The Cultural Conceptual Model for Simplifying the Design of Localized Websites

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Abstract. This paper introduces a cultural conceptual model that was created to provide a conceptual representation of the Cultural Markers Pyramid introduced for the purpose of designing a localized website. The proposed conceptual model is an abstract specification of a set of five groups of cultural markers and guidelines for culture-centered website design. Having the Cultural Markers Pyramid in a formal model will help experts to manage, validate and improve the model regularly.

Keywords: Localization, local website design, cultural markers, cultural conceptual model.

1 Introduction and Background

Over recent years, it has been recognized, in the literature and in practice, that it is necessary to take into consideration the cultural background(s) of the target user(s) when designing a localized website [1–4]. For that, at the Web & Information System Engineering (WISE) research group, we have done several studies aiming at verifying the relationship between websites and the anthropologists' cultural dimensions in order to propose cultural markers as well as to recommend some anthropological cultural dimensions for designing localized website [5–7]. Our experiments showed that it is difficult to establish an absolute and clear-cut set of cultural markers to be used for designing localized websites. And, one single cultural model for localizing websites could, in fact, be a poor choice because different levels of localization may be needed in different situations. As a result, 5 different groups of cultural markers for local website design and localization has been proposed: (1) the e-culture level – for non-localized (but rather international) websites, (2) the settled cultural level – for semi-localized websites, (3) the broad cultural level – for localized websites, (4) the variable cultural level – for highly localized websites, and (5) the vista cultural level – for fully cultural localized website. As illustrated in figure 1, these groups are organized as levels in a pyramid; the higher levels are building upon the lower levels and in this way they allow for different degrees of website localization [8]. For each level of localization, a group of cultural markers for a set of website design elements

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is provided, as well as a specific number of anthropological cultural dimensions that should be considered for that specific localization level.

The website design elements considered for the different levels are: (1) Text on websites; (2) Layout and Organization; (3) Colors; (4) Pictures, Graphic Elements, and Sound; (5) Interaction; and (6) Navigation. The anthropological cultural dimensions considered are 16 existing cultural dimensions: Human Nature Orientation, Individualism vs. Collectivism, Internal vs. External Control, Time Orientation, Authority Conception, Context, Gender Roles, Power Distance, Uncertainty Avoidance, Universalism vs. Particularism, Achievement vs. Ascription, Affective vs. Neutral, Specific vs. Diffuse, Experience of Technology, Face-Saving, and International Trade and Communication.

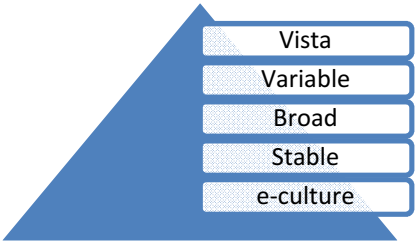

Fig. 1. Cultural Markers Pyramid

In this paper, we aim to transform the Cultural Markers Pyramid into a conceptual representation using Object Role Modelling (ORM) [9].

This paper is structured as follows. In section 2, we explain the necessity of a conceptual representation. We then explain the reasons for using the Object Role Modelling (ORM) language for this, and describe the Cultural Conceptual Model (C2M) using ORM. In section 3, we describe how to use the Cultural Conceptual Model (C2M) in practice. Conclusions are drawn in section 4.

2 Cultural Conceptual Model (C2M)

The Cultural Conceptual Model represents the components and their relationships of the different cultural markers levels, i.e. the website design elements and anthropological cultural dimensions (cultural markers), as well as the relationships in terms of cultural needs.

2.1 Necessity of Describing the Cultural Markers Pyramid

It is essential to represent the cultural markers pyramid by means of a conceptual representation, as a conceptual model will provide a formal description of the Cultural Markers Pyramid and its guidelines. Furthermore, the localization levels can be viewed in one place, thus it is easy to see all localization levels together and to understand the relationships among them. A conceptual model is easy to be shared by

experts, who can use it to maintain and enhance their knowledge. It is also vary handy to be used by different applications and systems to provide different kinds of support.

2.2 Object-Role Modelling (ORM) for Conceptual Knowledge Representation

Object-Role Modelling (ORM) is a conceptual modelling approach that was developed in the early 1970's [9]. It models the world in terms of objects and the roles that they can play. It specifies the model using modelling concepts that can easily be understood by non-technical people, and can flexibly transformed into different technical formats (e.g., OWL [10], relational schema [11]).

2.3 The Cultural Conceptual Model (C2M) Formalism

The complete conceptual model is illustrated in figure 2. It has been tested and several improvements have been applied before we obtained this final model.

As it would be rather extensive to describe the complete Cultural Conceptual Model (C2M) in detail, the following sections, section 2.3.1 and 2.3.2, describe the main components of the C2M and the conceptual representation of the main six website design elements. Section 2.3.3 describes briefly the five localization levels.

The full C2M is available on: http://www.mushtaha.be/C2M.

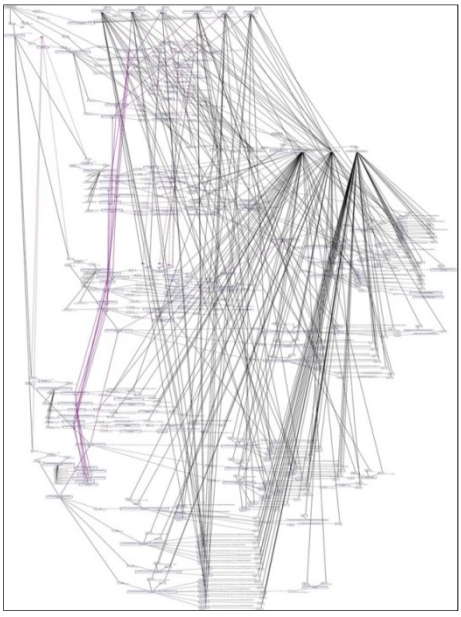

Fig. 2. Cultural Conceptual Model

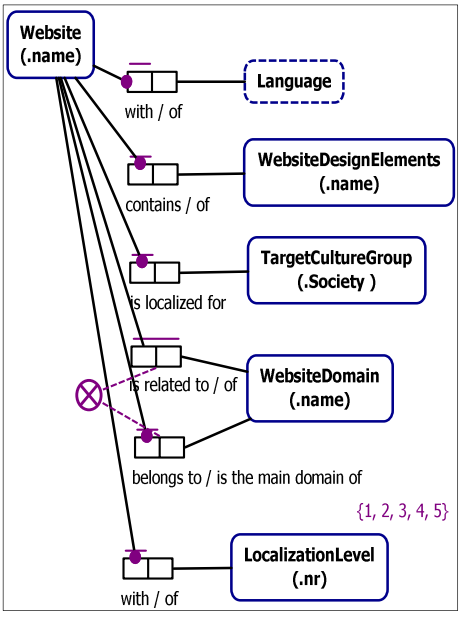

Fig. 3. C2M Main Components

C2M Starting Point: Website. An important object type of the C2M is 'Website'. This object type can be used as a starting point for traversing the model. Figure 3 provides the relevant part of C2M, verbalized as following:

- Website is an entity type. The (.name) under Website is the reference for Website, i.e. a website is uniquely identified by its name. This means that "every website has at least and at most one name".
- Each Website with exactly one Language.
- Each Website contains exactly one WebsiteDesignElements. This WebsiteDesign Elements group is an entity type and is further specified in figure 4.
- Each Website is localized for exactly one TargetCultureGroup.
- Each Website is belonging to exactly one WebsiteDomain.
- A Website may be related to some WebsiteDomain. It is possible that one Website is related to more than one WebsiteDomain or to none.
- Each Website is with exactly one LocalizationLevel. The possible localization levels are 1, 2, 3, 4 and 5. This is further elaborated in figure 5.
- No Website is related and belongs to the same WebsiteDomain. The symbol ⊗ depicts an exclusion constraint, indicating the populations are mutually exclusive. It means that, no website is related and belongs to the same website domain.

Website Design Elements. The following ORM fragment, figure 4, shows the main components of Website design elements.

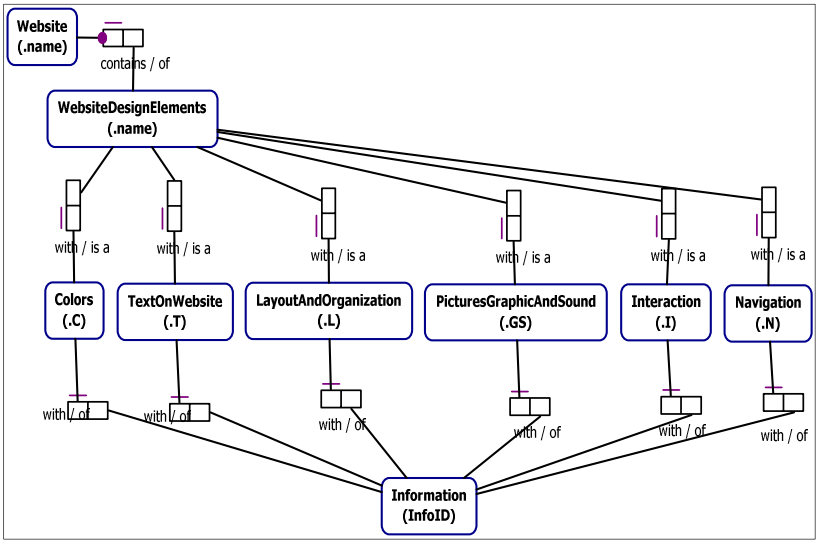

Fig. 4. C2M of the Website design elements

The ORM illustrated in figure 4 can be verbalized as following: Each Website contains exactly one WebsiteDesignElements group. This WebsiteDesignElements group is an entity type that contains six main different website design elements

groups: (1) TextOnWebsite, (2) LayoutAndOrganization, (3) Colors, (4) Pictures GraphicAndSound, (5) Interaction, and (6) Navigation. Each one of the previous six website design elements is linked to an entity object type "information".

Localization Levels. Figure 5 gives the ORM schema for the five different levels of website localization.

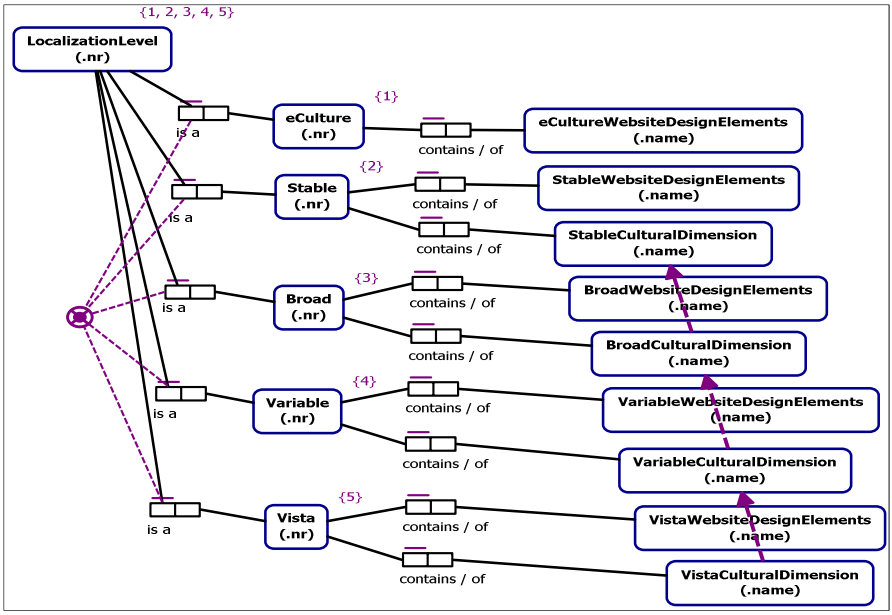

Fig. 5. ORM schema for website localization levels

The above ORM schema, figure 5, in combination with figure 3, states that each Website is with exactly one LocalizationLevel. That localization level has to be one of the following: (1) eCulture, (2) Stable, (3) Broad, (4) Variable, and (5) Vista. The exclusion (⊗) and exhaustion (⊙) constraints mean that at least and at most one of the five previous localization levels can be applied. In other words, any website can only achieve one particular localization level.

The following sections briefly describe the five different localization levels:

E-culture Level. The e-culture localization level is only considering digital cultural markers, no cultural dimensions. The following figure, figure 6, provides a simplified ORM schema of this level. Figure 6 shows that eCulture localization level contains at most one eCultureWebsiteDesignElements group. The eCultureWebsiteDesignElements group contains six website design elements as following: (1) ECultureTextOnWebsite, (2) ECultureLayoutAndOrganization, (3) ECultureColor, (4) ECulturePicturesGraphicAndSound, (5) eCultureInteraction, and (6) ECultureNavigation.

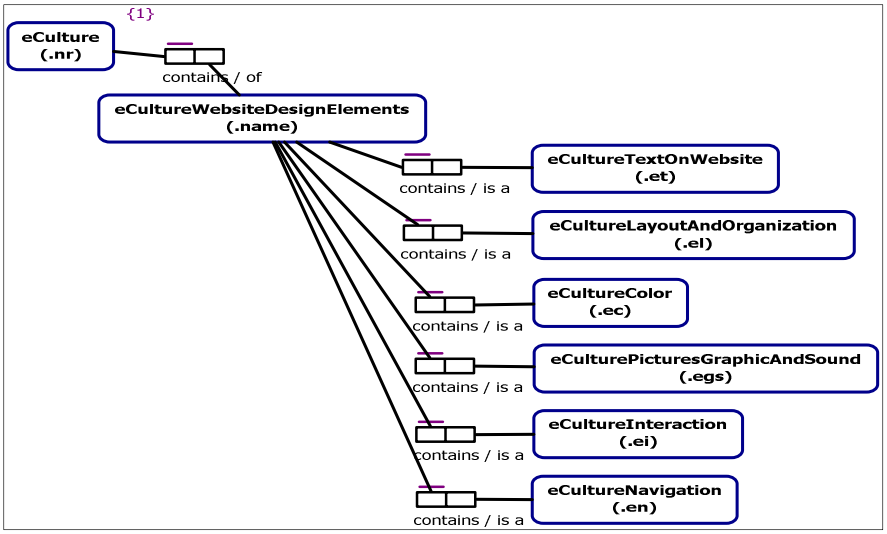

Fig. 6. Simplified ORM Schema of E-culture Localization Level

Note that each element of the six eCultureWebsiteDesignElements group is actually a sub-type of its corresponding WebsiteDesignElements (given in figure 4). For example, the ECultureTextOnWebsite is a sub-type of the TextOnWebsite. The sub-type in this situation means that the ECultureTextOnWebsite is a special kind of a TextOnWebsite object. Thus, all the characteristics of the TextOnWebsite are inherited by ECultureTextOnWebsite, which adds more specific characteristics.

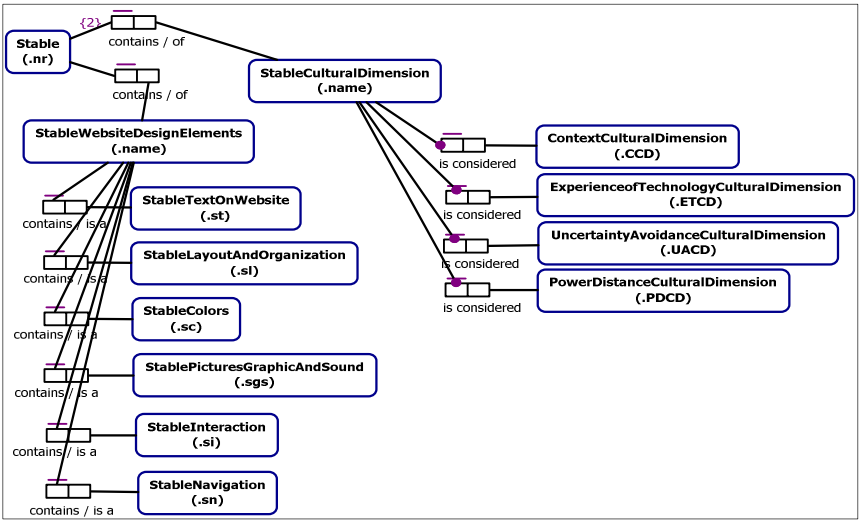

Fig. 7. Simplified ORM Schemas of Stable Localization Level

Stable Level. Stable level is the second level in the Cultural Markers Pyramid. This localization level considers website design elements and those anthropological cultural dimensions that are essential for this level of cultural adaptation. Figure 7 shows a simplified conceptual ORM fragment for this localization level.

As described in figure 7, StableWebsiteDesignElements contains six different website design elements: (1) StableTextOnWebsite, (2) StableLayoutAndOrganization, (3) StableColors, (4) StablePicturesGraphicAndSound, (5) StableInteraction, and (6) StableNavigation. Each of these six Stable website design elements is a sub-type of its corresponding eCultureWebsiteDesignElements. Moreover, StableCulturalDimension considers four different anthropological cultural dimensions.

It is not possible to explain this localization level in full detail because it involves too much detail; therefore figure 8 shows a simplified conceptual model of StableTextOnWebsite, and StableColors.

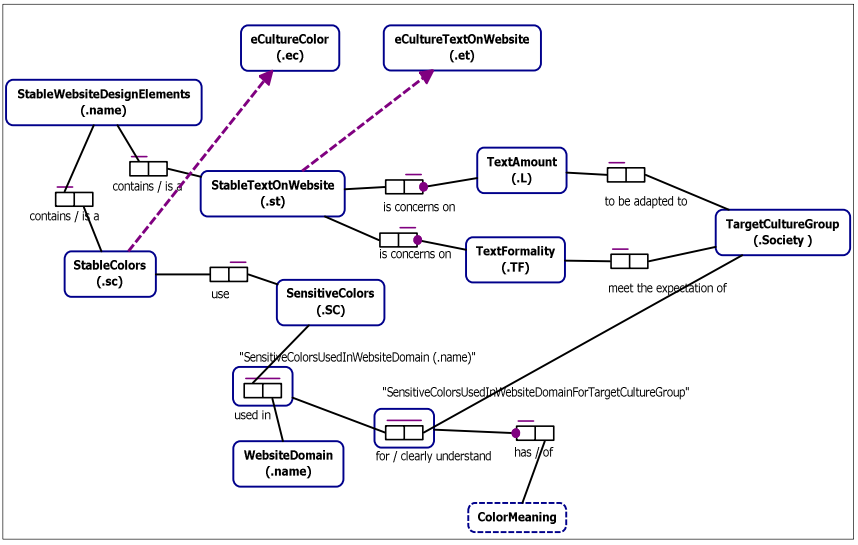

Fig. 8. ORM Schemas Shows Some Relations between Stable Website Design Elements

StableTextOnWebsite is a sub-type of the ECultureTextOnWebsite. In this way, StableTextOnWebsite inherits the specifications of the ECultureTextOnWebsite and can add some own specific specifications, which are (1) TextAmount and (2) TextFormality. If the own specific specifications are conflicting the specifications of the super-type then ORM offers constraints able to remove this overlapping.

StableColors is a sub-type of ECultureColor, and it has its own specification which is SensitiveColors. This object type is linked with WebsiteDomain through a nested relationship because it is possible that more than one SensitiveColors is used in the same WebsiteDomain, and that the same SensitiveColors is used in more than one WebsiteDomain. It is read like: “SensitiveColors used in WebsiteDomain for specific targetCultureGroup has ColorMeaning”. For example, Sensitive Color: [Red] used in website domain: [News] for target culture group: [Japan] has color meaning: [happiness, wealth, longevity and good luck. This is to be used for pleasure news. Not to be used for bad news, even if it is important].

Broad Level. The Broad localization level illustrated in figure 9 is containing two main components BroadWebsiteDesignElements and BroadCulturalDimension. Each one of the broad website elements is a sub-type of the stable peer component. For example, BroadNavigation is a sub-type of StableNavigation. Accordingly, every broad website design element component inherits all the characteristics of its peer related stable website design elements component. Moreover, it adds some own specific characteristics for the broad localization level.

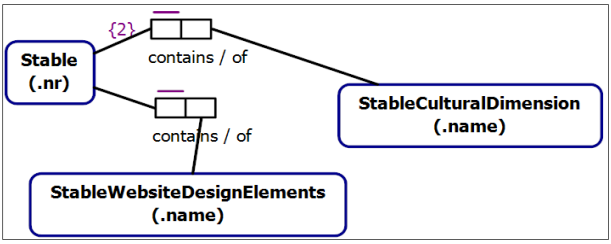

Fig. 9. Simplified ORM Schemas of Broad Localization Level

BroadCulturalDimension is a sub-type of StableCulturalDimension. Therefore the BroadCulturalDimension contains the four cultural dimensions of the StableCulturalDimension, illustrated in Figure 7, in addition to the three cultural dimensions as illustrated in figure 9.

The following figure, figure 10 describes as an example the InternationalTrade andCommunicationCulturalDimension. As appears, the InternationalTradeand CommunicationCulturalDimension respects WebInternationalStandards and Web NationalStandards. Furthermore, this cultural dimension affects LayoutAnd Organization and TextOnWebsite. And, this cultural dimension needs to be evaluated against people from TargetCultureGroup.

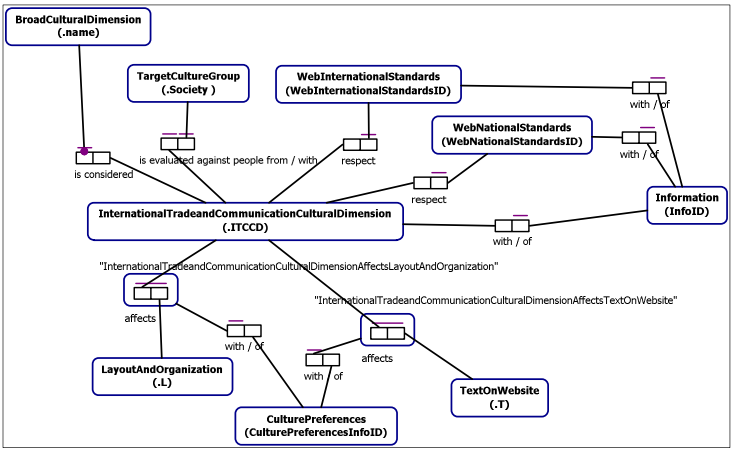

Fig. 10. ORM Schemas of International Trade and Communication Cultural Dimension

Variable Level. As shown in the following ORM schema, figure 11, the Variable level contains two main components VariableWebsiteDesignElements and Variable CulturalDimension.

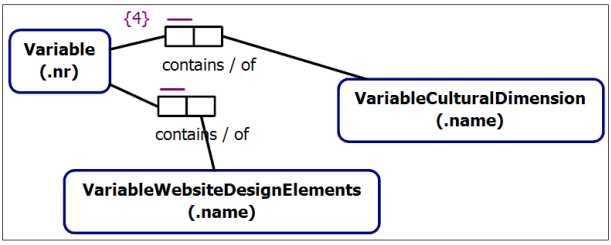

Fig. 11. Simplified ORM Schemas of Variable Localization Level

Each website design component is a sub-type of its relevant peer broad website design element component. As an example, the VariableTextOnWebsite is a sub-type of the BroadTextOnWebsite. Thus, VariableTextOnWebsite inherits all characteristics of BroadTextOnWebsite and adds some specific characteristics.

VariableCulturalDimension is a sub-type of the BroadCulturalDimension. Therefore, the VariableCulturalDimension contains the seven cultural dimensions listed in BroadCulturalDimension in addition to the following three cultural dimensions: FaceSavingCulturalDimension, AffectiveVSNeutralCulturalDimension, and TimePerceptionCulturalDimension.

Vista Level. Figure 12 illustrates a very abstract conceptual schema for the Vista localization level. This localization level contains two main components VistaWebsiteDesignElements, and VistaCulturalDimension. Each one of these vista website design component is a sub-type of its relevant peer variable website design component.

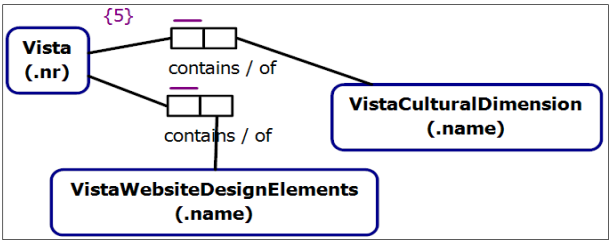

Fig. 12. Simplified ORM Schemas of Vista Localization Level

Figure 13 shows the ORM schema for the TextOnWebsite for all different localization levels. The top of the hierarchy is TextOnWebsite. The eCultureTextOnWebsite is a sub-type of TextOnWebsite. StableTextOnWebsite is a sub-type of eCultureTextOnWebsite. BroadTextOnWebsite is a sub-type of Stable TextOnWebsite. VariableTextOnWebsite is a sub-type of BrosadText OnWebsite.

Finally, VistaTextOnWebsite is a sub-type of VariableTextOnWebsite. As described earlier, each website component is inherits the characteristics of all its super-types.

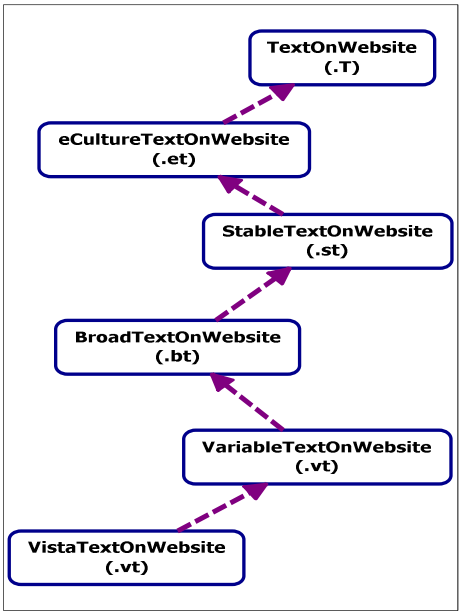

Fig. 13. TextOnWebsite Sub-type ORM Schemas

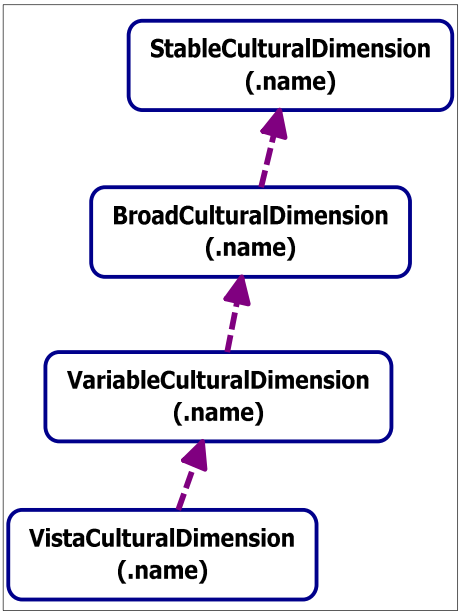

Fig. 14. Simplified ORM Schemas of Anthrpological Cultural Dimensions Groups

The ORM schema given in figure 14 shows how the different cultural dimensions are related to each other. The first group is the StableCulturalDimension, which contains the four anthropological cultural dimensions important for the stable localization level. The second group is the BroadCulturalDimension, which is a sub-type of StableCulturalDimension. In this way, BroadCulturalDimension includes the four cultural dimensions listed for StableCulturalDimension, and in addition to its own three cultural anthropological dimensions. VariableCulturalDimension is a sub-type of BroadCulturalDimension, so VariableCulturalDimension inherits all cultural dimensions listed for BroadCulturalDimension, and has three own cultural anthropological dimensions important and special for this localization level. VistaCulturalDimension is a sub-type of VariableCulturalDimension; in this way VistaCulturalDimension includes all cultural dimensions listed for all super-type cultural levels and adds to them its own special cultural dimensions.

3 Cultural Conceptual Model (C2M) in Practice

As illustrated in Figure 15, the intent is to transform the proposed C2M to different technical formats usable in practice. We transformed this cultural conceptual model into two different formats: (1) a Localization Ontology and (2) a relational schema.

The relational schema can be used to create a database for storing all relevant information that is needed to design a localized website, and store localization specifications. The full code of the Cultural XML schema, the XSLT transformation file, and the generated Cultural OWL are available on: http://www.mushtaha.be/C2M.

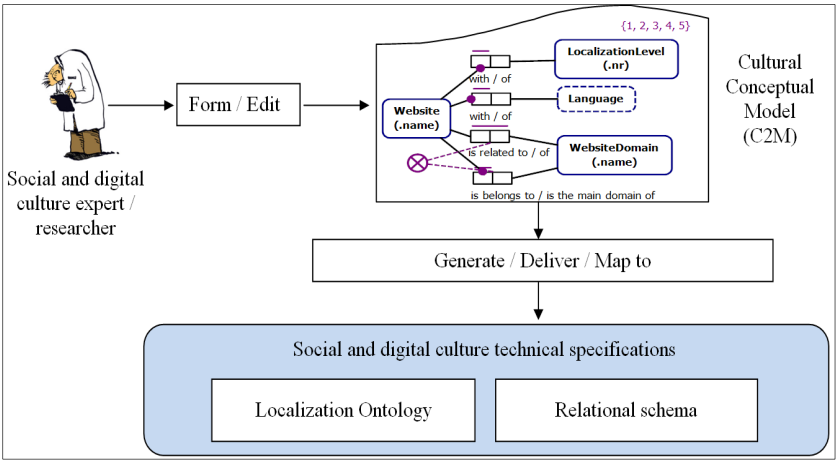

Fig. 15. C2M Transformation

4 Conclusions

In this paper, we have presented how to turn the Cultural Markers Pyramid into a practical tool usable by website developers and cultural experts. For this purpose, we represented the Cultural Markers Pyramid into a conceptual model, called C2M (the acronym stands for "Cultural Conceptual Model"). Having the Cultural Markers Pyramid guidelines in a conceptual model will help experts to manage, validate and improve the model regularly. This is needed as the world and the Web is changing constantly.

C2M was modelled using Object Role Modelling (ORM). This had the advantage that we could automatically transform C2M into a more practical oriented format (e.g. XML, XSD, UML, OWL, etc.). C2M was transformed into two different formats: an ontology, and a relational schema. These technical outcomes can be used as the basis for tool support for website designers that want to develop localized websites

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