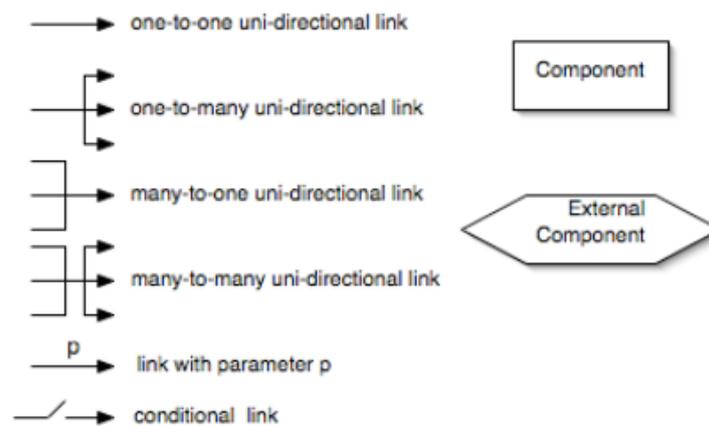


Figure 2.4: Procedural links and Components (source: De Troyer, Casteleyn & Plessers, 2007, p.26)

Semantic links and *navigational aid links* are added once the overall conceptual navigation structure is derived. For an example of semantic link, consider a requirement of an audience class for a web shop: *To be able to browse from a list of products to the shopping cart, in a straight forward way.* We can provide an opportunity to the particular audience class to create lists of products. From there, the user should be able to navigate from this list to viewing the details of a product, into adding that product to the shopping cart. The different tasks representing these requirements can be connected with each other with the use of semantic links. Figure 2.5 represents an example of this.

Examples of navigational aid links include the *home* link, the *log in* and *register* links and if we consider the case of a web shop, the *shopping cart* link.

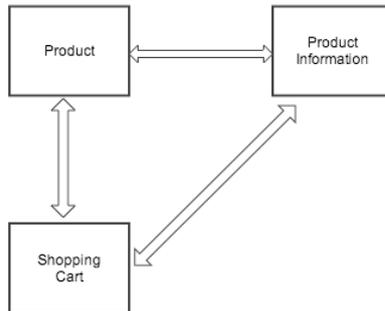


Figure 2.5: Example of Semantic Links

In addition to links, WSDM distinguishes between components in the following way:

- *Source Component*, is the component that links to other component(s)
- *Target Component*, is the component that “accepts” links from other component(s)
- *External Component*, is a component that is not a part of our web site, for example a web service (De Troyer, Casteleyn & Plessers, 2007, p.24 to p.33).

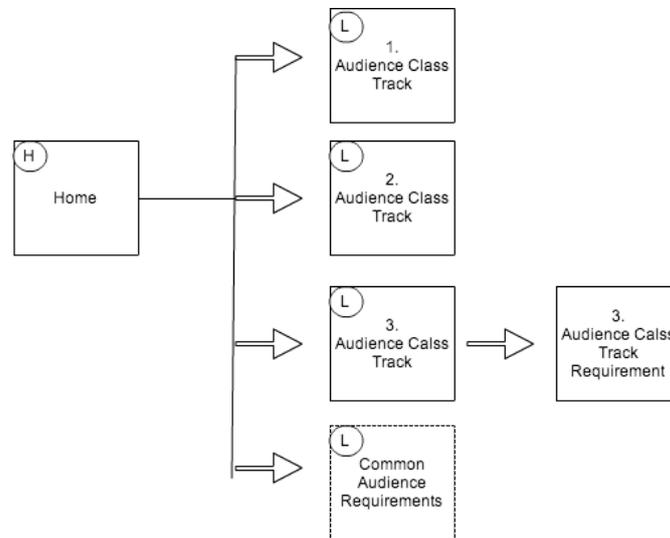


Figure 2.6: Example of abstract Navigational aid Links: Home and Landmarks

This method, with which we can model navigation, will be applied in WSDM-lite as well. In Chapter 3 we provide further explanation on how this will be possible.

2.2 Web Content Management Systems

A Web Content Management System (WCMS) is a software system which provides the developer all the necessary means to manage and create a web site with a relative ease. Within such a WCMS, the production and management of content, i.e. publishing and editing, is a completely separated process from setting up the site. To maintain the content of the web site, knowledge of programming and of markup languages is not considered necessary although, it may be useful in some specific cases. For setting up the web site more knowledge about ICT and web technology may be needed, although not always.

The majority of websites today are database-driven and template-based (Ford & Wedemann, 2008) and a WCMS framework frees the developer from creating the database and allows not only to populate it without, or with little, technical knowledge but in addition, a WCMS allows achieving security, scalability and extensibility. The way to succeed in that is by utilizing the general capabilities included in a WCMS, which according to (Roebuck, K., 2011) are the following:

- *Automated Templates*, which allow the developers to change the appearance of a web site, in an automatic way, from one central place (the admin panel¹¹), without affecting the structure or the content.
- *Scalable Feature sets*, which are the available plug-ins or modules included in a WCMS and which can extend the functionality of a web site.
- *Scalable Expansion*, which is the ability to expand an implementation by creating multiple sites, i.e. micro sites or web portals, within a main site (an example of such a feature is discussed in subsection 2.2.1 of Wordpress)
- *Access Control*, which allows developers to control the way users interact with the web site. For example, registered users can view pages that correspond only to them while unregistered users cannot access pages that require a log-in.

For a more complete description of the WCMS capabilities, we refer to (Roebuck, K., 2011)

Creating a web site with a WCMS framework can offer numerous advantages but it can also entail a lot of risks. In their majority, WCMSs are open source and even though there is a possibility where certain templates or plug-ins are premium (payable), that cost is not comparable to the cost of assigning the complete work to a professional developer team. However, a web site needs to be hosted and maintained especially in the event where internal module changes, or server side updates, cause errors in the layout or the functionality of the web site. A WCMS, in some cases, can provide hosting services (we will see this in the following subsection 2.2.1) but does not provide automatic maintenance. In addition, since WCMSs are designed to be used by non-technical people, they do not provide the same flexibility and

¹¹ An Admin Panel, or “Dashboard”, is the front page of the control panel of a WCMS. In this page it is indicated which modules need update and also the administrator can view statistics such as for example, the total sales per week

expressiveness as code frameworks or programming. In addition, out-of-the-box implementations may not be satisfying. Extra challenges with the use of such systems are storage issues concerning web sites that are data intensive, where updating of information may be difficult or a file may be hard to find. Latency issues can be caused as well if the database of the web site is not used properly or if the hardware infrastructure is not up to date. More information on Web Content Management Systems, is available in (Roebuck, K., 2011).

There is a large number of WCMS frameworks available today and it would not be possible to test the application of every one of them. In the following subsections, we provide a description of the WCMS frameworks that will be used in the implementation part of this thesis. In section 2.2.1, we discuss Wordpress, while in section 2.2.2 and section 2.2.3 we describe Joomla and X-Cart respectively. In each section, we provide examples of web sites that have been created with these particular WCMSs.

2.2.1 WordPress

Wordpress was first released in 2003¹² and apart from being an established bloggin tool, it is also a widely used Web Content Management System (WCMS) based on PHP and MySQL. In fact, Wordpress is in a dominant position in the WCMS market share, according to w3tcechs.com¹³, with 57.1% of web sites using it. At the time of writing the newest version, Wordpress Oscar 3.6¹⁴, has been downloaded more than 1.7 million times¹⁵. However, the reason to consider this particular WCMS is not only based on its popularity. Additional advantages include a plug-in architecture, which offers extensibility, and flexibility in customization which can be achieved through the available themes and widgets included in Wordpress.

In detail, more than twenty-six thousand plug-ins¹⁶ are available for Wordpress which allow developers to add to the web site, in a dynamic way, components that will support certain functionalities. An example of this is a plug-in that provides ways to manage the products of a web shop (we will provide a more detailed description of such a plug-in in Chapter 4). Widgets on the other hand, support a drag-and-drop content placement on the web site that would otherwise require a low level programming. For example, with the use of such widgets developers can add (fill-in) forms or Social Media buttons to the web site. These buttons, widely known as the

¹² First Wordpress Release Date: <https://wordpress.org/news/2003/05/wordpress-now-available/> [Access Date: 7-08-2013]

¹³ Usage of content managements systems for websites: http://w3techs.com/technologies/overview/content_management/all/ [Accessed Date: 6-08- 2013, Data are being updated daily]. The 57.1%, corresponds to 18.9% of all web sites.

¹⁴ Current Wordpress version: <http://wordpress.org/news/2013/08/oscar/> [Access Date: 7-08-2013]

¹⁵ Wordpress 3.6 download counter: <http://wordpress.org/download/counter/> [Access Date: 7-08- 2013]

¹⁶ Official Wordpress Web site: <http://wordpress.org/plugins/> [Access Date: 6 -08-2013]

‘like’, ‘share’, or ‘tweet’ buttons, allow users to link a piece of content from a web site to their Social Media profile (we will provide more examples of widgets in Chapter 4). Wordpress themes are either free or premium and they allow developers to change the graphical presentation of a web site without affecting the structure, or the content included within.

A number of well-known industries, mostly in arts, media, and entertainment, have used Wordpress to publish their content on the internet. Some examples include the web shop of ‘Kartell - Los Angeles’, shown in Image 2.1, and the web site of ‘Variety’, shown in Image 2.2

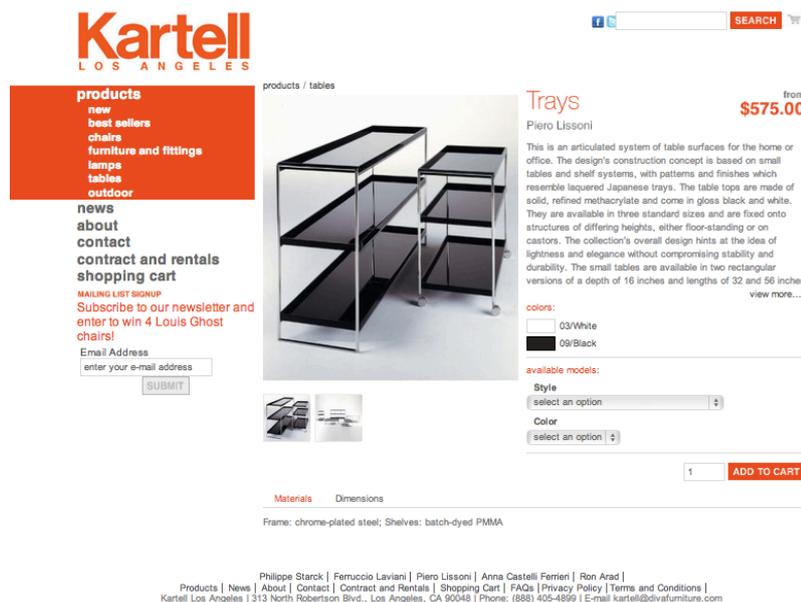


Image 2.1: Kartell web shop powered by Wordpress.org (source: <http://kartellstorela.com/>)

The web shop of Kartell, an Italian company which produces and sells modern furniture, is one of the plenty examples where a business uses a WCMS framework in order to be represented on the internet, and sell its products through the same mean. In this particular example, kartellstorela.com, is created with Wordpress in combination with the Shopp E-Commerce plug-in¹⁷. This plug-in supports cart and product management, shipping tax calculations, and features such as related products and add-on integration with several shipping services, like UPS¹⁸.

Variety is an American lifestyle magazine, which launched its first digital issue in 1998¹⁹. We provide this web site as an example because it includes a wide range of

¹⁷ Kartell - Los Angeles web shop: <http://wordpress.org/showcase/kartell-los-angeles/> [Access Date: 6-08-2013]

¹⁸ Shopp Plug-in for Wordpress web site: <https://shopplugin.net/> [Access Date: 6-08-2013]

¹⁹ Launch Date of Variety.com: <http://variety.com/static-pages/about/> [Access Date: 7 -08-2013]

information which is updated on a daily basis. In addition, this web site contains a searchable archive which includes information dating back to 1914. This is an example of how a data intensive web site can be designed and maintained with the use of a WCMS framework. Currently variety.com is powered by ‘Wordpress VIP’, a special plan of Wordpress. With this vip.wordpress²⁰ plan, the developer team of Wordpress provides for a certain fee, the hosting and security of the web site, scalability to handle big number of page views and user requests, and web service and API²¹ integration.

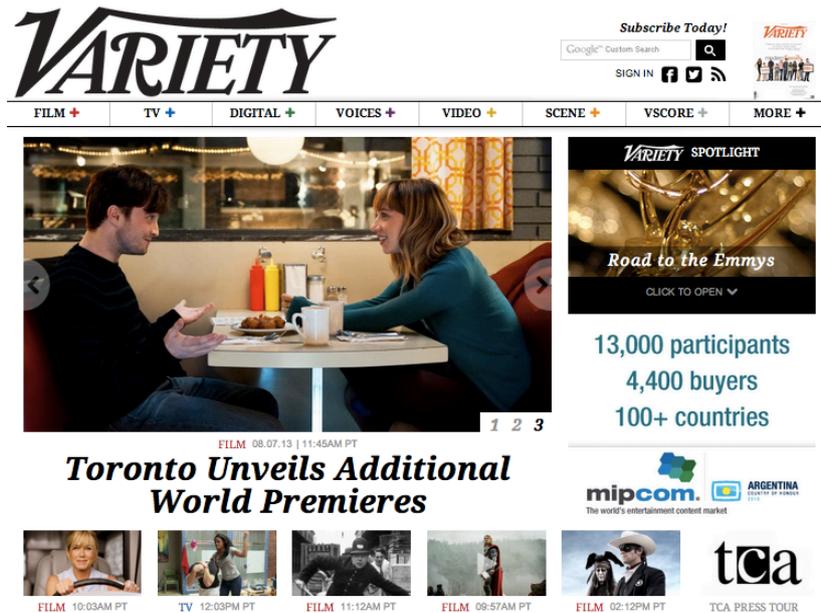


Image 2.2: Variety web site powered by Wordpress VIP (source: <http://wordpress.org/showcase/variety/>)

For types of web sites that need to contain a large amount of information but also sub divide a lot of content into different pages, Wordpress MS (MultiSite) is an optimal choice. Current versions of Wordpress have incorporated the Wordpress multisite configuration, which was once a stand alone version. This configuration allows developers to built multiple sites operating in one Wordpress installation²². We present two examples of such multisite web sites: [bbcamerica.com](http://www.bbcamerica.com)²³ , the web site of BBC America network, and [umaine.edu](http://www.umaine.edu)²⁴, the website of the University of Maine.

²⁰ Wordpress VIP Information: <http://vip.wordpress.com/> [Access Date: 7-08-2013]

²¹ Application Programming Interface

²² Wordpress Multisite Explanation: <http://mashable.com/2012/07/26/beginner-guide-wordpress-multisite/> [Access Date: 7 -08-2013]

²³ BBC america web site: <http://www.bbcamerica.com/> [Access Date: 7 -08-2013]

²⁴University of Maine web site: <http://www.umaine.edu/> [Access Date: 7 -08-2013]

The BBC America web site includes amongst other, information concerning the entertainment programs of this network. The way bbcamerica.com has structured their content is by sub dividing it into several micro web sites, what they call *child* web sites, each dedicated to a particular show of the network. These child websites have graphic styles that are appropriate for each show and contain different types of information, that correspond to each show. Image 2.3 shows examples of this.

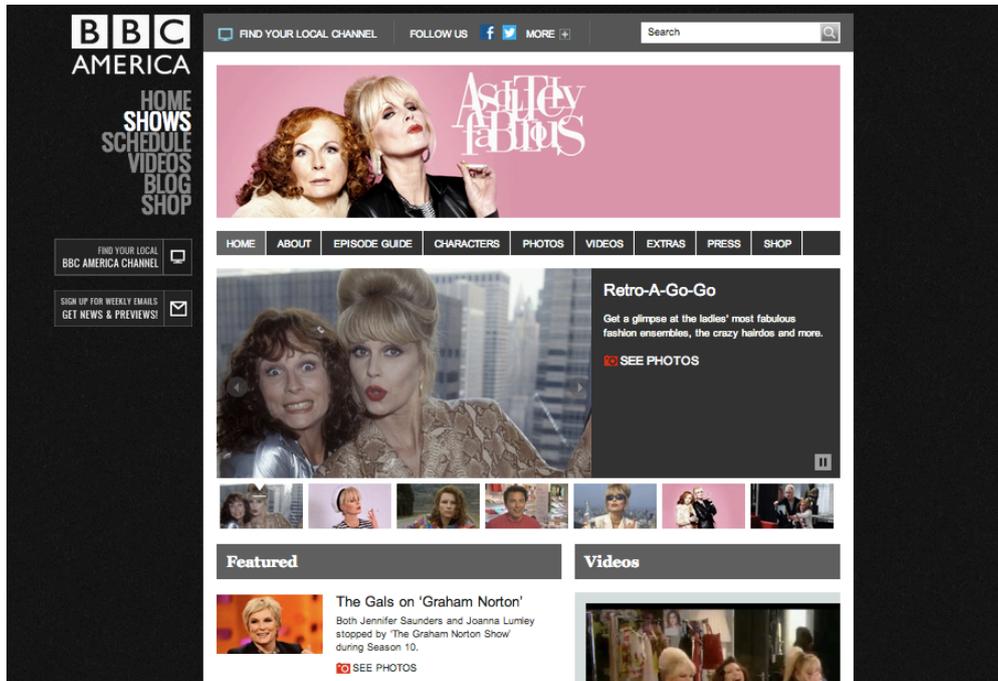


Image 2.3: BBC America 'child' web site for 'Absolutely Fabulous' program (source: <http://www.bbcamerica.com/absolutely-fabulous/>)

The website of the University of Maine, as every web site for an educational institution, includes a vast amount of information that corresponds to different types of users such as current students, future students, parents, and academic staff. The content within an educational web site, includes information about: admissions, educational programs, departments, scholarships, and much more. In this example, umaine.edu uses Wordpress MS to sub divide their content, while maintaining a common *look and feel*.

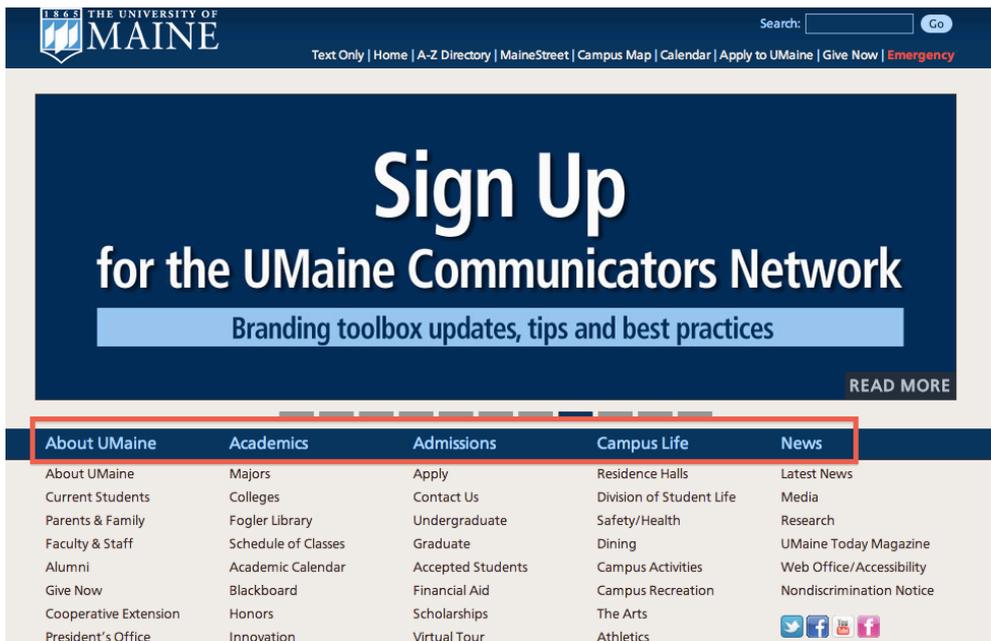


Image 2.4: Maine University-Home page (source: <http://www.umaine.edu/>)

In Image 2.4, we can view the main page of the University, which includes all the general information and several categories, indicated with a red rectangle, which correspond to different types of audience. In Image 2.5, we can see the page that includes information specifically corresponding to Parents and Family.



Image 2.5: Maine University- Parents & Family Page (source:<http://www.umaine.edu/parentsfamily/>)

Developers can also choose the Wordpress.com plan which provides the hosting of the website, offers a customizable domain name, SSL security, and backup of the web site all supported by the developers team of Wordpress. In addition, Wordpress.com

provides social integration and other features without the need for the developer to install a plug-in. For more information on Wordpress and its several plans, we refer to the <http://wordpress.org/> website.

2.2.2 Joomla

Joomla is a well known, open source Web Content Management System (WCMS) which was first released in 2005²⁵. The development team of this particular WCMS framework emphasizes the notion of open source code, a subject that is also widely discussed in the Computer Science domain. In fact, the name ‘Joomla!’ was the result of a vote from the community of developers and is the Swahili word, Jumla, which means *as a whole* or *all together*²⁶.

Joomla is based on PHP and MySQL however, as of 2012 it can also run on MS SQL and PostgreSQL²⁷. Additionally, Joomla can be used independently as a Model View Controller (MVC) web application framework²⁸. Extensibility, scalability and flexible customization can be achieved with Joomla through its *extensions* which are merely the available templates, plug-ins, modules, and components. As in every WCMS framework, templates allow developers to customize the layout, i.e. the graphical presentation of the web site. Plug-ins in Joomla provide a certain functionality; when an *event* is triggered, for example the submission of a user form, then all related functions in the plug-in will be executed in a specific order²⁹ (a more detailed description of a plug-in will be provided in Chapter 4). Modules, allow developers to add certain functionality to the web site such as a log-in or a search box. Components, in Joomla, are described as mini-applications and are the most important kind of the extensions³⁰. These components are responsible for certain operations, such as for example the products menu system for a web shop (a more detailed example of such a component will be given in Chapter 4).

For the moment, Joomla holds the second position on the WCMS market share, powering 9.8% of web sites, according to w3tcechs.com³¹. Even though that is a noticeable difference from the percentage that Wordpress holds, a lot of major

²⁵ General Information for Joomla and Release date: <http://www.joomla.org/about-joomla/the-project.html> [Access Date: 7-08- 2013]

²⁶ Open Source matters: <http://opensourcematters.org/joomla.html> [Access Date: 7-08- 2013]

²⁷ Multi Database support in Joomla 2.5 : <http://www.joomla.org/25> [Access Date: 7-08- 2013]

²⁸ Joomla MVC web application framework : http://docs.joomla.org/J1.5:Developing_a_MVC_Component/Introduction [Access Date: 7-08- 2013]

²⁹ Joomla Plug-in: <http://docs.joomla.org/Plugin> [Access Date: 7-08- 2013]

³⁰ Components of Joomla: <http://docs.joomla.org/Component> [Access Date: 7-08- 2013]

³¹ Usage of content managements systems for websites: http://w3tcechs.com/technologies/overview/content_management/all/ [Access Date: 6-08- 2013, Data are being updated daily]. This number corresponds to 3.3% of all web sites.

corporations and industries use Joomla to create their web sites, examples include automotive industries such as Peugeot and Toyota³². For the purposes of this research, we present two examples of web sites both powered by early versions of Joomla. One is the web shop of Olympus Australia, olympus.com.au³³, and guggenheim.org³⁴, which is the web site of the Guggenheim museum.

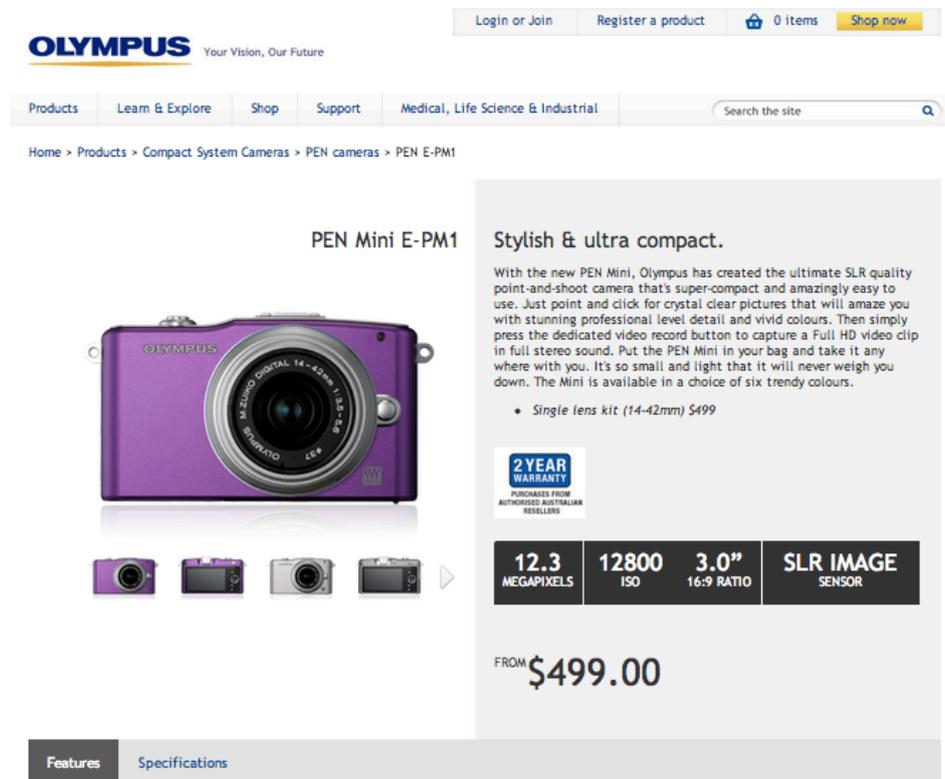


Image 2.6: Olympus Australia web shop (source: <http://community.joomla.org/showcase/sites/technology/consumer-electronics/olympus-australia.html>)

The web shop of Olympus Australia, shown in Image 2.6, is designed with the first version of Joomla and includes a variety of product categories of this brand. It was not possible to retrieve more specific information concerning the plug-ins and components that were used for the web shop's product management and cart system. However, we include this example of a web shop because of several usability flaws that we were able to point out. As mentioned before, popularity is not necessarily equivalent to a good design. In addition to that, a WCMS framework cannot guarantee efficiency if the developers did not design the web site with the proper care. In this specific example, while it is possible to browse through products and find information concerning them such as a detailed description, a list of specifications and the price, it is not possible to purchase all of them from the web site. For example, for the product

³² Joomla Showcase for Automotive: <http://community.joomla.org/showcase/sites/business/automotive.html> [Access Date: 7-08- 2013]

³³ Olympus Australia web site: <http://www.olympus.com.au/> [Access Date: 7-08- 2013]

³⁴ Guggenheim museum web site: <http://www.guggenheim.org> [Access Date: 7-08- 2013]

shown in Image 2.6, a customer can view the price, a detailed description and the specifications of this product but he/she cannot add it to shopping cart nor purchase it. That could frustrate the users and discourage them from using this web shop for a purchase, or in the future.

The web site for the Guggenheim museum of modern and contemporary art, is designed with Joomla 1.5 and contains information about the museum exhibitions in its multiple locations as well as information on special events. One of the goals of the web site is to help potential visitors of the museum gather all necessary information before their visit while in addition, the opportunity to purchase tickets on line is provided. The guggenheim.org, includes a calendar where users can search for past and future events. There is also a link from the web site to the corresponding museum shop, although it is not clear if the web shop is also created with Joomla. This is an example of a web site which includes a vast amount of information and functionalities, yet powered by a WCMS in order to manage and organize all of this content and functionality.



Image 2.7: Guggenheim Museum web site (source: <http://community.joomla.org/showcase/sites/arts/museums/the-guggenheim-museum.html>)

2.2.3 X-Cart

X- Cart is a turnkey E-Commerce solution that is created by Qualiteam³⁵ and was first introduced in 2001. Currently, 30 thousand web shops worldwide are using X-Cart³⁶. X-Cart combines the attributes of an E-Commerce software package with certain characteristics of a Web Content Management System. X-Cart provides a fully customizable front end, an administration profile and configurations options for appearance, all of which are characteristics included in any WCMS framework. In addition to that, X-Cart provides a product catalog, inventory tracking, shipping taxes calculation, shopping cart, and search engine optimization. The aforementioned functionalities are provided by most of the E-Commerce software packages and plug-ins. Nonetheless, X-Cart is known and marketed as an E-Commerce software package and not as a WCMS.

X-Cart is based on PHP and MySQL, and it provides the application and business logic of the web site. The Smarty template engine³⁷ is responsible for the presentation output that X-Cart generates in order to be displayed to the user screen. That means that while X-Cart is responsible for the technical and functional specifications of the web shop, the way that the information is going to be displayed after it is processed is handled by Smarty. This specification, clearly presents the distinction of X-Cart and any WCMS framework.

Unlike the previous cases of Wordpress and Joomla, not many big or popular industries have used X-Cart so far. However, we include an interesting example of the gregnormancollection.com³⁸ web shop, created with X-Cart. Greg Norman is a highly accomplished Australian golf athlete who, amongst other entrepreneurial activities, has created a golf inspired clothing line³⁹. The Greg Norman collection web shop includes articles of clothing and plenty types of accessories for both men and women. Image 2.8 shows this.

³⁵ Qualiteam web site: <http://www.qtmsoft.com/about.html> [Access Date: 7 -08-2013]

³⁶ X-Cart wiki page: http://help.x-cart.com/index.php?title=X-Cart:Understanding_X-Cart [Access Date: 7 -08-2013]

³⁷ Smarty web site : <http://www.smarty.net> [Access Date: 7 -08-2013]

³⁸ Greg Norman Clothing Web shop: <http://www.gregnormancollection.com/> [Access Date: 7 -08-2013]

³⁹ Greg Norman personal web site: <http://www.shark.com/sharkwatch/aussierules/aussierules17.php> [Access Date: 7 -08-2013]

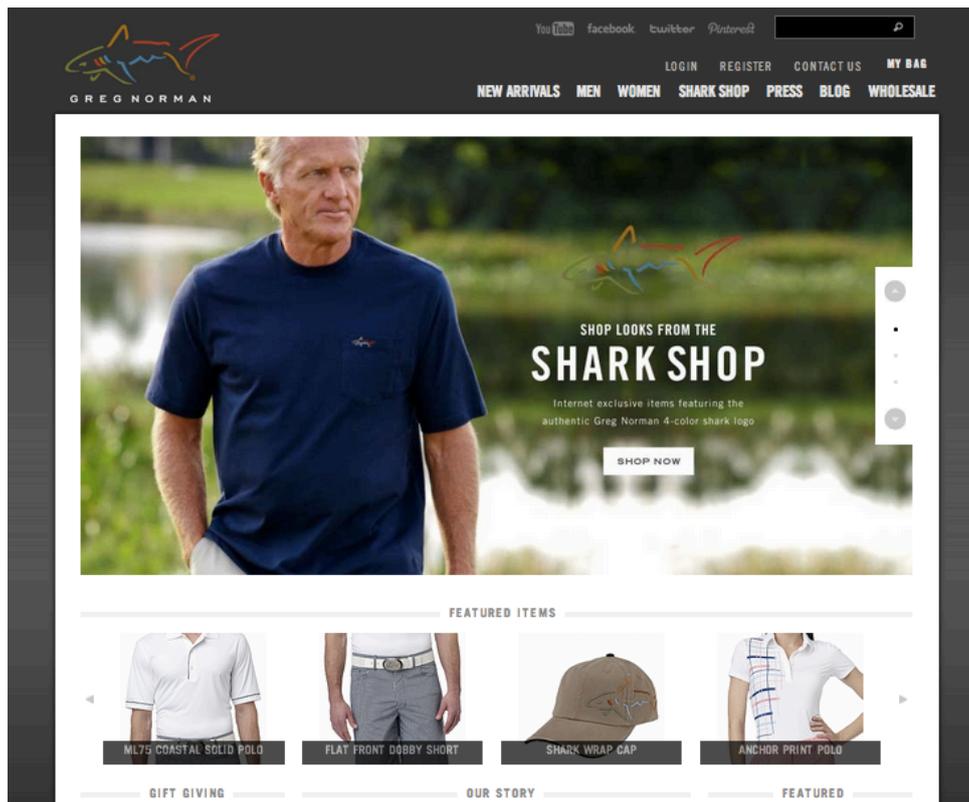


Image 2.8: Greg Norman Collection web shop- X-Cart (source:<http://www.gregnormancollection.com/>)

2.3 E-Commerce Web sites

A commonly accepted classification of web site genres is rather difficult to find in literature. That happens due to the fact that there are numerous, and diverse aspects to be taken into consideration in order to categorize web sites into genres. These aspects can be:

- *The Implementation method*, which was used to create a web site. Such as web content management system based web sites, or code driven web sites.
- *The content*, which is included within the web site for example, a personal web site or blog, a community web site or a portal, a professional web site or portfolio, an E-Commerce web site, or an informational web site.
- *The technology*, which was used to create the web site. Such as, flash web sites, dynamic web sites⁴⁰, hybrid web sites⁴¹, or static pages.
- *The functionality*, that each web site provides. Such as a media sharing web site, a mirror web site, an E-Commerce web site, or a Social Media profile web site.

⁴⁰ A dynamic web site is, a web site that can be updated automatically and on real time

⁴¹ A hybrid web site is, a web site that combines various technologies. An example is adding Flash components to HTML

Therefore it would appear that, a single classification for web site genres will not be appropriate, or fully representative. Regardless of how we choose to categorize web sites, the E-Commerce genre is often found amongst categories based on content classification, and it can even be further on divided into sub categories. In this section, we will provide a definition of an E-Commerce web site taken from the literature, and we will specify the aspects which are included in each E-Commerce web site. In addition, we will discuss the evolution of this genre and the impact that Social Media plays in it providing some examples. At the end of this section, we will provide several exceptional and inadequate examples of existing web shops.

2.3.1 Definition and Types of E-Commerce

E-Commerce, i.e Electronic-Commerce, can be loosely defined as the business transactions which are conducted over the internet (Ford & Wedemann, 2010), more formally it can be defined as “*a networked information system that serves as an enabling infrastructure for buyers and sellers to exchange information, transact and perform other activities related to the transaction before, during, and after the transaction*” (Varadarajan & Yadav, p.297, 2002).

This includes the transactions of :

- *Business to Customer* (B2C), where the provider of a product or service is a business organization and the buyer is the customer.
- *Business to Business* (B2B), where both the provider and customer of the product or service is a business organization.
- *Customer to Customer* (C2C), where both the provider of the product or service is not a business organization but the customer.
- *Customer to Business* (C2B), where the customer provides the requirements of a service or product and the business meets these requirements to create the product (Chan, et al., 2007). We will provide examples of these types of transactions in the following sub sections.

The term *transaction* in the E-Commerce definition, but also in the context of this research is key since we will be considering interactive E-Commerce web sites, and not what are known as brochure websites. A brochure web site according to crunch42.com⁴², is a non-interactive web site⁴³ which includes a showcase of products, information concerning these products, and information for the business. These characteristics can be found in web shops as well, however in brochure web sites it is not possible to make a transaction. An example of a brochure web site is shown in Image 2.9

⁴² Brochure web shop definition: <http://www.crunch42.com/services/brochurewebsite.php> [Access date: 19-08-2013]

⁴³ In some cases users can fill a contact form in this type of web sites, therefore they can also be considered as interactive.

An E-Commerce web site can include many types of goods such as, services that can be provided, software or a file which can be downloaded, information that can be made accessible, physical products, or even nutriments which are virtually represented. We will provide some examples of such products further on.

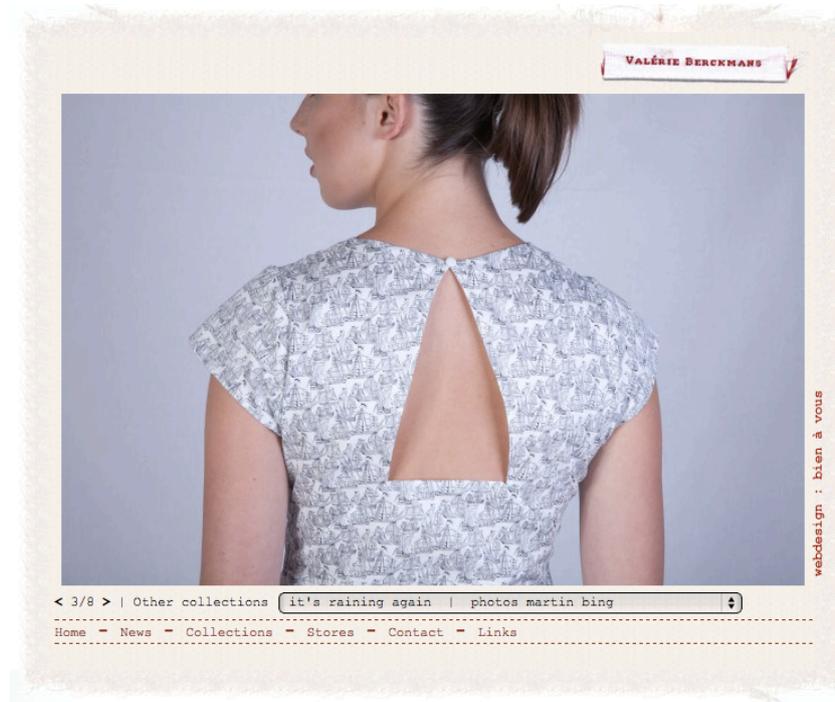


Image 2.9: Example of E-Commerce Brochure web site (source: <http://www.valerieberckmans.be/>
Access date: 19-08-2013)

The **ultimate goal** of every E-Commerce web site, which from now on we will call in short a *web shop*, is to make the conducting of business over the network as flexible and straight forward as it is in reality. Customers need to feel confident when they purchase something from a web shop, and not be concerned about the compromise of their personal and/or payment information, and delivery of the product (Loshin & Murphy, 1997). A lot of additional factors can be associated with the **success of a web shop**. In their research, Liu and Arnett (1999), from a business domain, supported that these factors are :

- *Information Quality*, meaning that the information included in the web shop should be relevant, accurate, and up-to-date. In addition, this information should be flexible and customizable (an example is including multi language support).
- *Learning Capability*, meaning that the web shop should not require a long learning process time and should be well organized by including a help function, well presented links, and well organized navigation.
- *Playfulness*, meaning that the user will have an enjoyable visit which in turn will increase the possibility of him or her coming back to the web shop. An enjoyable visit can be achieved by motivating customers to participate in several actions or by

including some charming features to the web site (an example is the inclusion of animation or augmented reality, an example of which we will provide later on)

- *System Use*, which is the way customers will use the web shop, given what is provided from the functionality which is included in it. For example, offering a tracking service of a user order, offering secure payments, or offering a good return policy.
- *Service Quality*, is associated with quick responsiveness of the web shop, i.e. performance, quick error recovery, reliability, and customer service after the transaction.

Generally, a lot of professionals are involved with the development of web shops such as, computer scientists, graphic designers, advertisers, and even executive managers. These experts often put emphasis on performance and extensibility, inclusion of new advanced technologies, innovative designs, and embedding media into a web shop, rather than putting emphasis on the audience, their requirements, and usability. Issues of usability and security still remain a problem in E-Commerce, in fact, according to a survey of the European Electronic Messaging Association, more than 97% of participants expressed that security is their top concern when they visit web shops (Liu & Arnett, 1999).

2.3.2 Web Shop Aspects

In the context of web shops the most important aspect is the Shopping Cart functionality, due to the fact that it can establish confidence to potential customers, or on the contrary discourage them from using a web shop altogether. According to the American Marketing Association⁴⁴, a Shopping Cart is “*software used to make a site’s product catalogue available for online ordering, whereby visitors may select, view, add/delete, and purchase merchandise*”. The logic of shopping cart software is pretty much straightforward, as it is nothing more than a virtual metaphor of the use of a physical shopping basket.

With the use of shopping cart software, we manage to not concern the customer with the inner procedures of the web shop, we rather make an effort to provide a secure, convenient and efficient order environment for them. A shopping cart system most commonly includes:

- *Product Selection Features*, where the customer can specify the quantity of the product. In some cases, several cart systems offer the possibility to choose the size or specify the color of the product while in the shopping cart.
- *Specification of Capacity*, meaning the maximum amount of products that can be included in the shopping cart.
- *Calculation of Taxes*, which are calculated according to the rate of each country or state. In fact, the Belgian E-Commerce regulations oblige local web shops to specify

⁴⁴ American Marketing Association: http://www.marketingpower.com/_layouts/Dictionary.aspx?dLetter=S [Access Date 20-08-2013]

wether they include Value Added Tax, in the indicated product price even before the customer adds it to the shopping cart.

- *Calculation of Shipping*, which can be realized based on different variables according to what is specified by a particular web shop, i.e. by dimensions, by weight, by package size and more. Several web shops include shipping offers as means to motivate customers to buy more. Image 2.10 shows an example of that.
- *Specification of Transportation means*, which is the information of the company responsible for the delivery of the product such as FedEx, UPS, or the Postal Service and more.



Image 2.10: Shipping Offer-Action example (source: <http://www.urbanoutfitters.co.uk/page/home&setlocn=eur>)

So far, with the use of Shopping Cart software, the data for a product prior to purchase can be bound. In order to complete the transaction, which will include the transfer of sensitive data from the customer to the web shop⁴⁵, the use of the Secure Sockets Layer (SSL) protocol is required. This protocol will ensure the encryption of data, ensure secure transmissions, and eliminate the possibility of hacking. The use of the SSL protocol is present in every web shop and is by far the most important aspect in the task of secure on line shopping. Along with providing security, by using the SSL protocol, one additional benefit is considered to be the use of a Payment Gateway method, such as PayPal⁴⁶. Currently 110 million PayPal accounts⁴⁷ are active which certainly means that a significant number of customers is showing confidence in this method of ordering on line. A Payment Gateway is simply the intermediate between the customer and the web shop and protects both parties in the transaction.

Almost every web site today is database driven, especially web shops are required to be able to connect and access a database where product information, client information, and images can be stored. The dominant database model is the relational database, which uses relations to represent *entities* and *relationships*⁴⁸. These relations

⁴⁵ Such information is address, credit card number and personal information such as age and full name.

⁴⁶Web site of PayPal: <https://www.paypal.com/> [Access date: 21-08-2013]

⁴⁷PayPal User data: <https://www.paypal.com/webapps/mpp/ent-online-attract-shoppers> [Access date: 21-08-2013]

⁴⁸ The definition of these terms is provided to the Object-Role Modeling section.

are represented with tables which can be updated or deleted and the relational schema, describes the structure of the database (Chan, et al., 2007). Nearly all web content management systems, are based on MySQL, a dominant relational database management system⁴⁹, which means that nearly 66,3% of websites today are using relational databases.

This concludes the description of the most important aspects that are included in a web shop. In the following subsection we will discuss the evolution of web shops, providing some examples.

2.3.3 The evolution of Web Shops and the Impact of Social Media

The growth and evolution of the web continues to accelerate with a fast pace. The platforms which we use to publish information on the internet have matured over the years and have raised, at the same time, the standards of web design. Broadband connectivity to the network is a norm in almost every aspect of our lives, for communicational, informational, commercial, and financial purposes. While people in the past have been skeptical about purchasing on line, especially when it comes to apparel products, today a significant amount of people uses the network, or applications on their phone, to make purchases of the simplest products such as groceries, as shown in Image 2.11 (Ford & Wedemann, 2010). The growing influence of the web in our every day lifestyle, has enabled the formation of new and powerful types of E-Commerce, examples of such we will describe in this section.



Image 2.11: Delhaize supermarket application (source: iTunes application information)

We can observe the competition between businesses to include the latest technologies and features in their web shops, in order to be innovative, and in order to be distinguished from their competitors and gain competitive advantage. Mark Fredman,

⁴⁹ Market Share of database Systems: <http://www.mysql.com/why-mysql/marketshare/> [Access date: 21-08-2013]

in (Ford & Wedemann, 2010) suggests that many of the same things that can make a business successful off line can make it successful online as well, such as, clear communication, high quality customer service which will create more product demand, innovation, brand identity, and sometimes the element of surprise. Therefore, there are plenty of things to be considered when designing and developing a web shop aside from the available technologies, such as the budget, the timeline, and most importantly the audit of audience. The first and most popular E-Commerce web sites are Amazon⁵⁰, which was launched in 1995 by Jeff Bezos, and eBay⁵¹, which was launched in 1996.

Amazon.com, is an example of a business-to-customer (B2C) web shop, which initially included only categories of books and presently, has become a web shop that includes a vast amount of product categories such as tablets, cameras, toys, and phones amongst others. With the use of Data Mining techniques, Amazon creates a customer recommendations system which promotes the products included in the web shop. Amazon is known to be trusted with product delivery which is realized by mail.

E-Bay, is an example of customer-to-customer (C2C) web shop, which provides product trading between users by means of auctions. An individual user publishes a product, and information related to this product on eBay, and other users can bid on it as many times they wish for a specific number of days. Currently, 112.3 million users are active on eBay, based on the data available from the site⁵², who can participate in these auctions, sell products as well as participate in the community of eBay.

The aforementioned examples were the first and are the most popular web sites of E-Commerce. However, in terms of today, E-Commerce and on line shopping, are more less outdated phraseologies. When a customer purchases on line, he or she behaves very similar than when purchasing from a physical store. Therefore businesses are advised to do the same, selling merchandise on the web should not be disjoined from selling merchandise in the actual shop, and in fact if a business wants to achieve maximum profit, on line presence is considered mandatory. It is even suggested that customers expectations are higher when they buy from a web shop. Since now, technology is advanced, there are no longer limitations concerning the representation of a business on the web. On the contrary, the problem is integrating the web shop with the physical shop and designing one which will provide a good buying experience for the customer (Ford & Wedemann, 2010). There are plenty of examples of businesses which are innovative and pioneered on the web, while considering the needs of their audiences, and by including new technologies. It is not possible to include all of them in this research however, we will present two typical examples.

⁵⁰ <http://www.amazon.com/> [Access Date: 20-08-2013]

⁵¹ <http://www.ebay.com/> [Access Date: 20-08-2013]

⁵² eBay Active users data: http://files.shareholder.com/downloads/eBay/2310655857x0x160230/D11C904B-4EEA-4821-9C42-D0228F676BAD/eBay_Metrics.pdf [Access Date: 22-08-2013]

The first example we will discuss is the case of IKEA, a Swedish furniture company that is registered in the Netherlands. This is an appropriate example of a business that uses technology, i.e. mobile technology, in an innovative way to create a good customer experience. According to a research performed by the company, over 70% of their customers cannot calculate the actual size of their homes which means that often they purchase an item of wrong size⁵³. IKEA responds to this need of their customers with the catalogue of 2014, which, as of September 2013, will include a feature where users can visualize how the furniture will look at their home, or apartment using augmented reality⁵⁴. Image 2.12, shows this:



Image 2.12: IKEA - Augmented Reality mobile application (source:<http://www.latestdigitals.com/2013/08/07/ikea-customers-try-before-buy-with-augmented-reality-app/>)

This feature as it is shown in the image above, will project items into a physical location by using a real time view which is captured by the camera of the device in use.

An other example is the case of Domino's Pizza, an American based company, which launched their pizza ordering platform in 2006. Domino's pizza is an example of customer-to-business (C2B) web shop, where the customer defines the characteristics of the product they wish, in this case which ingredients will be in their pizza, and the company meets these requirements and delivers the end product. Domino's Pizza offers an accurate animated visual representation of the available pizzas and a tracking order system⁵⁵, which allows users to see the progress of their order. According to Rob Weisberg in Ford & Wedemann (2010), this platform resulted in a 70% increase of web shop visits, and ten million new users registered in Domino's.com. In addition, the web shop became third in the market share of pizza

⁵³ IKEA Customer Research: <http://www.latestdigitals.com/2013/08/07/ikea-customers-try-before-buy-with-augmented-reality-app/>

⁵⁴ IKEA Augmented reality application : <http://www.fastcompany.com/3014930/most-innovative-companies/todays-most-innovative-company-ikea-uses-augmented-reality-to-show> [Access Date: 22-08-2013]

⁵⁵ The Tracking System utility is included in the American web shop and not in the Belgian version.

ordering web shops. That was clearly a result of the updated design, and improved user interface to create a better customer experience while inspiring trust. Image 2.13 shows the utility of pizza tracker:



Image 2.13: Domino’s Pizza - Pizza Tracker Utility (source: <http://www.bubblews.com/news/27224-dominos-pizza-tracker-is-the-best-thing-ever>)

Aside from the available channels, platforms, and devices we have available today to conduct business, good reputation and positive customer experience (which is shared and communicated to others), what is called the “word of mouth”, is still an important factor which can increase revenue. Publishing and editing information on the web today is the most common and easy task and through the Social Media, (FaceBook, twitter, and instagram) people can share their interests, thoughts, pictures and preferences, with others. In a similar way, they can also share the products they enjoy, the brands they prefer, while at the same time they can publish reviews for these products, for businesses, and their customer services.

Social Media offer flexibility in communication, and interaction between customers and businesses. This happens because there are simply no barriers in dialogue between the customer and the business through these means. Initially, the FaceBook social network was popular for enabling people worldwide to connect with each other in a fast way, but since 2007, the social network introduced FaceBook Pages. These are profiles for businesses and popular icons of culture, politics, and so on. Currently, more than 4 million businesses are present in FaceBook Pages⁵⁶, where they can publish, share, and advertise information included in their web shops, and physical shops. In almost every form of advertising, i.e. in printed advertisements, or in television advertisements, businesses encourage people to show their support to the brand by joining their FaceBook Page. The following figure 2.7, shows the significant percentage of commerce, represented with a red rectangle, on FaceBook Pages:

⁵⁶ Number of FaceBook Pages: <http://www.insidefacebook.com/2012/04/27/facebook-platform-supports-more-than-42-million-pages-and-9-million-apps/> [Access date: 24-08-2013]

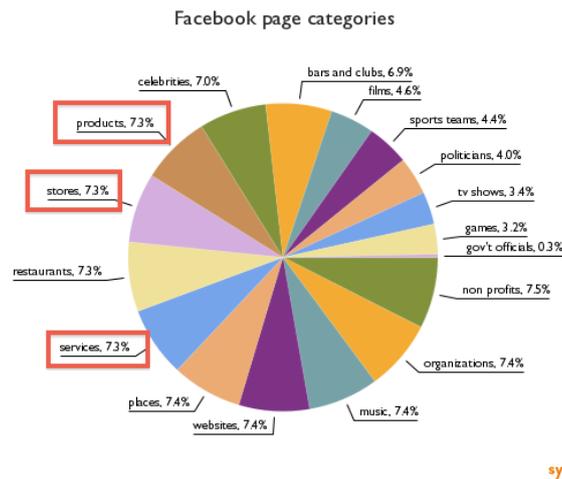


Figure 2.7: FaceBook Page Categories (source: <http://www.sysomos.com/insidefacebook/>)

A business however, should keep in mind that there should be consistency between the physical, the on line, and the social presence. Businesses in Social Media, will have to abandon the repetitive messages that they have been using in other channels, to avoid overloading their audience with information which can drive them away. Direct communication with customers may on one side provide flexibility, but should be managed with care. Currently in business there are even communication specialists and advertisers whose responsibility is solely the management of a business FaceBook Page. We discuss how these aspects are tackled in WSDM-lite, later on in Chapter 3.

2.3.4 Web Shop Examples

In this section, we will provide some exceptional examples of web shops that exist on the web today, both exceptionally good and exceptionally bad. Although it can be rather difficult to find a web shop that satisfies all of the requirements, that includes all the necessary components which would result in a good design, and success for the business. Nonetheless, some web shops achieved a high level of usability and returned profit to the (physical) business.

For a first example we will discuss the Netherlands based company, [easycarparts.be](http://www.easycarparts.be)⁵⁷, which provides spare parts for any model and brand of car. In such a case, the customer would most likely want to search for a specific part of a car model, and be reassured that this will be delivered in a good condition. This particular web shop, provides a straight forward interface for the customer to find what they need in a fast way, by including three selection fields: model, brand, and type, and return the availability of this product that exists in the web shop. In addition, it emphasizes on the fact that it is certified as trustworthy, which will most likely make the customer feel comfortable in purchasing, Image 2.14 shows this.

⁵⁷ Easy Car Parts web shop: <http://www.easycarparts.be/> [Access Date: 19-08-2013]

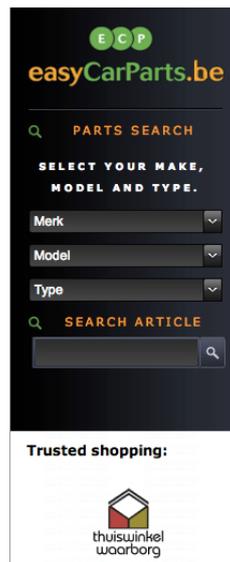


Image 2.14: Easy Car Parts - Usability example (source: <http://www.easycarparts.be/>)

The second example we include, with respect to their effective product display and filtering of results, is the web shop of Urban Outfitters⁵⁸. This is a Philadelphia based retail company, with shops in the United States and Europe. This brand offers a wide variety of products such as apparel, furniture, decorative items, accessories, and books. Several items are available only through the web shop, and approximately 250 new products are introduced per week on line. Baynote⁵⁹, the company which designed the web shop of this brand, used an audience driven approach to create the urbanoutfitters.co.uk web shop, according to information retrieved from their executive report⁶⁰. This company emphasized on customer's shopping patterns and habits to develop an appropriate and effective product recommendations and filtering system. By using the filtering system the customer can restrict the catalogue of products to a particular view such as by price, by color, or by size. The recommendation system increases the visibility of products especially since they are renewed quite frequently. Images 2.15 and 2.16 show this.

Sadly the web is filled with web shops that include flaws. Most common mistakes in such web shops are: the use of obsolete technology, overload of graphics, illegible terminology or jargon that is not clear to customers, insufficient information or on the contrary overload of information, unfinished pages, confusing or misleading navigation, and a difficult ordering process. As a result, a web shop that contains these types of flaws will not be able to make the expected profit and it will not achieve the goals we have already discussed in the beginning of this section.

⁵⁸ Urban Outfitters web shop: <http://www.urbanoutfitters.co.uk> [Access Date: 19-08-2013]

⁵⁹ Baynote web page: <http://www.baynote.com/> [Access Date: 19-08-2013]

⁶⁰ Executive Report: <http://www.baynote.com/wp-content/uploads/2012/04/UrbanOutfitters-SS111.pdf>

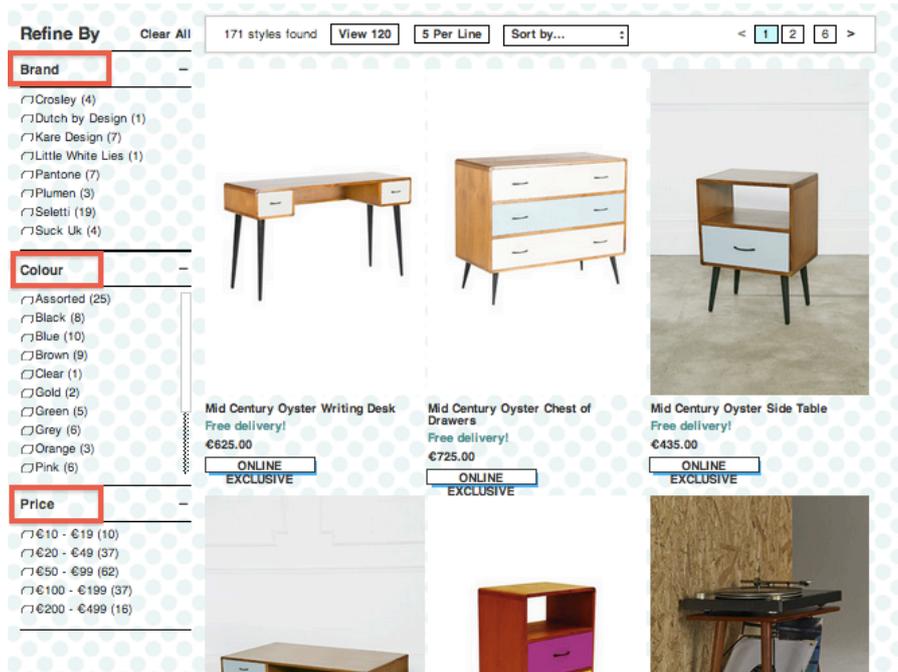


Image 2.15: Urban Outfitters - Product Filtering System (source: <http://www.urbanoutfitters.co.uk/furniture-+amp-lighting/icat/furnituremain/>)

The most appropriate example that includes almost all of the aforementioned flaws is the UK based, leasing car service of Ling Valentine, [lingscars.com](http://www.lingscars.com), which also received an award for the “worst web site”⁶¹. In this C2B web shop, the lease of a car service is provided although it is almost impossible to understand the way to use this service. The design is overloaded with unnecessary personal graphic designs which make it seem like a farce web shop. An overload of information is provided within the home page which results in bad navigation. Additionally, a customer would most likely not trust the service of this web shop since it is clearly stated within that it does not respect EU regulations concerning the collection of personal user data, with the use of cookies. Image 2.17 shows a part of this web shop.

The use of obsolete technology while the web is constantly advancing in this area, will discourage customers from using the services of a web shop. The UK based yacht insurance company, [dinghyinsurance.com](http://www.dinghyinsurance.com)⁶², has realized that and improved their web shop to a great extent. The graphical presentation of the web shop was initially rather inadequate with respect to current presentation standards, as it can be seen in Image 2.18. In addition the navigation was simply a collection of links, for these reasons it is safe to assume that the web shop would not inspire trust to customers. However, it was improved to a great extent as seen in Image 2.19

⁶¹Leasing Cars web site: <http://www.lingscars.com/> [Access Date: 20-08-2013]

⁶² Yacht Insurance Company : <http://www.dinghyinsurance.com/> [Access Date: 20-08-2013]

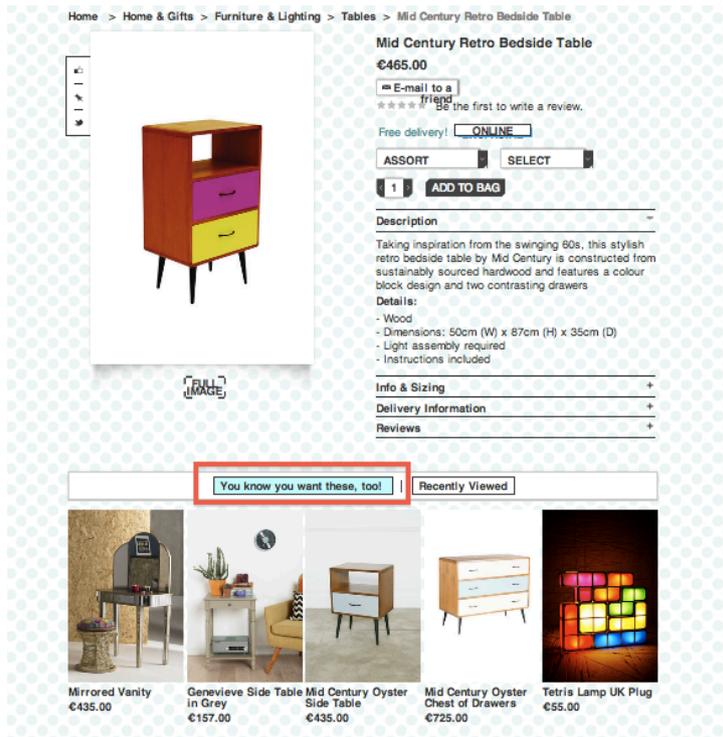


Image 2.16: Urban Outfitters - Product Recommendations System (source: <http://www.urbanoutfitters.co.uk/mid-century-retro-bedside-table/invt/5520441640003/>)



Image 2.17: Ling's Cars - Leasing Cars On line Service (source: <http://www.lingscars.com>)



Image 2.18: Dinghy Insurance web site - Initial graphic design (source: <http://www.slideshare.net/dear123000/good-bad-E-Commerce-websites-2969089>)

As we mentioned in the Introduction of this research, popularity is not necessarily equivalent to a good design or a good web shop. We have already discussed the case of Olympus Australia, where the customer apparently cannot order every product displayed in the web shop, while all information related to it is provided, that is shown in Image 2.6. A confusing and difficult order process reduces the system use, which as we have explained is an important factor leading to a successful result. It is most likely that the audience will be frustrated and confused and chances to return will be decreased in this case.

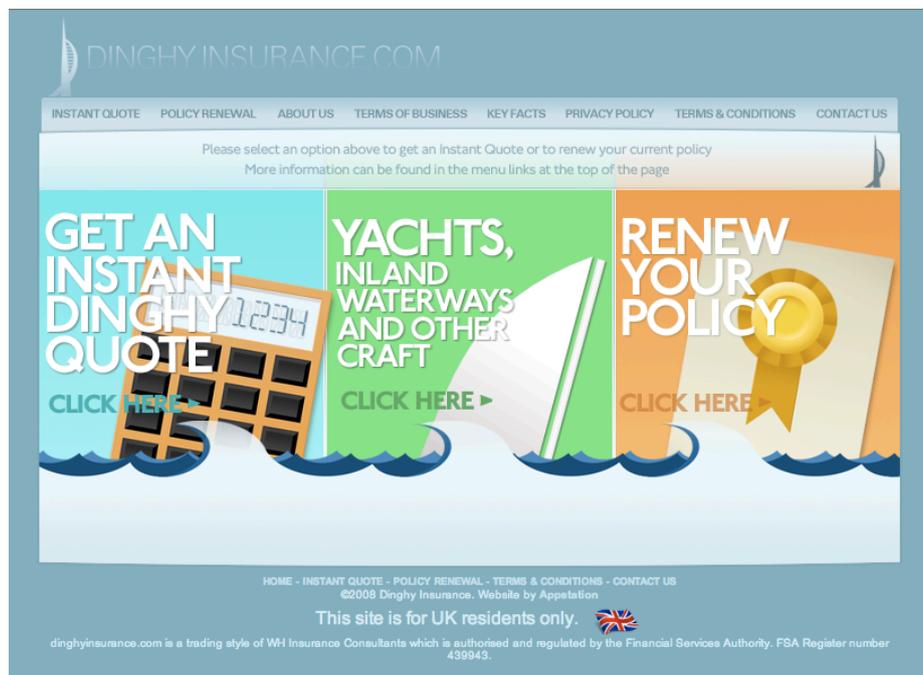


Image 2.19: Dinghy Insurance web site - Improved graphic design (source: <http://www.dinghyinsurance.com/index.php>)

In the previous section, we have discussed the advantages of using a web content management system in order to create a web shop. The designer will have a relative ease when adding information, components, and functionality of any kind in the web shop. It is important however, to not only rely on the provided ease of use without carefully designing the web shop and deciding what information will be included in it. The following example is of a Brussels based online shop, which contains accessories clearly targeting a female audience. However, it contains inadequate information concerning products, and unedited pages. In addition to this, it seemingly contains some functionality that in reality is not provided. Image 2.20 and Image 2.21 shows this.

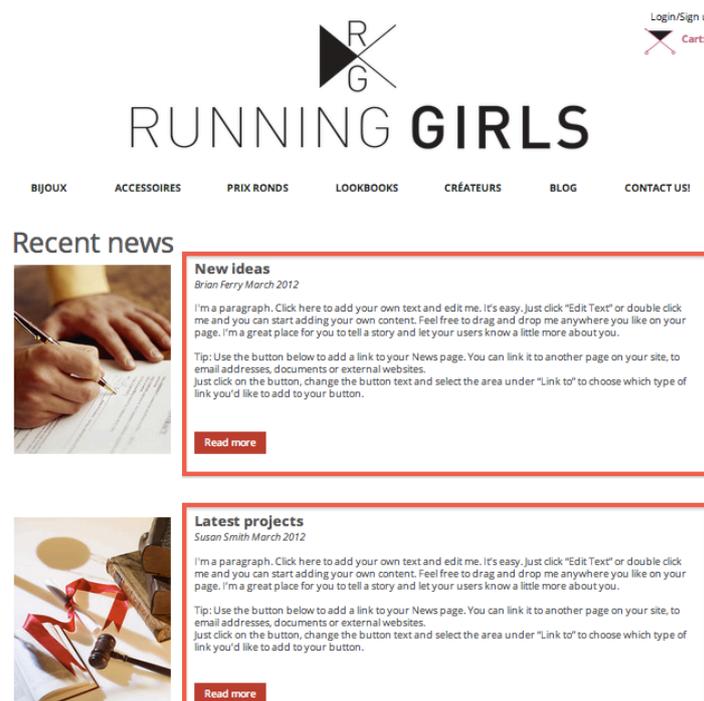


Image 2.20: Running Girls web shop - Un Finished pages (source: <http://www.wearerunninggirls.com/#!events/cn69>)

Such a page can seem as if it is still under development, it most likely would not inspire trust to customers as it provides superficial information about the products displayed and it is not quite responsive (product images and links between pages take some time to load). We can presume that web shops like this are designed with an emphasis on personal taste reflecting the style and personality of the individual designer without taking into consideration the audience that will visit the web shop.

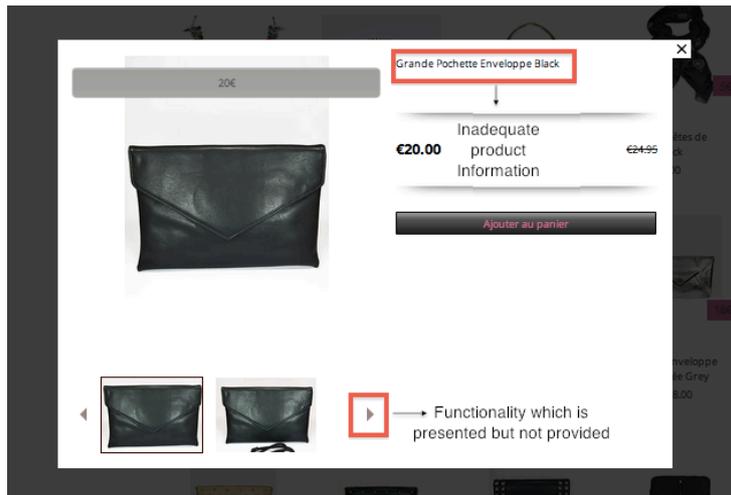


Image 2.21: Running Girls web shop - Inadequate Product Display (source:<http://www.wearerunninggirls.com/#!/product/prd1/717881821/grande-pochette-enveloppe-black>)

2.4 Summary

In this Background chapter, we have discussed the aspects which are related to the research topic of this thesis. We started with the audience driven WSDM method, and the modeling techniques included in it, after that we explored the context of Web Content Management Systems and provided specific examples of Wordpress, Joomla, and X-Cart. We concluded this chapter with a brief study of E-Commerce, and presented the related aspects as well as several remaining issues in this domain.

We argue that an effective web shop should adopt an audience driven design, in order to be effective, avoiding flaws such as those we presented in this sub section. In addition to that, a web shop may have many different types of audiences whose requirements have to be satisfied as we previously discussed. In the following Chapter, we explain how the WSDM method can be adopted to serve this purpose and provide a complete E-Commerce solution.

3. The WSDM-lite Methodology for Web Shops

The Web Semantics Design Methodology (WSDM), consists of five concrete phases each of which produces a specific outcome that is used as an input by its subsequent phase(s). For instance, the outcome of the *Conceptual Design* phase is a set of conceptual models (a number of *Task models*, *Object chunks*, and *Navigational models*) which constitute the input for the following phase called *Implementation Design*. These models are complemented in the *Implementation Design* phase with the required information for an actual implementation (De Troyer, Casteleyn & Plessers, 2007).

All phases of WSDM along with their specific output, are illustrated in Figure 3.1. and this represents the process that a developer must follow in this precise order when WSDM is applied for the development of any type of web system, although the process may also be used in an iterative way.

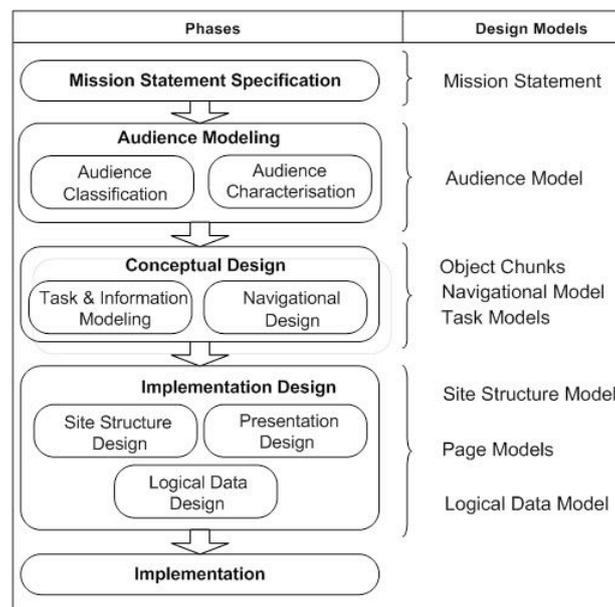


Figure 3.1: WSDM Overview (source: wise.vub.ac.be)

However, the focus of the present thesis is on a specific website genre, i.e E-Commerce web systems, and which are implemented with the use of a Web Content Management System framework (WCMS). The aforementioned aspects are not considered in WSDM as they would limit the method greatly. However, the limitation to a specific web site genre and the use of a WCMS for the implementation could considerably simplify the method. For that reason, we are led to the adaptation of WSDM to *WSDM-lite*.

WSDM-lite is not a less efficient or incomplete methodology, rather it is a simpler version of WSDM which is limited to the design of web sites of E-Commerce web site genre and with a pre decided implementation method. WSDM-lite allows to provide a complete E-Commerce solution for small-medium enterprises. Certain

phases of WSDM are discarded or are made more straightforward and some specific sub phases are unified to make one adapted phase in the 'lite' version. In this chapter we will describe the adapted phases of WSDM-lite and at the same time compare them to the original phases of WSDM.

3.1 Web Shop Subject Specification

During the first phase of WSDM called 'Mission Statement Specification', an abstract description of the web site is given along with its objectives and goals. The definition of this mission statement includes the purpose, the target users and the subject of the web site under development.

According to the literature study and the research conducted for this thesis, every web shop has a common purpose. In fact, every web shop wants to achieve similar objectives. Therefore, we propose a common statement about the purpose and objectives that is applicable for every web shop. If necessary, it is always possible to refine or customize the given statement. The statement about the purpose and objectives of a web shop is defined as follows:

“To achieve competitive advantage and have as many customers as possible. In addition, to build strong business-customer relations⁶³. The aforementioned goals should be achieved by providing all necessary information about available products (description, pictures, accurate price, related products) and by causing the interest of customers to explore additional categories increasing, at the same time, their intent to buy⁶⁴. A web shop could attract as many customers as possible, by periodically offering promotions on available products, offering secure transactions and allowing users to share their reviews about featured products and purchased products from within the web site”

An example where it could be useful to customize the statement is in the situation that, for what ever reason, the company does not want to have reviews from users. Furthermore, the mission statement in WSDM requires to specify the target users of the web site. The users of E-Commerce web sites are people who enjoy, are able and feel secure enough to purchase products online wether it is for their personal use or for others. Due to the advances of web technology, the simplification of the already straight forward task of online purchasing, and the safety in online transactions provided by the use of the appropriate protocols have notably increased the number of users who can shop online. Other factors which have contributed to online purchasing are the significant involvement of the Social Media in the E-Commerce domain and the increased use of E-Commerce applications on tablets and smart phones. An info graphic survey according to mashable.com, has shown in fact, that the majority of

⁶³ Strong Business-Customer Relations means that the customer will trust the business and its products or services. By achieving this trust, the customer will most likely return to make new purchases.

⁶⁴ The longer the customer browses on a website the chances to make a purchase are increased

customers in the United States were more likely to shop online using their tablets or mobiles during the Thanksgiving holiday season of 2012⁶⁵. Specific technical knowledge or experience is no longer as necessary as before to purchase products online. Even a user who has never shopped online before is guided through each step and can complete this task successfully.

Therefore, we can identify the target users of an E-Commerce web site as the *people who have the necessary means and enjoy to purchase products online for their personal use or for others*. The necessary means being, having an income, have access to a computer, smartphone or tablet which is connected to the network and owning a type of credit card. Although several web shops allow purchasing by money order⁶⁶ that is not the most common electronic payment method. In specific situations, it may be necessary to refine the target users. This will be possible in the next phase. An example can be the case where a web shop specifically corresponds to young women.

The subject of a web shop however, in contrast to what has been described so far, needs to be specified. In general, every web shop offers products or services. Nonetheless, it needs to be taken into consideration that these products and services are of different kinds. In addition to that, each web shop may include different types of information concerning the offered products or services. For example, below in Image 3.1. and Image 3.2. two cases of web shops are given which both offer products. However the first example, shown in Image 3.1, is of a brand that offers women apparel and accessories, while the second example, shown in Image 3.2, is of a local business that offers technology gadgets and design objects. Both of these web shops include different types of information which better represent the content within, and better correspond to their target audience.

⁶⁵ Article “Mobile Shopping on Thanksgiving Day Will Double This Year” from: <http://mashable.com/2012/11/19/mobile-shopping-doubles-thanksgiving/> [Access Date: 13-07-2013]

⁶⁶ Money Order is a printed order for payment of a specific sum, issued by a bank or post office (Definition taken from the “New Oxford American Dictionary”)

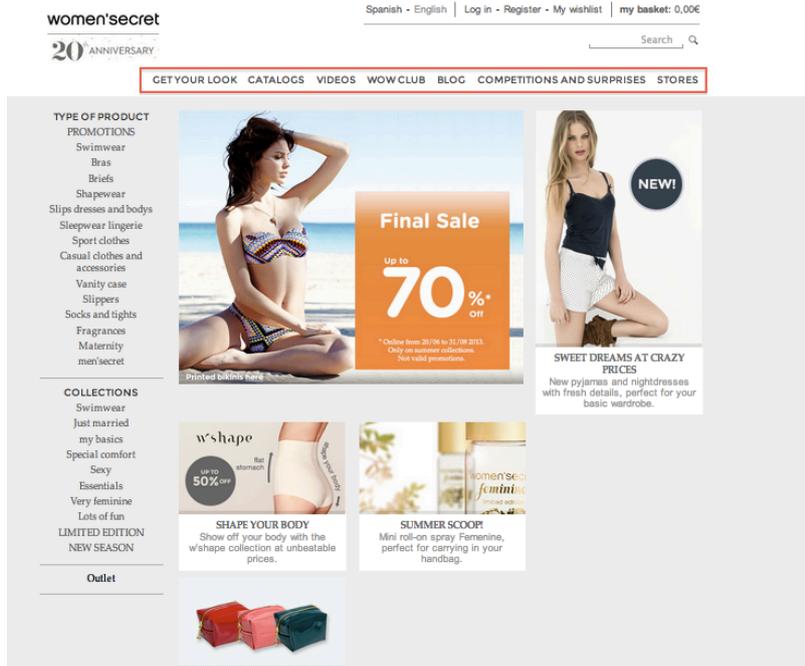


Image 3.1: Women Secret web shop (source: <http://womensecret.com> Access Date: 13-07-2013)

For that reason, the specification of the subject is a necessary part of the design process and that will constitute the first phase of WSDM-lite, called ‘**Web Shop Subject Specification**’. This phase is a simplification of the Mission Statement Specification phase of WSDM, due to the fact that there is no need to specify the purpose or explicitly specify the target users of the web shop but only the subject. The outcome of this phase is the specification of the products/services that we plan to sell in the web shop. For example, we may develop a web shop that will sell apparel products in which case the Web Shop Subject Specification may be as follows:

“We will sell through our web shop a certain number of modern apparel. More specifically, we will include within our web shop several categories of women and mens wear, as well as related items such as accessories and shoes that will help our customers to find the perfect outfit”

The subject specification as defined above specifies the subject of the web system while in addition it includes a first indirect refinement of the target audience. As mentioned earlier, we can start from a general characterization of the users of web shops, however depending on the subject of the web shop they may have to be specified in more detail. If we consider once again the provided examples in Image 3.1 and Image 3.2, in the first case the target users are, in principle, restricted to females of a younger age. While in the second example young male and female users would likely be most interested in purchasing gadgets online. The target users will be refined in the next phase of WSDM-lite similar to what happens in WSDM.

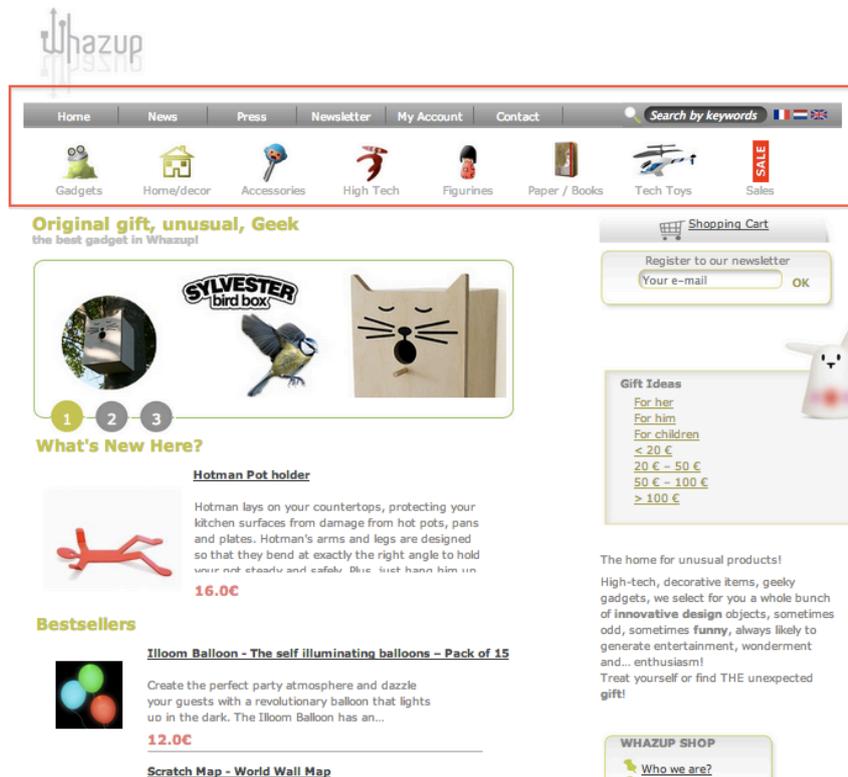


Image 3.2: Whazup Gadget web shop (source: <http://www.whazup.be/index.php> Access Date: 13-07-2013)

3.2 Target Audience Specification

In the subsequent phases of WSDM, after the mission statement specification, all aspects of the web system are modeled and specified. This includes the target users, the navigation design, the content representation and the information which will be included in the web system. Users are the first concern that is elaborated in the method since WSDM is audience driven. During the ‘Audience Modeling’ phase, the target users of the web system are refined in what are called audience classes. In WSDM the Audience Modeling phase is separated in two sub phases:

- The Audience Classification sub phase, where the different types of users are specified and after that classified into audience classes and
- The Audience Characterization sub phase, where the characteristics of each of the audience classes are specified.

Some possible audience characteristics are the users education level, their experience with technology and the web, their age, their gender and their nationality.

The importance of classifying the users of the web site lies in the fact that different users have different needs, which leads to the formulation of different information and functional requirements. Therefore, it is necessary to represent information and functionality for different types of users (De Troyer, Casteleyn & Plessers, 2007). The

identification of their characteristics are necessary because it may have an influence on the graphical presentation of the web site or result in different usability requirements.

Concerning the adapted WSDM-lite methodology, our view is that, in general, the audience characteristics of web shops are similar. That is because a web shop wants to attract as much potential buyers as possible, and therefore we should keep the web shop accessible to as much people as possible. The only audience characteristic in the which can change in a particular web shop is the age and gender. Those characteristics can be specified in each separate case according to the subject of the web shop since the audience and the subject of the web shop are directly connected, as explained in the previous section. For example, several web shops target only young people or more specifically only young women. In addition, the age and gender of target users will influence the presentation of the web shop. That does not mean that users which do not belong to that particular age and gender group will not be able to browse through the web site nonetheless; they do not constitute our priority.

Excluding age and gender, the remaining characteristics are in general not important for a web shop. Note that children should not be able to make an online purchase even if that is by mistake, therefore the target audience should only be people of “*legal age*”. In the case of E-Commerce applications incorporated in smart phones or tables, the use of which is effortless for children, the user has the option to save personal account information in order to purchase services easier and faster. That means that it is no longer necessary to fill out a credit card number or address with each additional purchase and a user may complete a new one simply with the press of button. Image 3.3 illustrates an example of the importance of ‘child security features’ in such applications.

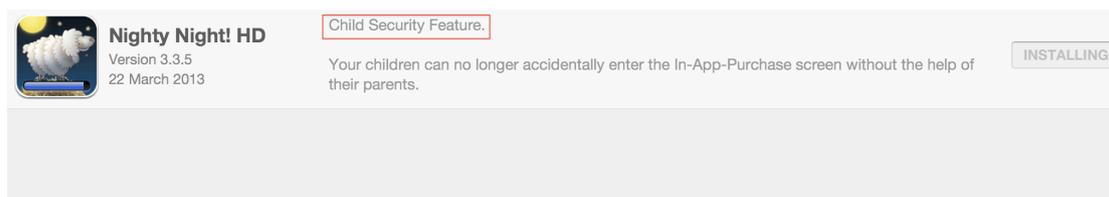


Image 3.3: Child security feature concerning purchases (source: iPad Applications)

Since it is necessary to only specify explicitly the **age** and **gender** of the audience classes, it is no longer necessary to have two separate sub phases for the Audience Modeling. The suggestion in WSDM-lite is to unify the two sub phases of WSDM, Audience Characterization and Audience Classification, in one phase called ‘**Target Audience Specification**’.

The first step during this adapted phase is the age and gender specification. If we consider the apparel example provided in the previous section, the age and gender specification can simply be represented with the following sentence: “*Our target audience is women and men between the ages of 18 and 25*”.

Concerning the Audience Classification in WSDM, two ways are described to derive the final audience classes. The first way is using the activities of the organization and the people involved with these activities to derive the audience classes. The second way gathers all possible information and functional requirements of the users, and applies these requirements as dimensions of a matrix table with the final objective to retrieve, from this table, the different audience classes (De Troyer, Casteleyn & Plessers, 2007). In WSDM-lite, we apply the activity-based method, the reason being that it is a more straight forward, and a less complex approach than creating a matrix table. That, in addition, enhances the scope of WSDM-lite to be useful for developers with little programming awareness. The steps of the activity method are as follows:

1. Consider the activities of the business which are directly related to the purpose of the web shop.
2. Identify the people involved in the business activities and restrict them to target users.
3. Identify the requirements of the target users.
4. Based on the different information or functional requirements, divide the target users into different audience classes.
5. Decompose a business activity if necessary, and repeat from step 2.

When the activities of the business cannot be further decomposed and if no further classification of users into audience classes is applicable, the final audience classes are formulated (De Troyer, Casteleyn & Plessers, 2007). In WSDM, the first step of the activity based method is expressed as “*Consider the activities of the organization related to the purpose of the web system*” since with this method we can create any kind of web site. However, WSDM-lite focuses on web shops and thus, the first step is formulated in a slightly different way. The organization for which we will consider its activities, is a business and the web system to which these activities relate to is a web shop. Furthermore, we are going to consider these activities which are directly related to the web shop.

The following sub sections (from subsection 3.2.1 to subsection 3.2.4), describe how, for the purposes of WSDM-lite, we have applied the activity-based method in order to obtain a set of audience classes and their requirements, specifically for a web shop. By predefining a set of audience classes along with their requirements, we provide a *shortcut* to the developer, as such the workflow of the method lightens. In addition, the developer is free to choose the appropriate audience classes and requirements for each case. We may say that these predefined audience classes and requirements are in a way *plug-ins* for WSDM-lite.

3.2.1 Step 1: Activities of the Business Directly Related to the Web Shop

Concerning the specific domain of E-Commerce, the activities of a business directly related to the web shop, are as follows:

- To provide information on available products and-or services
- To provide related information concerning a specific product or service
- To maintain and update information of products and-or services
- To give trust to the customer
- To create seasonal promotions
- To (*ideally*) sell (*all*) available products

The aforementioned activities should be reflected in the web system due to the fact that they are directly related to its purpose.

3.2.2 Step2: Identification of the People Involved with Business Activities and Restriction to Target Users

The people who participate in the activities of the business related to the web shop are the marketers, the providers of the products or services, and the customers which will browse though the various categories and possibly make a purchase. Both the marketers and customers are considered in the audience classification since they will directly interact with the web site to perform various tasks.

The marketer, in the context of a web shop is called the administrator⁶⁷ who is responsible for back-end operations concerning the information and the management of the web shop. For example, the administrator is responsible for providing and updating the content of the web shop as well as the proper categorization of this content and for handling requests of the users.

Taking into consideration the fact that a Web Content Management System (WCMS) is going to be used for the realization of the web shop, the maintenance of the general design and structure (concerning a selected theme) as well as the several updates related to the modules or extensions of the WCMS are tasks that should not be related with the requirements of any of the aforementioned audience classes. As WCMSs provide these functionalities, these aspects will not be considered. At the same time, a WCMS E-Commerce package can support all the functional requirements of the administrator, which raises the question wether the task of gathering, specifying and modeling the requirements for this audience class is in fact necessary.

However, by identifying all the requirements of this audience class we take into consideration every task the administrator will have to perform. Since a web content

⁶⁷ The marketer (owner of the business or seller) does not necessarily have to be the administrator of the web system. Another person can be assigned to that position which is up to the business to decide. However, that does not effect the audience classification since the tasks of the administrator will remain the same.

management system has several limitations, the identification of audience requirements provides a clear outline of what is necessary to be included and thus makes it possible to avoid the use of a WCMS containing such limitations⁶⁸.

3.2.3 Step 3, Step 4 & Step 5: Identifying the Requirements of Target Users and Dividing Them into Audience Classes

By identifying the requirements of the marketer and the customer, and by decomposing their activities further on, we derived the following general list of audience classes and their requirements. These audience classes and their requirements are in general, which means that they are applicable to any kind of web shop. However, it is always possible to make changes to the audience classes and their related requirements, if necessary. We can consider again the fact that a company would not want to include customer reviews.

The starting point for our audience classes are the **administrator(s)** and the **customers**. These two groups of people have completely different requirements and are therefore disjoint audience classes since the administrator will not be a customer of the web shop at the same time.

The customers are covered by the *Frequent Visitor* class, as often a user will browse through a web shop only to view and gather the necessary for him/her information, without the intent to buy online. After gathering all that information, the *frequent visitor* will complete the purchase in a physical shop. While every user should feel secure and should be invited to purchase through the web shop, there is still a noticeable percentage of people who will visit the web site frequently but only for informational purposes and their requirements should be taken under consideration.

The *Potential Customer* is a subclass of *Frequent Visitor* and includes users who have the intention to buy online but it is not certain that they will complete this task. The users in the *Potential Customer* audience class share the same requirements as the users of the *Frequent Visitor* class but have some additional requirements. That is based on the definition of superclass and subclass described in the WSDM method (De Troyer, Casteleyn & Plessers, 2007).

The *Regular Customer* is a subclass of *Potential Customer*, and therefore also of *Frequent Visitor*. This particular audience class includes users who are familiar with the web shop and visit it regularly to make purchases, namely in this situation the business-customer trust has already been achieved. Regular customers have the same requirements as *Potential Customers* and *Frequent Visitors*, but in addition they have a number of specific needs which need to be reflected in the web shop. An example can be, the opportunity to register to the web shop which will allow these types of users to log in and save certain personal information, i.e their address and their email. By doing so, the Regular Customer will not be bothered with the task of providing an

⁶⁸ This subject will be further elaborated in the Conceptual Design and Implementation Design section

email address or location with each new order, what is known in the terminology of web shops as a *faster checkout process*.

The requirements of these different audience classes are identified as follows:

A. System Administrators

- To have an administrator interface⁶⁹
- To log in as the administrator of the web shop
- To log out as the administrator of the web shop
- To get an overview of orders for a specific period of time (*for example, a sales report per week*)
- To be able to view information concerning customer orders (*for example the status of an order, the date, and the total amount per customer*)
- To be able to create product categories
- To be able to map products to categories
- To edit category information
- To create and publish an article⁷⁰
- To be able to delete categories and articles
- To create product promotions (*discounts*) in a straight forward way
- To provide information concerning the terms and conditions related to the use of the web shop (including payment regulations and delivery information)
- To be able to receive customer questions and customer feedback
- To be able to respond to customer feedback and questions
- To be able to handle and process customer requests
- To be able to change the presentation of the web shop in a fast and straight forward way
- To be able to include in the web shop interesting links related to the products included within the web shop
- To make all information available in multiple languages (*the web shop should be in a 'local' language but also in English when selling in a global market is aimed for*)

B. Frequent Visitor

- To get an overview of products currently available for sale
- To browse through product categories
- To browse through products within a category
- To browse products by means of different views such as by price, by brand, by size, or by color
- To view product information such as the description, the price, the availability and the size
- To be able to compare products with other products.

⁶⁹ That would be provided by the Web Content Management System

⁷⁰ In the E-Commerce domain the article refers to an item, a product and all related information to this product. For example, an item's image, description, price etc

- To be able to compare the prices in provided offers (*what was the price before, and which is the new price*)
- To get an overview of current offers and promotions
- To view, along with the current product, related products and complementary products
- To be able to browse to interesting links related to the business and the products included in the web shop

C. Potential Customer

- To securely purchase a product
- To be able to select product features (*such as the size, and the color of a product*)
- To obtain information concerning the terms and conditions of the business. That includes payment regulations as well as the privacy and return policies
- To get information for the exact price of a product including shipping and any additional costs such as taxes, or value added taxes
- To get information concerning the delivery of the product such as which company is responsible for the delivery of a parcel and how many days are required until the product is delivered
- To have the opportunity to add products in the shopping cart in a straight forward way
- To manage products in the shopping cart (*for example remove a no longer desirable product or adjust the quantity of a product*)
- To be able to order a product in an easy way by providing the necessary information which is the billing address, a credit card number, and the exact location

D. Regular Customer

- To be able to create personalized lists with products
- To be able to add or delete products from personalized list(s)
- To be able to add or delete products from a 'Favorite' list
- To be able to browse from a list of products to the shopping cart in a straight forward way
- To be able to write a review about a product
- To receive news related to business activities such as a newsletter, promotions, competitions, new arrivals, and special offers
- To be able to register to the web shop with a customer account
- To log in at the customer account
- To log out from the customer account
- To be able to store and save specific personal information such as email, location and address
- To be able to view the process of an order (*tracking of an order*)
- To be able to view a personalized history of orders

In WSDM, the requirements which are identified to be common in all audience classes are assigned to a separate audience class called **Visitor**, which is always placed at the top of the audience class hierarchy (De Troyer, Casteleyn & Plessers, 2007). In the case of web shops and amongst the audience classes which have been formulated, the requirements of the Visitor class are as follows:

Visitor

- To be able to find a specific product by means of search
- To publish a comment about a product
- To be able to share the product on a Social Media website

This concludes the construction of the predefined Audience Hierarchy which is represented in Figure 3.2. The list of all the requirements of the audience classes will constitute the input for the next phase, called Conceptual Design phase. At this point we have to mention yet again, that the developer is free to not consider some of the audience classes or requirements that would not be relevant to his specific design. An example of this, is discussed in Chapter 4.

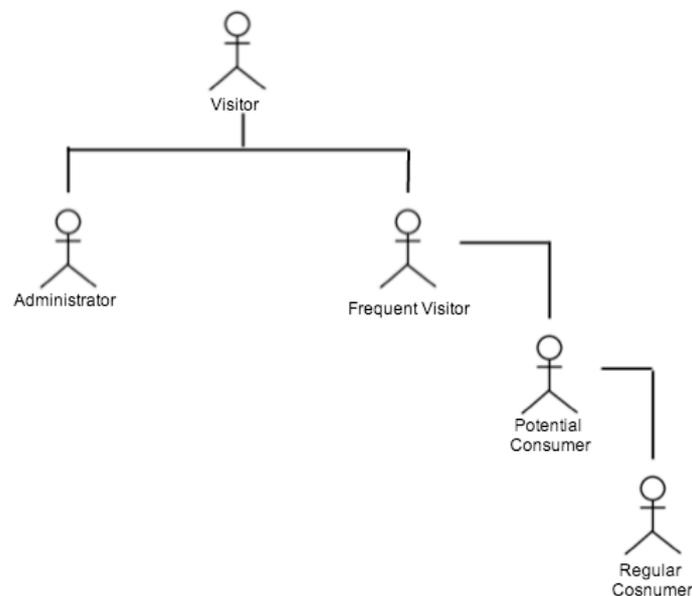


Figure 3.2: Predefined Audience Class Hierarchy for web shops

3.3 Conceptual Design

The objective of the ‘Conceptual Design’ phase in WSDM is to turn the informal requirements identified in the previous phase of the method, into high level formal descriptions which will be used to create the web site. During this phase, the focus is on the conceptual features⁷¹ rather than on the visual features and presentation of the website. These conceptual features are covered by two sub phases:

- The Task and Information Modeling sub phase, during which the content and the functionality of the web site are modeled
- The Navigational Design sub phase, where the conceptual structure of the web site and the navigation are specified.

In contrast to other web design methods, WSDM does not start with modeling the information and functionality in an overall conceptual model. Instead, WSDM starts by analyzing the requirements of the different audience classes which are specified in the previous phase. This results in a number of *object chunks*, meaning a number of “formal conceptual descriptions of the information and functionality needed by the user when performing a task” (De Troyer, O.Casteleyn & S.Plessers, 2007, p.19). After modeling the requirements of the audience classes, the resulting object chunks are integrated into an overall conceptual model. This approach provides a set of important advantages since the developer can concentrate to the needs of the user instead of solely modeling the information and functionality which exists in the terms of the business. In addition, we can avoid designing the web site according to the business structure, which is not always useful for the target audience. Most importantly, this approach gives consideration to the fact that different users have different needs which in turn need to be structured in a different way, or need to be represented with a different terminology (De Troyer, Casteleyn & Plessers, 2007).

The structure of the web site and the way the users will navigate through it and perform tasks, is defined with a set of *navigational tracks*. A navigational track “contains all and only the information and functionality needed by the members of the associated audience class” (De Troyer, Casteleyn & Plessers, 2007, p.24). These navigational tracks will be integrated in a basic conceptual navigation, one navigational model comprised of components and the links between these components (De Troyer, Casteleyn & Plessers, 2007). The outcome of the Conceptual Modeling phase in WSDM is a set of conceptual task models, object chunks, and the navigational model of the web site.

The purpose of adapting WSDM to a lighter version is to facilitate the application of the method for creating web shops and to provide a relative ease to developers who are not familiar with programming. For that reason, the two sub phases of the ‘Conceptual Design’ are adjusted in order for that phase to become more

⁷¹ The conceptual features of the web site or else the conceptual “what and how”. That includes the information, the content and the functionality.

straightforward. First the adaptation of Task and Information Modeling in WSDM-lite is explained, and then a description of how navigational Design is adjusted will follow.

3.3.1 Information Modeling

The Task and Information Modeling phase in WSDM starts by modeling the requirements of the audience classes into a set of task models which are later *translated* into the corresponding object chunks. Task Models represent in detail the different tasks each user has to perform and formally describe the data and functionality needed for these tasks. Complex tasks are decomposed in a number of subtasks, which have relationships between them to indicate the order in which they have to be performed. Task models are modeled in WSDM by using the Concurrent Task Trees (CTTs) notation developed by Paterno (Paterno, 2003)(De Troyer, Casteleyn & Plessers, 2007).

Designing a task model as well as an object chunk for each user requirement falls out of the scope of WSDM-lite. The information as well as the functionality can be modeled exclusively with object chunks by using the Object Role Modeling (ORM) notation. Therefore, the use of task models is discarded in WSDM-lite which in addition makes the design process more brief. The ORM notation suffices for the modeling of information and in order to model functionality the “graphical conceptual data manipulation language” of WSDM will be applied (De Troyer, Casteleyn & Plessers, 2007). The notation and the principals, as described in the background chapter, remain the same, while functionality can be modeled by the addition of some extra symbols which are represented in the following Table 3.1:

WSDM - Graphical Conceptual Data Manipulation Language	
Symbols	Explanation
in *m	Represents the input parameter and restricts the whole schema to a particular view
out *I	Represents the output parameter and restricts the whole schema to a particular view
!	Represents the selection of one value
!!	Represents the selection of multiple values
?	Represents the input of more of a single value

WSDM - Graphical Conceptual Data Manipulation Language	
??	Represents the input of more than one instance
NEW '+'	Represents the creation of a new instance
REMOVE '-'	Represents the removal of one or more instances
'='	Represents the assignment of a value to a variable
*USER	Represents a user session

Table 3.1: WSDM Graphical Conceptual Data Manipulation Language (De Troyer, Casteleyn & Plessers, 2007)

Consider for example the requirement of adding a product to the shopping cart of a user. This is a requirement that involves functionality and it can be modeled as shown in Figure 3.4:

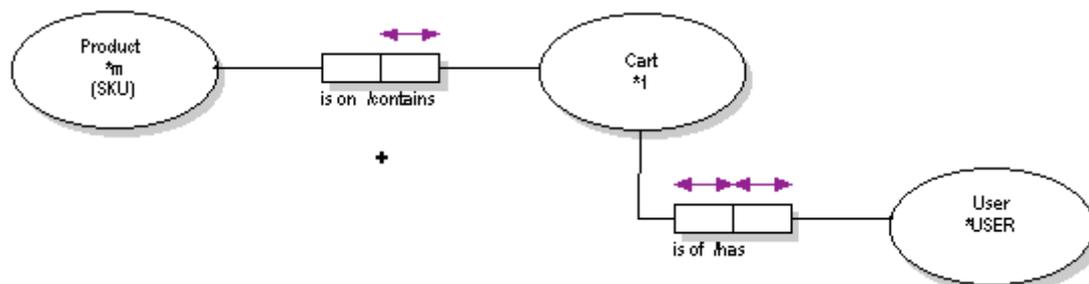


Figure 3.3: Object Chunk “Add Product to shopping cart”

3.3.2 Navigational Design

The ease of navigation is an essential requirement for a web site, as it is important for both usability and functionality. In addition the more time the user spends in the web shop (without being frustrated) and explores the various product categories, the more likely it is that he or she will buy something. In order to achieve that, we need to include in the web shop an effective and comprehensible navigation to help and guide our audience. In addition, the audience should immediately understand the purpose of a menu item and its function, for example, this can happen by providing an appropriate title to the menu item. The importance of navigational design becomes more clear, if we consider that visitors have little time and patience and they do not

want to invest time in exploring a complicated website in order to find something (Ford & Wedemann, 2008).

The logic structure of the web shop, i.e the conceptual model, needs to be considered in order to lead to a successful navigation (Ford & Wedemann, 2008). Consistency between the overall conceptual model we derived from the previous step, and the navigational model that we will construct, plays an important role. That happens because in that conceptual model we have defined relationships between concepts which in this sub phase can lead to possible ways to cross navigate within the web shop, later on we provide an example of that. The hierarchy that was derived from the previous phase of Target Audience Specification, shows how we can organize our content into topics and subtopics based on the specific audience needs.

In the background chapter of this thesis, we have provided a description of the navigational design method based on (De Troyer, Casteleyn & Plessers, 2007). During this particular sub phase in WSDM, the developer can derive the internal structure of the *navigational tracks* from Task Models. However, in WSDM-lite, Task Models are discarded as we explained in the previous section. The suggestion in WSDM-lite, is for the navigational tracks to be derived from the related object chunks, created in the previous ‘Information Modeling’ sub phase. The method with which the developer can be led from an object chunk to a navigational track, can be summarized in the following steps:

For each Audience requirement

1. Consider the related Object chunk, and whether it represents information or functionality.
2. Create a navigational component for each object type of the Object chunk.
3. In the case that the object type represents functionality, create also the component which implements this functionality.
4. Connect the derived navigational components based on the order in which they need to be processed to create a navigational track.

In addition

5. Take into account which other (additional) functionality (if any) can be related to this navigational track.
6. Create components for these functionalities (if not yet done) and link these components to the existing navigational track to enhance usability and navigation.

We provide an example of how this method can be applied by considering the requirement of a member of the ‘Potential Customer’ audience class: *To have the*

opportunity to add a product in the shopping cart. The related object chunk for this requirement is represented in Figure 3.3. From the object types represented in this figure, we derive the navigational components for the navigational track, being:

- ‘*View product Info*’, for the object type “Product” which is restricted to a particular view (represented with *m)
- ‘*Add to Shopping Cart*’, for the object type “Cart” which represents the addition of one item to the cart. At this point we do not oblige the user to login, i.e validation is not required. That means that in this user session, the user may be anonymous and choose to log in/subscribe later.
- ‘*Add to Shopping Cart*’, for the relation of the object type “Cart” with the object type “User”. In this case a user is in a user session (represented with *USER) which means that the user is identified, i.e logged in, in which case the component is included in a protected area, i.e the Validation area, represented in a grey frame as in WSDM (De Troyer, Casteleyn & Plessers, 2007).

This particular object chunk represents functionality, therefore we have to also consider related components which implement this functionality. In order to view product information of a product we must first select it, for example from a list of products. As a result, the additional component which implements this functionality is the ‘*Select Product*’ component. When we connect the derived components based on the order in which they will be processed, we derive the navigational track as shown in Figure 3.4 :

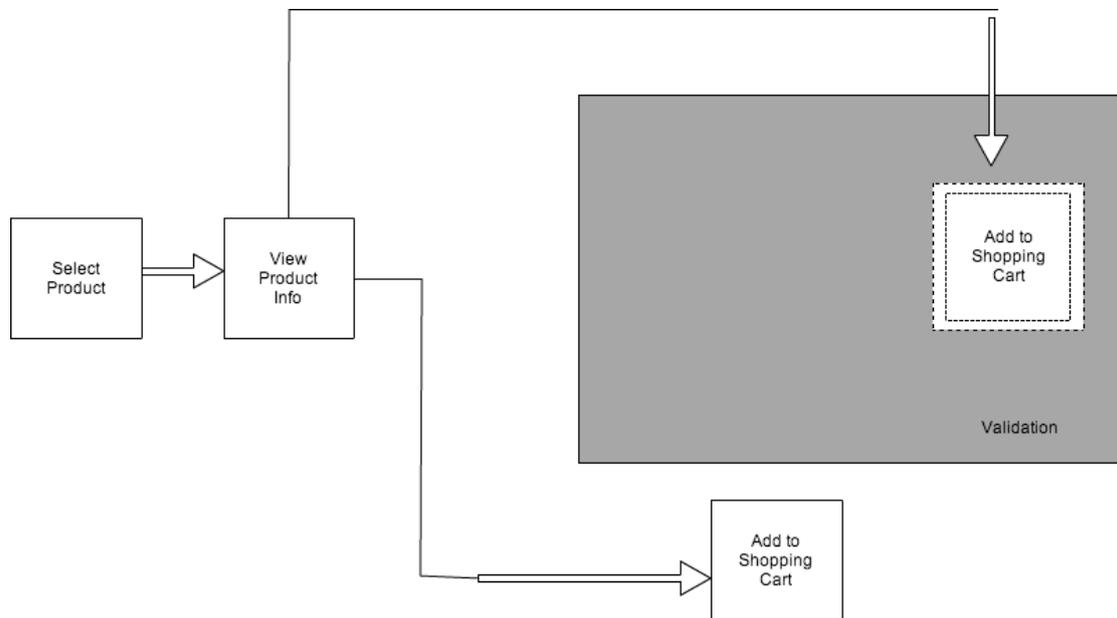


Figure 3.4: Initial Navigational Track “Add Product to shopping cart”

However, one of our goals is to enhance usability and functionality for our navigation. This happens with steps 5 and 6 of the method. We consider the case where the user may take a different track after viewing the product information, he may choose for example, to bound this product by adding it in a personalized list, or to a favorites list and add it to the shopping cart later after browsing more products. That, in addition,

would require a log in, since lists are personalized. Therefore by taking into account these related functionalities, step 5, and by presenting this functionality by components, and linking these components to the existing navigational track, step 6, we derive the final navigational track as shown in Figure 3.6:

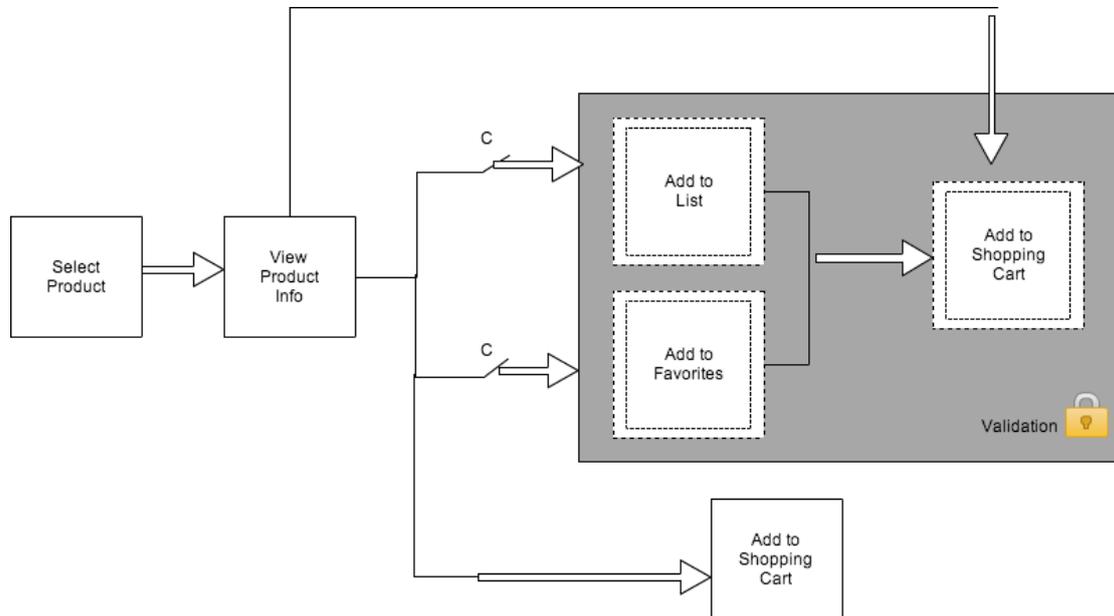


Figure 3.5: Navigational Track “Add Product to shopping cart”

Designing the navigation when it is known that the implementation is going to happen with the use of a Web Content Management System, is rather tricky. So far, we have modeled the requirements of the audience classes and we have designed navigation in such a way that it takes into consideration the structure and organization of these audience requirements. The goal is to put information where the target users will expect it to be and therefore to make navigation understandable and intuitive for the visitors. Also, the goal is to create a navigation that does not take too much space, i.e. that contains a big number of menu items, or a navigation which would make the content of a page become secondary (Ford & Wedemann, 2008). The possibilities to create an innovative and creative graphic design in navigation are numerous. Such navigation is very attractive in web sites however, it is mostly corresponding to advanced audiences who would know how to manage it, otherwise it will have no impact to the average user who will not understand it and as a result will miss a lot of content from the web shop.

An additional scope is to make it possible for pages to be reached in few steps, i.e. in one or two clicks. However, the WCMS that we will choose may include limitations concerning the navigation. Often, a template provides a limited number of menu items. Several inconsistencies may exist between the way we modeled the navigation and the way we can actually implement it. We discuss how we can deal with this.

Ideally, we search for the template that will most accurately represent our navigation model due to the fact that we should not change the logic of our navigation. However, when that is not possible we can try to find way of abusing notation, i.e. to use a field

in a different way from that for which it was originally defined for, or revisit our navigational models and re-design the parts that are necessary to be changed (we will elaborate on this issue in the following sections).

The visual structure of the navigation, in terms of whether our menus should be vertical or horizontal or whether we should create animated menus, is not yet considered. We emphasize that, so far, in the method, the focus is on the conceptual design which will constitute the input for the following phase.

3.4 Implementation Design

The Implementation Design phase in WSDM, takes as an input the resulting conceptual design of the preceding phase and complements it with the necessary details for an actual implementation. During this phase, the functionality and information is grouped in a way to achieve a good balance between the amount of information on a page, and the number of clicks that are required to reach this information. In addition, a mapping is defined from the conceptual description, i.e the overall conceptual model, to the actual data source of the web site. As we previously mentioned, most websites today are database driven which means that the data source of a web site is a database, more commonly a Relational Data Base (RDB).

The implementation design phase in WSDM consists of three sub phases to reach its objectives. These sub phases are the following:

- *Site Structure Design*, results in a site structure model which contains the abstract pages of the web site and how they are connected with each other.
- *Presentation Design*, results in a presentation model which contains a number of page models, i.e. the template and style of each page.
- *Logical Data Design*, results in a logical data schema, where the mapping between the conceptual schema and the data store of the website is created, or defined. (De Troyer, Casteleyn & Plessers, 2007)

In WSDM, the use of a web content management system for the implementation design phase is not discussed, even though the possibility to implement the web site this way is not restrained. In WSDM-lite, the implementation design phase is organized in such a way as to be realized explicitly with the use of a WCMS. That happens as we previously explained, with respect to the objective to provide relative ease to developers who lack the technological background and knowledge to create a web site from scratch (with code). In this chapter, we describe how the Implementation Design phase of WSDM is adapted in WSDM-lite for this purpose. In WSDM-lite, the Implementation phase is realized with two sub phases:

- *Site Map Design*, which results in a site map that contains the abstract pages of the web site and how they are connected to each other.

- *WCMS Specification and Social Media Integration*, includes the choice of a template, the choice of related plug-ins, and modules. This sub phase results in an overall graphic presentation of the web shop and a Social Media identity.

3.4.1 Site Map Design

During the Site Map Design sub phase in WSDM-lite, the developer decides how to group the components included in the navigational design, into the various web site pages. Several components, or just one component, can be included in one page, and one component may be included in more than one page. This organization of components into pages, happens with respect to the conceptual links and structure we have defined in the previous sub phase. This practically means that, in order to decide how to group components in each of the site's pages, it is required to consider which components are included in the navigation design, and what is their relation to other components so that it can be decided where to place them on the web site.

We illustrate the principles with the following examples. Firstly, in our Navigational Design, we should include the component '*Terms and Conditions*' which represents the Terms and Conditions of the web shop, a necessary requirement for the Potential Customer audience class. This component cannot be accessed, by means of a direct link, by the component of '*Product Information*' for example; therefore these two components should not be included in the same page, the '*Terms and Conditions*' component should independently be in one page.

In contrast to the previous example, as we have previously showcased there exists a conceptual link between the components '*Add to Shopping Cart*', '*Add to favorite List*' and '*Add to (personalized) list*'. As a result, we can group these components in one page, Figure 3.7 shows this part of the site map, however it is clear that in practice such a site map will include information concerning all pages of the web shop. We will provide examples, in the following chapter, Chapter 4, in the Implementation Design sections.

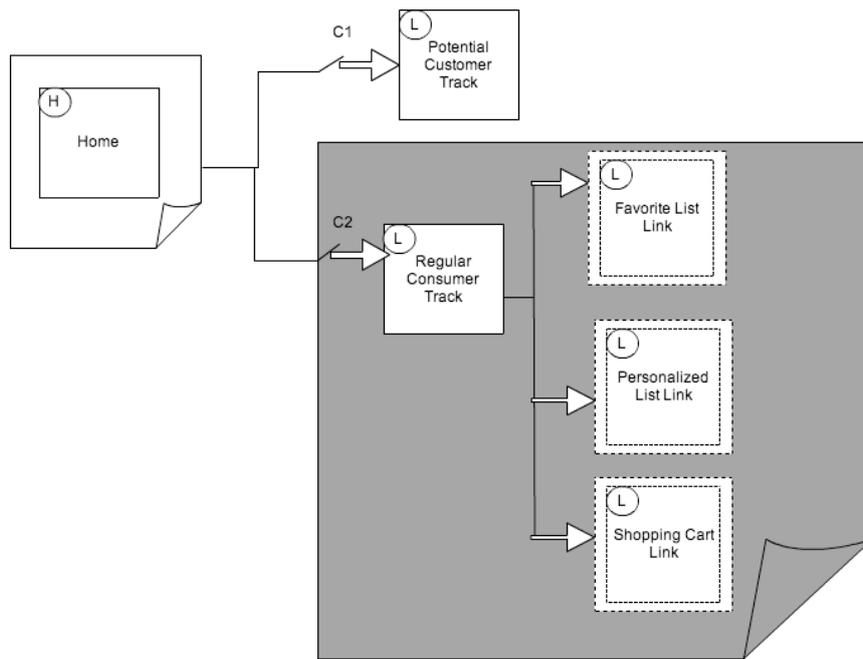


Figure 3.6: Part of the site Structure Design- Shopping Cart Navigation

In the actual presentation, we expect to be able to have the following representation, with all the aforementioned components in one page, as shown in Image 3.4:

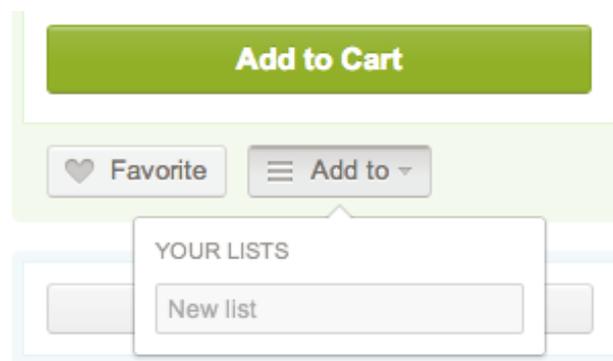


Image 3.4: A part of Grouping Navigational Components to pages (source: <http://www.etsy.com>)

However, we are not concerned with the presentation design just yet. At this point in WSDM-lite, we aim to group information in different pages with respect to the audience needs. We began with the specification of audience requirements, based on these requirements we designed the conceptual model and the navigation of the web shop. Finally, based on the components of this navigation we design the site map of the web shop; this way we manage to keep the audience requirements as the center of our design.

However, there are several important limitations to be considered since the actual Implementation is realized with a use of Web Content Management System.

Firstly, it is not up to the developer of the web shop to design the structure of pages concerning the administrator audience class. Every Web Content Management System (WCMS) framework provides an interface commonly called, an *administration panel*, an example of which is shown in Image 3.5. In most cases this panel is a web based interface in which administrator(s) can perform all of their tasks. The team which develops the WCMS is responsible to design the structure of the page(s) in that interface. As we explained in the “Target Audience Specification” phase section, we consider the gathering and modeling of the administrator audience class requirements, as a way to outline the needs of this particular audience class in the early stages of this methodology. This fact gives us the opportunity to chose a WCMS which will provide all or most of these requirements, in the red rectangle of Image 3.5, we can see examples of some audience requirements that we have defined and which are provided by the X-Cart administration panel. In the contrary case, we are able to realize whether a WCMS framework is not fitting the needs of the administrator audience class. We elaborate on this in the following Chapter 4.

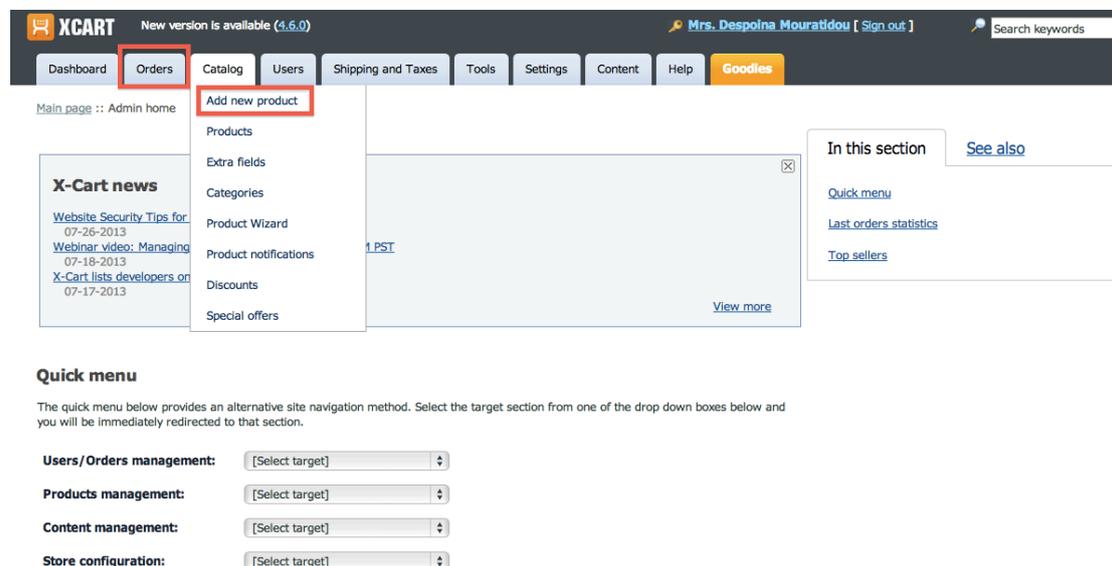


Image 3.5: X-Cart Admin panel (source: <http://88.198.56.23/~despoina/xcart/xcart/admin/>)

3.4.2 Web Content Management System Specification and Social Media Integration

During the final phase of WSDM-lite, the designer should specify which WCMS framework will be used to implement the web shop. The WCMS specification includes the template and plug-ins selection, the choices of which are based on the site map design, by taking under consideration the audience characteristics, and based on the requirements defined for the administrator. Furthermore, the WCMS framework chosen should provide the versioning of the web shop pages in terms of different devices, i.e smart phones and tablets. After that, we discuss the integration of our design with Social Media, i.e FaceBook Pages.

In order to choose an appropriate template, we will have to consider several factors. First of all, the Age and Gender specification and the Subject specification, as they are defined in the earlier stages of this methodology, have to be considered. Both of these factors will influence the colors, language and terminology, and the fonts we will use for our pages, as it is almost mandatory to choose the appropriate way to deliver the content to our audience, if we want to achieve usability. We have already provided an explanation of these factors and their influence on presentation in the previous sections (we refer to Image 3.1, p44 and Image 3.2, p45). The importance of properly presenting the information in a site page is also discussed in (Ford & Wedemann, 2008) where they mention that “managing the content of a web page, means understanding your audience”.

After that, we have to consider the physical presentation of the business, if that exists⁷², the logo and storefront of the physical store has to be consistent with that of the web shop. An example of this is illustrated in Image 3.6. with, [huntingandcollecting.com](http://www.huntingandcollecting.com), a clothing and accessories shop in the center of Brussels which maintains a minimalistic design in both the web shop and the physical store. This uniform style in the web shop and the actual store will help the customers to not differentiate between the two but rather treat them as one.



Image 3.6: Hunting and Collecting - Example of consistency in presentation (source: <http://www.huntingandcollecting.com/shop/> & <http://www.facebook.com/huntingandcollecting>)

During this phase the developer has to also choose the necessary plug-ins and modules⁷³ that will provide, in a straight forward way, specific functionality for the web shop. There are plenty of available plug-ins included in each WCMS framework,

⁷² Several small medium businesses exist only in electronic form

⁷³ Plug-ins and modules are referred to as components and widgets depending the WCMS we use

that provide product management and cart system functionality. The developer can read reviews for these plug-ins as well as the documentation provided for each of them. The audience requirements as well as the conceptual design we have defined in the previous phases, will help the developer in choosing the appropriate plug-ins at this point. For example, as we have previously specified, we want to provide the option to our all audience classes to share a product of the web shop on Social Media. Therefore, we should choose a plug-in that will also include this functionality, as seen in Image 3.7:

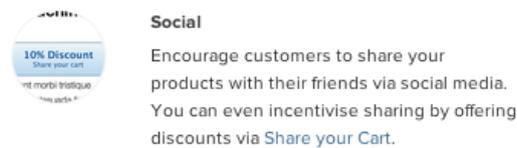


Image 3.7: Plug in Selection - Necessary Functionality (source: <http://www.woothemes.com/woocommerce/#customer-friendly>)

Once the WCMS specification is completed, we will have the final *look and feel* of the web shop which will allow us to create a Social Media identity that corresponds to the presentation of the web shop. This will further enhance the uniformity of online

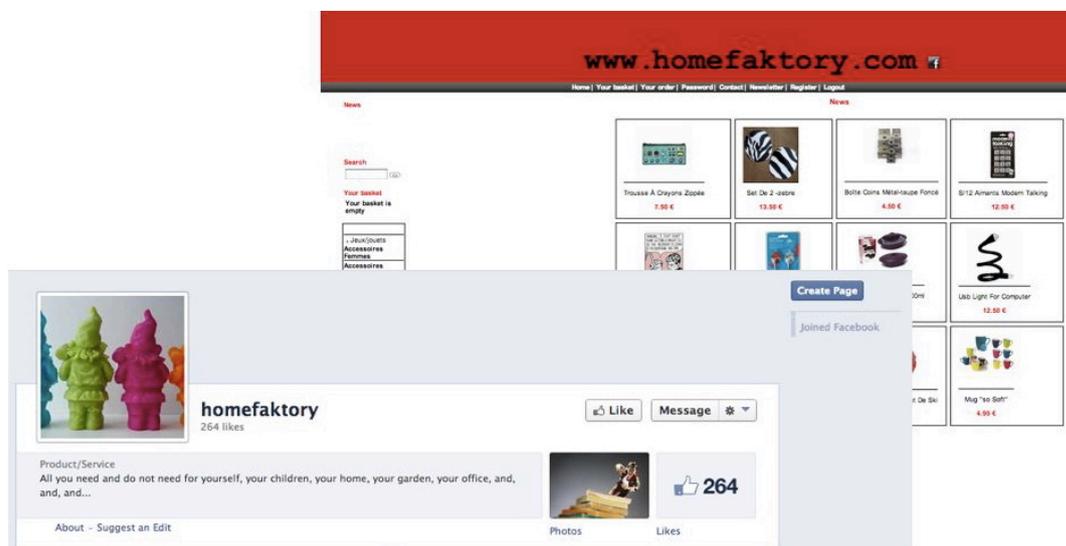


Image 3.8: Inconsistency of presentation in Web Shop and Social Media - *Homefaktry.com* example (source: <http://www.homefaktry.com/> & <https://www.facebook.com/pages/homefaktry/>)

and physical presence of the business. Consider for example, the example shown in Image 3.8, where there is no consistency between the web shop of homefaktry.com, and the Social Media representation of the business on FaceBook Pages. For a

customer, visiting the web shop and the FaceBook Page, probably visiting the actual store as well, becomes a separate experience. That can result into a struggle of building a customer base, especially if customers cannot recognize that they visit the same shop. Now consider the case of whazup.be, a similar type of business (both businesses sell gadgets and home accessories) where the presentation of the web shop is consistent with the presentation of the business in Social Media, as shown in Image 3.9:



Image 3.9: Consistent presentation web shop and Social media - *Whazup.be* example (source:<http://www.whazup.be/> & <https://www.facebook.com/Whazup.Brussels?fref=ts>)

The impact of Social Media in E-Commerce, as explained in the background for E-Commerce web sites, is massive and it should not be taken lightly. Every business that is represented on the internet should maintain a presence in the Social Media where it can access a possible customer base in a more direct way.

3.5 Summary

In this Chapter, we have presented the adaptation of WSDM to WSDM-lite. The workflow of WSDM-lite is shorter than the workflow of WSDM, and as this methodology concentrates on the design of web shops, the phases which are included in it are modified. The sub phases of Audience Modeling, Audience Characterization and Audience Classification, are unified while the Task Modeling step in the Conceptual Design phase is discarded. A new Navigational Design method is provided in order to deal with this change. The Implementation Design phase is also revised for the reason that a WCMS will be used for the actual Implementation of the web shop. A new sub phase is introduced at this point in which we specify the WCMS we will apply and where we create a Social Media identity for the business. The overview of the adaptation of WSDM in WSDM-lite is presented in the following, Table 3.2.

Overview of WSDM to WSDM-lite Adaptation		
WSDM Phases	WSDM-lite Phases	Adaptation
Mission Statement Specification	Web Shop Subject Specification	- Simplification of the phase in order to be adapted to web shops
Audience Modeling: a. Audience Classification & b. Audience Characterization	Target Audience Specification	- Unification of the two sub phases - Adaptation of Audience Classification sub phase to web shops
Conceptual Design: a. Task& Information Modeling b. Navigational Modeling	Conceptual Design: a. Information Modeling b. Navigational Modeling	- Removal of Task Modeling step - Adaptation of navigational Modeling phase
Implementation Design: a. Site Structure Design b. Presentation Design c. Logical Data Design	Implementation Design: a. Site Map Design b. WCMS Specification and Social Media Integration	- Adaptation of sub phases with respect to the use of WCMS - Replacement of the two final sub phase with a newly introduced sub phase.

Table 3.2: Overview of adaptation from WSDM to WSDM-lite

We argue that this methodology can provide the necessary guidelines for the design of an effective web shop and in the next Chapter, we will demonstrate this solution with several examples. The overview of the WSDM-lite phases and their output, are illustrated in Figure 3.7 below:

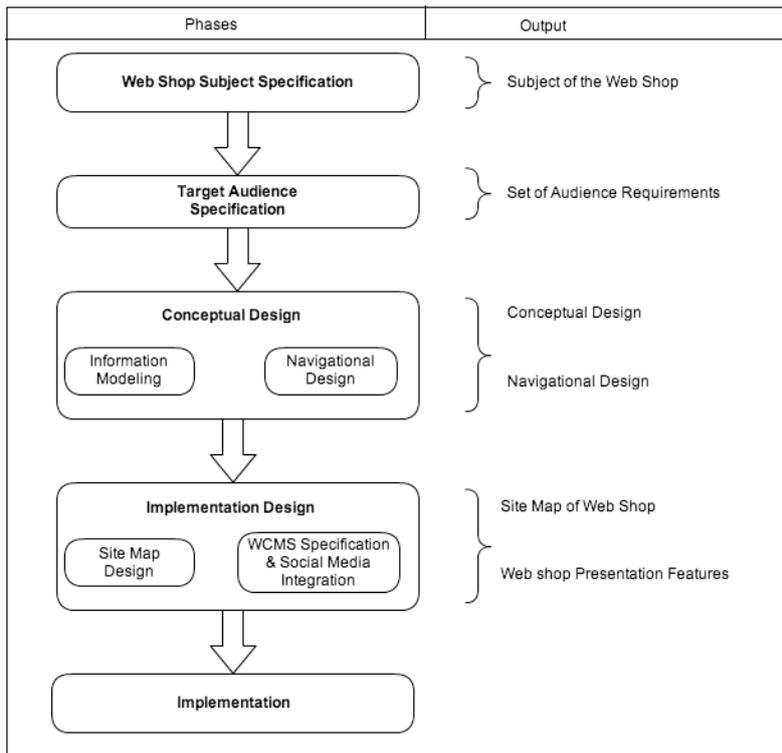


Figure 3.7: Overview of WSDM-lite

4. WSDM-lite Demonstration

In this Chapter, we will demonstrate WSDM-lite, as it is presented in the previous Chapter. Three cases are considered, in the first case we will use Wordpress for the Implementation and we will develop a fictional B2C web shop of Accessories and Jewelry. In the next case, we will alter an existing C2B web shop by applying WSDM-lite with Joomla, in order to showcase what could be different from the current web shop. In the final example, we will convert an existing brochure web site into a B2C web shop, where transactions could be possible.

4.1 WSDM-lite with Wordpress

In this section, we will demonstrate the application of WSDM-lite with the use of Wordpress. We will use a fictional example of a web shop that includes jewelry and accessories, in order to demonstrate this first case.

4.1.1 Web Shop Subject Specification

The first step in WSDM-lite is the Web Shop Subject Specification. During this phase we will specify what will be included in the web shop, that is:

“Our web shop will include a variety of contemporary jewelry and accessories for women. We aim to become the ultimate source of fashion jewelry by providing our customers with stylish choices for affordable prices”

4.1.2 Target Audience Specification

As we have explained already in Chapter 3, during the Subject Specification a first indirect specification of the target audience is provided. In this case, the target audience is restricted to women a factor that will later on also influence our Implementation Design. for the moment, the Audience Characterization is the following:

“Our target audience are women of all ages, but we mostly target fashion conscious women between the ages of 25 and 40”

For this example, we keep all of the predefined Audience Classes with the same Audience Hierarchy as defined in the previous Chapter 3. However, some of the Audience Requirements are not considered because they are not present in the business, some are adjusted to represent the business in a better way, and finally some of the requirements are assigned to a different Audience Class. These changes are as follows:

A. System Administrators

- **REMOVED:** To be able to include in the web shop interesting links related to the products included within the web shop

B. Frequent Visitor

- **MODIFIED:** To get an overview of *jewelries and accessories* currently available for sale
- **MODIFIED:** To browse through categories of *jewelries and accessories*.
- **REMOVED:** To be able to compare products with other products.
- **MODIFIED:** To browse through *jewelries and accessories* within a category
- **MODIFIED:** To browse *jewelries and accessories* by means of different views such as by price (highest to lowest, or lowest to highest), or by date in which they have been added to the web shop (newest or oldest).

C. Potential Customer

- **TRANSFERRED REQUIREMENT:** To view jewelry and accessories information such as the description, the price, the materials used, and dimensions.
- **TRANSFERRED REQUIREMENT:** To view, along with the current item, related products and/or complementary products
- **MODIFIED:** To securely purchase *jewelries and accessories*.
- **MODIFIED:** To be able to select features such as the quantity, and the color of a jewelry or of an accessory.

D. Regular Customer

- **REMOVED:** To be able to write a review about a product

Visitor

- **REMOVED:** To publish a comment about a product

Two of the requirements of the Frequent Visitor now belong to the Potential Customer class, namely the first two requirements of the Potential Customer. This has been done because we consider that people with absolute no intention to purchase from this web shop, will not be interested in the detailed description of a jewelry or the material with which it is created. In addition, Frequent Visitors would not be interested in related or complementary products.

The task of *Adding a review or a comment about a item*, is also not considered. This is done because for this example we believe that, both jewelry and accessories are products which are compatible with the current trends and the personal taste of the audience that chooses to wear them. Therefore reviews in such type of web shop

would most likely be subjective and would not provide assistance or helpful information to other users or to the purpose of the web shop in general.

4.1.3 Conceptual Design

In this step we model the information and functionality, as well as the navigation according to what we explained in Chapter 3. The result is an overall conceptual design model and a navigational design. For this fictional web shop the following Figure 4.1 and Figure 4.2 represents the overall conceptual design⁷⁴.

- **Overall Conceptual Model:**

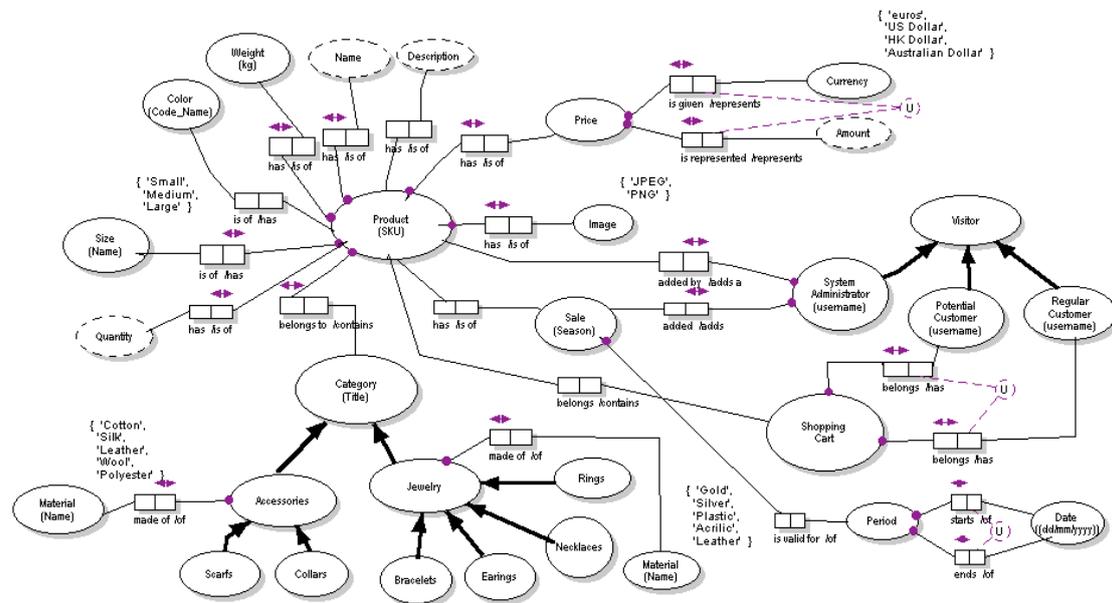


Figure 4.1: Conceptual Design - Fictional Jewelry & Accessories Web Shop

- **Navigational Design:**

Based on this Conceptual Design with the method we have described in the section, 3.3.2 for Navigational Design, an overall Navigational model can be retrieved.⁷⁵

⁷⁴ In order for the conceptual design to be readable it is better to be viewed in the printed version. This Model is broken in two parts, the second part can be found in the Appendix under the title ‘Additional Figures’

⁷⁵ Due to time constraints an example is not illustrated here but can be demonstrated during the presentation

4.1.4 Implementation Design

As we have explained in Chapter 3, the Implementation Design phase consists of two sub phases. The first is the Site Map Design and the second is the Web Content Management System specification and Social Media Integration:

Site Map Design

Based on the overall conceptual and navigational design we decide how to group information on the various pages of our web shop. The resulting Site Map Design is can be designed.

WCMS Specifications and Social Media Integration

The WCMS that we use in order to implement the web shop is the newest version of Wordpress 3.6 to which the ‘E-Commerce’ template from templatic.com⁷⁶ is installed. This template has the appropriate style to correspond to our female target audience while at the same time it represents the ‘style’ of the business.

In addition to this template, **WooCommerce**⁷⁷ plug-in is used which provides an administration panel that supports all the predefined requirements of the System Administrator audience class. Furthermore, a cart and product management system is provided along with shipping and tax calculations, localization, and features such as related products, product descriptions, product attributes (color, size, and material) and integration with Google analytics. We provide a particular example to showcase that in the following Image 4.1:

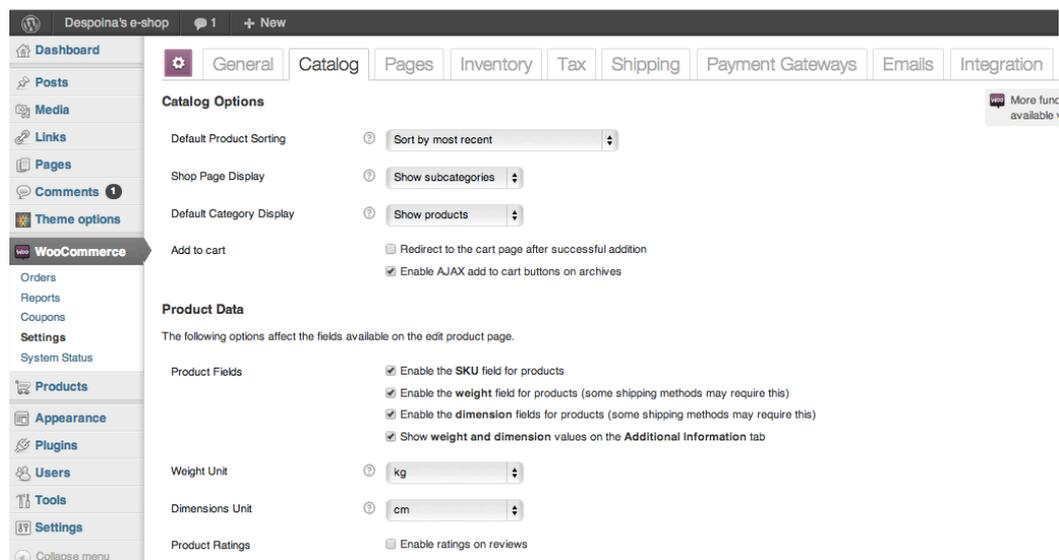


Image 4.1: WooCommerce Plug in- Administration Panel

⁷⁶ Templatic e-commerce theme: <http://templatic.com/ecommerce-themes/ecommerce> [Access Date 25-08-2013].

⁷⁷ WooCommerce plug-in: <http://www.woothemes.com/woocommerce/> [Access Date 25-08-2013].

In practice it can be rather difficult to consider all the additional widgets, and modules that can be useful for our design. The conceptual model of the previous phase will help us identify the necessary aspects that should be included in the web shop. An example is the fact that we allow users to share our products in their Social Media profile, commonly that is an extra widget which we will need. The same applies for the following examples as well.

4.2 WSDM-lite with Joomla

For the second example, we will implement a web shop using Joomla. In this particular case, we will show to which extend a current web shop can be altered when WSDM-lite is used. The website of [lescupcakesdemilie.be](http://www.lescupcakesdemilie.be)⁷⁸, which is already renewed from its initial design, is a C2B and B2B web shop where the audience chooses the appropriate characteristics of the product and the business follows these specifications in order to manufacture the end result (a few choices are provided already for the customer to choose from).

4.2.1 Web Shop Subject Specification

An appropriate Web Shop Subject Specification for this particular example is the following:

“Through our web shop clients will be able to order cupcake desserts. We aim to become your first choice when planning the catering for your events and celebrations”

4.2.2 Target Audience Specification

The first step of Audience Specification is the Audience Characterization which is the following:

“Our target audience are men and women of all ages, who enjoy the sweet things in life and like to be original”

Concerning the Audience Hierarchy and Categories however, for this particular case, plenty of aspects are different. Firstly, the *Frequent Visitor* audience class is discarded in this example. That is because this business exists mainly on line therefore it is not possible for a user to view a product through the web shop and then purchase it from the physical shop, as we have specified previously for the Audience Class of Frequent Visitor. Even though the business has ‘points of sale’ the product characteristics in

⁷⁸ Web shop of The cupcakes of Emilie: <http://www.lescupcakesdemilie.be> [Access Date 25-08-2013]. The content of this web shop belongs to its rightful owner. There is no intention of profit or copyright infringement with the alteration of this web shop. It is only used as an example, for the purposes of this research.

those places are selected by the responsible owner, of that point of sale, and vary from what is included in the web shop.

Secondly, the *Potential Customer*'Audience Class is named in this case as plain *Customer*. We believe that the users who visit this type of web shop, have the intent to order products from it. There is a possibility that they visit the web shop for informational purposes as well, however if they return it would be to make a purchase.

Finally, a new Audience Class is introduced as a subclass of *Customer*, that is the *Business Customer*, a variant of *Regular Customer* in a way. This class includes the users who will buy products from the shop but for their own business (bakery, groceries store etc) and they will be making purchases frequently. As the *Regular Customer Audience Class* we provide the type of users the opportunity to have an account and store some of their information in the web shop.

The revised Audience Hierarchy for this example is the following:

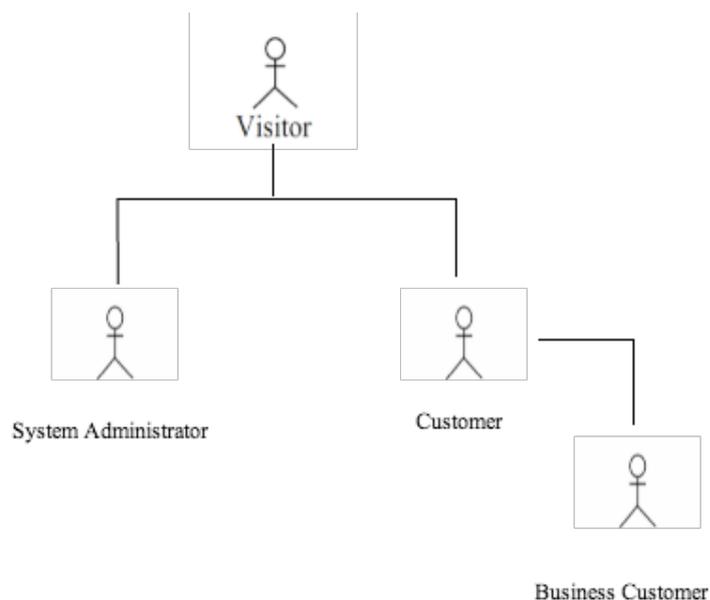


Figure 4.2: Audience Hierarchy- Cupcake Web Shop

System Administrators

- **MODIFIED:** To create product offers in a straight forward way

Customer

- **MODIFIED:** To get an overview of available cupcakes
- **MODIFIED:** To browse through cupcake categories
- **MODIFIED:** To browse through cupcake within a category

- **MODIFIED:** To browse products by means of different views such as by ingredient, by type, or by flavor.
- **REMOVED:** To be able to compare products with other products.
- **REMOVED:** To be able to compare the prices in provided offers (*what was the price before, and which is the new price*)
- **REMOVED:** To get an overview of current offers and promotions
- **REMOVED:** To view, along with the current product, related products and complementary products
- **MODIFIED:** To be able to select product features (*such as the quantity, and the ingredient*)
- **MODIFIED:** To receive news related to business activities such as a newsletter, and special offers

Business Customer

- **REMOVED:** To be able to create personalized lists with products
- **REMOVED:** To be able to add or delete products from personalized list(s)
- **REMOVED:** To be able to add or delete products from a 'Favorite' list
- **MODIFIED:** To be able to write a review about the service
- **REMOVED:** To be able to view a personalized history of orders

4.2.3 Conceptual Design

During this phase we model information and functionality, as well as the navigation. The overall conceptual design, for this web shop are illustrated in the following Figure 4.3⁷⁹.

- **Overall Conceptual Model**

⁷⁹In order for the conceptual design to be readable it is better to be viewed in the printed version. This Model is broken in two parts, the second part can be found in the Appendix under the title 'Additional Figures'

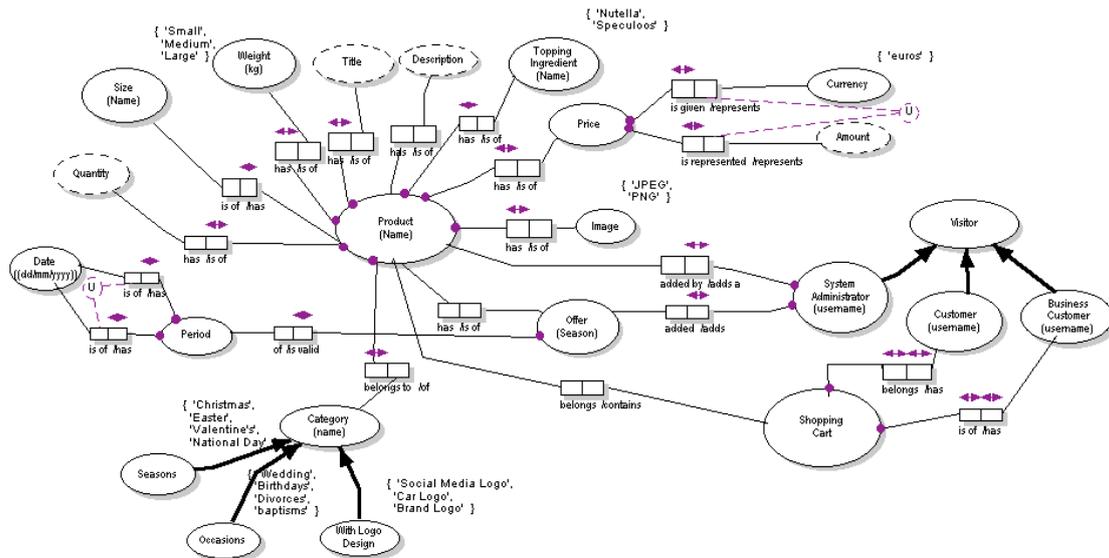


Figure 4.3: Conceptual Design- Cupcake Web Shop

4.2.4 Implementation Design

Site Map Design

Based on the overall conceptual and navigational design we decide how to group information on the various pages of our web shop. This would result in a site map for the web shop

WCMS Specifications and Social Media Integration

The WCMS that we use in order to implement the web shop is the newest version of Joomla to which the 'Soila' template from globbersthem.com⁸⁰ is installed. This template has an equivalent style as the current web shop in terms of colors and fonts, which apparently represents the philosophy of the business and therefore it remains the same.

In addition to this template the **Virtuemart**⁸¹ E-Commerce plug-in is used which is designed to be used in combination with Joomla. Similarly to these types of E-Commerce plug ins, Virtuemart offers product and cart management and includes all the requirements for the System Administrator Audience Class. Image 4.2 shows this:

⁸⁰ Soila e-commerce theme: <http://www.globbersthem.com/> [Access Date 25-08-2013].

⁸¹ Virtuemart plug-in: <http://www.woothemes.com/woocommerce/> [Access Date 25-08-2013].

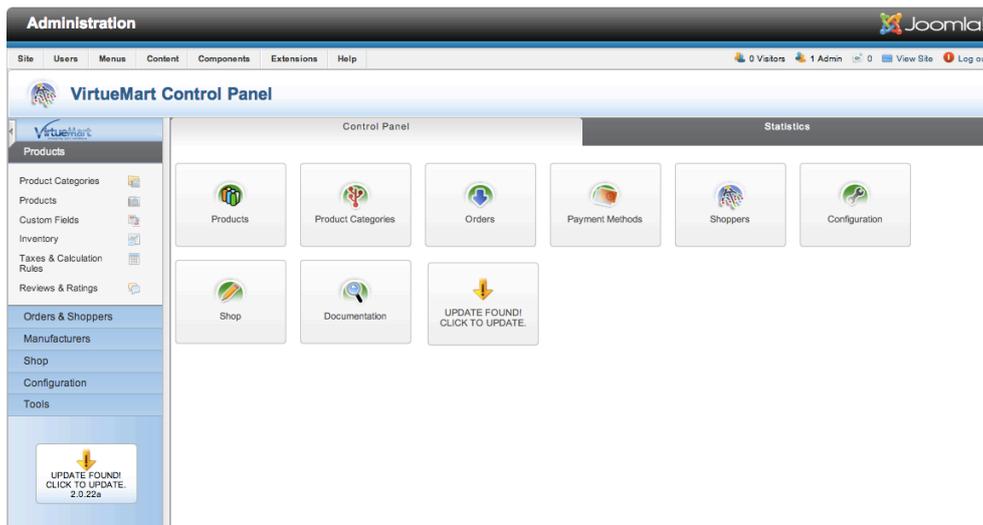


Image 4.2: Virtuemart Plug-in- Administration Panel

4.3 WSDM-lite with X-Cart

In this section we will demonstrate how a brochure web site, 2be-online.be⁸², can be refined as a web shop where transactions, between the business and customers (B2C) will be possible. The implementation of this web shop is realized with the shopping cart software, X-Cart.

4.3.1 Web Shop Subject Specification

We begin with the Web Shop Subject Specification, where we will specify the subject of this web shop. In this case, a physical store already exists and the products which are sold there will be included in the web shop as well. We will not include products exclusively on the web shop, or vice versa. The 2be shop, includes a variety of brands of modern undergarments, sportswear, and accessories for men of young age. The Subject Specification will be the following:

“We have selected for our customers a collection of well known brands of fashionable undergarments, sportswear, and accessories. Men will be able to discover in our web shop the look which will represent the lifestyle of those who like to live in the extreme.”

4.3.2 Target Audience Specification

After the Subject Specification we will proceed with the Audience Characterization, which is pretty straight forward if we consider the Subject Specification. At this point, we will specify the age and gender of our audience:

⁸² 2be brochure web site: <http://www.2be-online.be/> [Access Date: 25-08-2013]. In order to create this particular example, we have asked the permission, which was granted to us, from the responsible of the business Mr. Philippe Vangheel.

“Our target audience are men of all ages, but we mostly target men with extreme taste between the ages of 18 and 50”

For the 2be web shop, we keep the predefined Audience Hierarchy and Audience Classes presented in Chapter 3: the System Administrator, Frequent Visitor, Potential Customer, and Regular Customer. The requirements of these audience classes remain the same with a few exceptions, which are:

Frequent Visitor

- **REMOVED:** To be able to compare products with other products

Regular Customer

- **REMOVED:** To be able to view a personalized history of orders

In the web shop a limited number of products from various brands and of various kinds will be included, therefore we consider the comparison of products a requirement which will not provide an added value to our audience. In addition, since the stock of the business is updated by season, we consider the task of purchase history not of added value for our audience.

4.3.3 Conceptual Design

In this step we model the information and functionality, as well as the Navigation. The overall conceptual design is illustrated in the following Figure 4.4⁸³ from this design we can also derive the Navigational Model.

⁸³ In order for the conceptual design to be readable it is better to be viewed in the printed version. This Model is broken in two parts, the second part can be found in the Appendix under the title ‘Additional Figures’

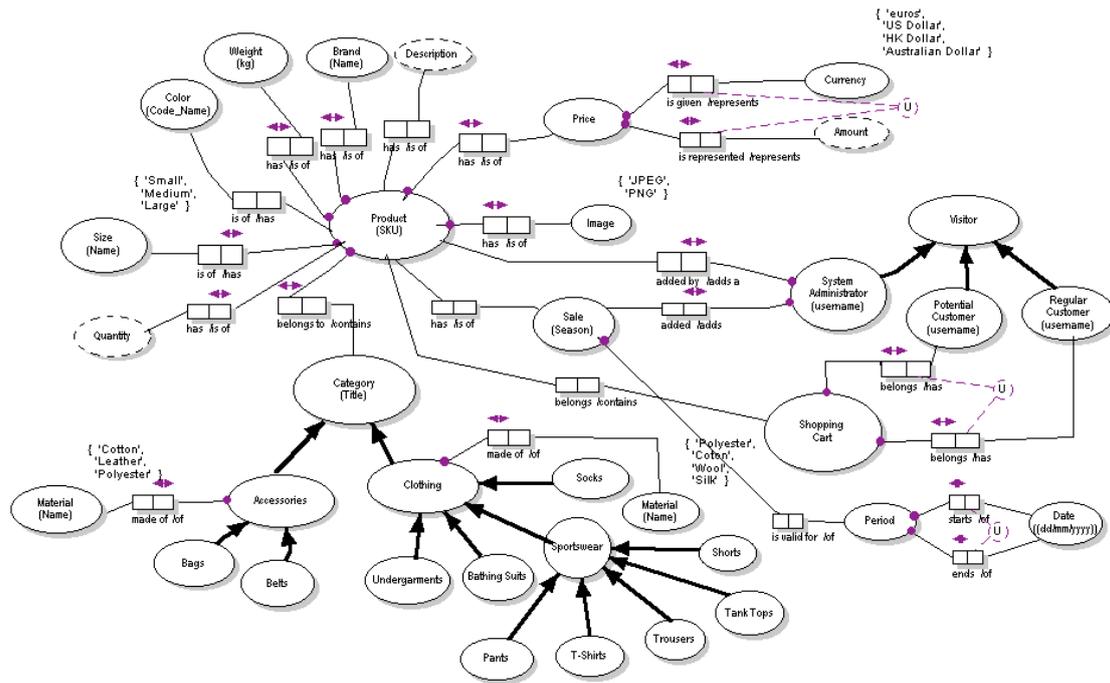


Figure 4.4: Conceptual Design- 2be Web Shop

4.3.4 Implementation Design

Based on the overall conceptual and navigational design we decide how to group information on the various pages of our web shop. That would result into a site map for the web shop.

WCMS Specifications and Social Media Integration

For this example, we use the software package of X-Cart in order to implement the design of the web shop. As we have explained in the Background of this thesis, X-Cart combines the characteristics of a WCMS with the attributes of an E-Commerce software package. This means that a lot of built-in functionalities for web shops are already included in X-Cart, for example the Tax and Shipping Calculations, and the additional installation of an E-Commerce Plug-in was discarded. There exists a number of additional modules, and plug-ins available to be installed however, we noticed that in most cases these modules and plug-ins are premium and for that reason they were not considered. We have already provided an example of the X-Cart Administration area in Image 3.5

5. Future Work

An additional challenge we can define for web shops is to gain competitive advantage against other businesses which are, amongst others, big corporations that have already achieved brand awareness and customer trust. For that reason, an additional goal of this research was to examine the possibility of mapping the web shop with the a product Ontology and more specifically, with the GoodRelations ontology, <http://www.productontology.org/>. This mapping could offer amongst other, an increased visibility of products and information in search engines, factors which can provide competitive advantage, and can help with the increase of sales. With a product Ontology we could also achieve interoperability, something that could be necessary in the future.

WSDM as well as WSDM-lite use the ORM notation, by doing so an integration with existing ontologies such as the E-Commerce GoodRelations ontology can be achieved. In (De Troyer, Casteleyn & Plessers, 2007) it is explained how the ORM notation can be easily mapped to OWL which is a Web Ontology Language. OWL facilitates greater machine interoperability of content on the web by providing additional vocabulary with formal semantics (For a more in depth description of OWL the reader can refer to <http://www.w3.org/TR/owl-features/>.) During the Implementation Design in WSDM and specifically during the Logical Data Design a mapping between the conceptual schema and the data store of the website is created, or defined. In WSDM-lite as a last step of the Implementation Design we could define a mapping between the MySQL data source of the web shop and the reference Ontology, which in this case would be the GoodRelations Ontology. However, due to time constraints for this thesis report, this is now considered as future work.

During this research there was an effort to collect data from small to medium businesses concerning how they choose to be represented on the web, with a custom web shop, in Social Media, or both. If they in fact have a web shop, we asked for their level of satisfaction with that web shop, the technologies they used to create it, and if they believe that they have achieved an increase of sales or brand awareness by being present on the web. We opted to collect these data by the means of a questionnaire⁸⁴. However the participation was quite poor, only 4 businesses responded, therefore we could not retrieve results which we could analyze for our research purposes. However, we consider that it is still important investigate the current situation in the industry in order to identify the needs and schedule our research so that we can provide solutions to these needs.

Currently, in almost every Web Content Management System plenty of templates, plug ins, and modules exist to be used to create a web site with relative ease. For this research, we focused on E-Commerce, however WSDM could be adapted for other genres as well, such as, travel and booking web sites, or entertainment web sites.

⁸⁴ Questionnaire in Google Docs: https://docs.google.com/forms/d/1aiNgsTfRyQ6Lbsm7_sncW7RdYhcEEb--jqncyzHJ5Zg/viewform [Last Access Date: 28-08-2013]

6. Conclusions

In this thesis, we introduced the adaptation of WSDM to WSDM-lite, in order to provide a complete solution for web shops which represent small to medium businesses on the web. WSDM-lite, provides the necessary guidelines that will constitute the basis for an actual implementation of any web shop. With WSDM-lite, it can be possible to gather all of the essential aspects with which the web shop can be successful, by having the audience as a priority. We have argued the importance of following an audience driven methodology in order to achieve a most optimal outcome, and we have provided several examples of what can go “*wrong*” when a method, and especially an audience driven method, is not followed, i.e. :

The audience requirements are not fully considered during the development of web shops, the end result has usability flaws, and may discourage the audience from using a web shop altogether.

In computer science, several methods exist with which we can develop a web site, and we believe that the question should lie on which of these methods is the most appropriate to be followed, and which method takes into consideration all the necessary aspects, to bring the web site closer to its objectives. Most computer scientists put emphasis on the latest and most advanced technologies, on the other hand graphic designers and advertisers put emphasis on the most advanced presentation techniques and attractive styles. As a result, usability, as well as the target audience are usually not put forward in the design process.

We argue that this approach presented in this thesis can offer a solution to these problems by helping the developer not only to consider the necessary requirements but at the same time by keeping the audience at the frontline.

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