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Farm2.0: Using Wordpress to Manage Geocontent and Promote Regional Food Products

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Farm2.0: Using Wordpress to Manage Geocontent and Promote Regional Food Products

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Abstract

Recent innovations in geospatial technology have dramatically increased the utility and ubiquity of cartographic interfaces and spatially-referenced content on the web. Capitalizing on these developments, the Farm2.0 system demonstrates an approach to manage user-generated geocontent pertaining to European protected designation of origin (PDO) food products. Wordpress, a popular open-source publishing platform, supplies the framework for a geographic content management system, or GeoCMS, to promote PDO products in the Spanish province of Valencia. The Wordpress platform is modified through a suite of plug-ins and customizations to create an extensible application that could be easily deployed in other regions and administrated cooperatively by distributed regulatory councils. Content, either regional recipes or map locations for vendors and farms, is available for syndication as a GeoRSS feed and aggregated with outside feeds in a dynamic web map.

To Dad,
Thanks for being 2TUF:
MTLI 4 EVA.

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Index

1 Introduction

In this chapter, we discuss the demographic, ecological, and economic challenges faced in rural areas of Spain. We present the European Union's quality labeling scheme and explain how it attempts to reduce rural depopulation, prevent environmental degradation, and strengthen the rural economy. We go on to describe the difficulties encountered by stakeholders as they seek to advance the visibility of quality labels. In light of research on quality label marketing, we propose the use of online technologies to promote regional products. We base our objective on addressing the problems identified in the current system and define a set of project goals accordingly. A description of the tools and methods used is provided, along with an outline of subsequent chapters.

1.1 Motivation: Spanish rural development and quality labels

In recent decades, rural Europe has experienced notable declines in population, agricultural profits, and employment (O'connor, 2006). Recognizing that over 56% of European Union citizens reside in rural areas, and that rural land accounts for more than 91% of total EU territory, sustainable rural development has been identified as a major EU priority. Current policies encourage agricultural activities that produce value-added products and reform the food supply chain to promote economic, social, and environmental sustainability in rural areas.

In particular, rural Spain demands urgent sustainability efforts: In 1965, agriculture accounted for 16% of the Spanish Gross Domestic Product and provided 35% of total employment (O'connor, 2006). By 2008, these figures had dropped to 12% and 2.4%, respectively (FIAB, 2008).

The Spanish agricultural sector is distinguished in the European Union by being comprised almost exclusively (96.35%) of small enterprises with an average of 15.5 employees (FIAB, 2008). At a median size of 25 hectares, these operations are dwarfed by farms in the UK (81 ha), France (52 ha) and Germany (46 ha). Additionally, due to the country's relative isolation during the Franco regime and late entry into the EU, Spain has not been able to construct significant infrastructures for industrial agriculture or implement modernized farming techniques to the extent of its EU counterparts (Dominguez, 2006). Furthermore, nearly 80% of Spain's utilized agricultural area (UAA) is classified as less favorable area (LFA) due to poor soils, difficult access, or mountainous terrain (EEAC, 2008). These factors constrain avenues for rural development and have made it difficult for Spain to compete in an increasingly competitive global market, and prompt many farmers to simply abandon their holdings.

Citing this rural exodus their greatest concern, Spanish policy makers have involved themselves in the European Union's Common Agricultural Policy (CAP) through a specialized national framework supported by EU funding (European Commission, 2007). The agreement focuses on three objectives:

- Reduce rural depopulation by strengthening competitiveness of agriculture and forestry sectors.
- Protect and restore the ecology of rural areas.
- Maintain and improve the quality of rural life through diversifying the rural economy and building local capacity.

The document specifies a compulsory measure to increase the production of value-added products. The country's continued practice of low intensity agriculture, direct sales, and traditional production of specialty products seem to make it an ideal candidate for this approach. Indeed, many recent research indicate that quality labeling initiatives are an essential strategy for Spain's rural sustainability (Dominguez, 2006; Briz, 2007; van Ittersum, 2007; Parrott, 2002; Villelas, 2005).

Quality labels as a means of economic growth

Spain actually pioneered the concept of quality labels in Europe in 1932 when it created a statute to protect regional wines (Villelas, 2005). It wasn't until 1992 that the European Union began its

multinational scheme with the Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI)labels[1]:

> A product bearing the *PDO logo* must have proven characteristics which can result solely from the terrain and abilities of producers in the region of production with which it is associated. A product bearing the *PGI logo* has a specific characteristic or reputation associating it with a given area, and at least one stage in the production process is carried out in that area. (European Commission, 2009.)

Implementation challenges for Spanish quality labels

As a component of CAP, the labels are intended to encourage agricultural diversity, increase producer revenues, and ensure product quality for consumers (European Commission, 2009.; European Agricultural Fund for Rural Development, 2005.; European Commission, 2008). The labels are much more prevalent in the Mediterranean member states. Spain has 138 PDO and PGI labels - within the EU only France and Italy have more, see Figure 1.1. This geographic inclination towards the use of quality labels can be attributed to the a cultural emphasis placed on terroir and artisan production. The French term *terroir* articulates the idea that both the environmental characteristics of a region - its climate, soil and terrain - as well that the and cultural context of production - traditional processing and recipes - imbue products with unique characteristics (Parrott, 2002).

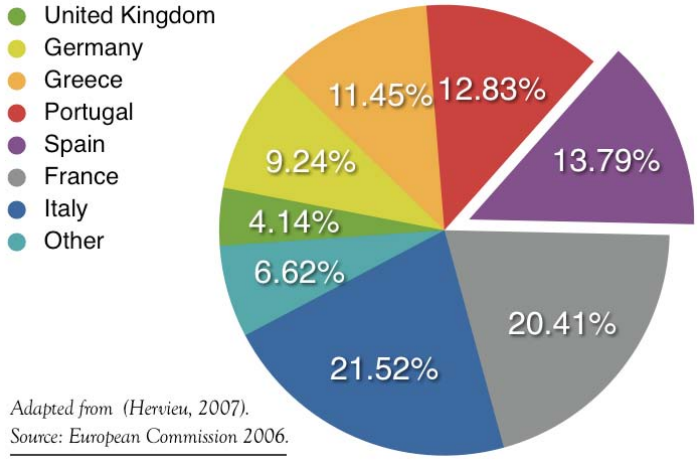

Figure 1.1 Percentage of total European Union PDO and PDI products from each member state.

Unfortunately, appreciation of regional quality does not always dictate the behavior of Spanish consumers. In a 2003 study performed by the Spanish consumer association (OCU), researchers found that geographic origin is only considered important during product purchase by 18% of shoppers (Villelas, 2005). In fact, the majority of Spaniards are not even aware of quality and origin labeling schemes (Giraurd, 2006). While the attitude of these shoppers is towards the idea of PDO and PGI products is favorable (Libery, 1998; Giraurd, 2006) they are not always willing to pay higher prices for such products (McCluskey, 2003). Consequently, the added income earned by farmers who participate in quality certification amounts to a modest €635 a year. In contrast, organic farming, though adopted only by a small number of Spanish farmers[2], generates an average of €5,624 increased yearly income per farm (Dominguez, 2006).

Efforts must therefore be undertaken to disseminate information about PDO and PGI products such as that will ultimately justify higher prices for shoppers. This type of information must highlight the extrinsic attributes of PDO and PGI products - craft, origin, and brand - as well as experiential

1 The European Union has recently implemented a third certification, Traditional Specialty Guaranteed (TSG). The label has yet to be broadly implemented, and Spain only has 3 TSG products registered. This project will handle the PDO and PGI certification schemes which are considerably more established and examined in the literature.

2 6% of farmers practice organic farming while 18.5% participate in quality labeling schemes (Dominguez, 2006).

characteristics such as taste, appearance, and aroma (Hervieu, 2007; Briz, 2007). Experts suggest focused communication strategies targeted toward niche markets, and recommend a marketing emphasis on the specific regions and processes of production (Dominguez, 2006; Briz, 2007; van Ittersum, 2007; Villelas, 2005). The publication of time-honored regional recipes, a theme that has been receiving revived attention in recent years, also appears to be a promising approach to quality label marketing (Briz, 2007).

Spanish regulatory boards, in addition to enforcing quality controls, are responsible for product promotion. While the future importance of this duty is seen as extremely important by these institutional actors[3], PDOs and PGIs do not currently possess the funding necessary to undertake large scale marketing such as television advertisement or point-of-sale marketing (Sanz Cañada, 2005). Moreover, there are sizable challenges apparent in the institutional themselves: There is a lack of cooperation between regulators and other invested parties including private enterprises, non-governmental organizations, and university researchers. Additionally, while the percentage of internet users in the Spanish population is higher than the EU average and growing substantially faster than that of any other country (see Figure 1.2), little has been done to utilize this medium for product promotion. One explanation for this lack of innovation in this area is that regulators lack highly qualified human resources, especially in the area of new information technologies (Briz, 2007).

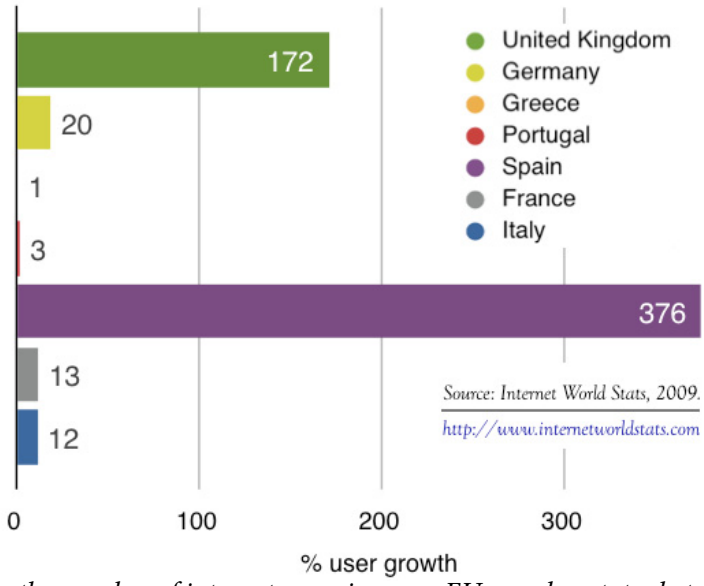

Figure 1.2 Increase in the number of internet users in seven EU member states between 2000 and 2008.

1.2 Objective: a geoCMS for promotion of quality labels

Farm2.0 serves as a prototype web portal that promotes PDO and PGI products in the Spanish community of Valencia. Designed according to the suggested marketing approaches discussed above, the *fundamental goals* of the system are to:

- Provide online information about the meaning of PDO and PGI labels.
- Educate consumers about the natural and cultural contexts of production for each product.
- Allow users to locate retailers where products may be purchased.

In fact, most regulators already have portions of this information on existing websites. Unfortunately, reflecting the atomized PDO and PGI supply network itself, these sites are generally difficult to find and provide no form of unified navigation. Farm2.0 aims to serve as a hub for all Valencian product

3 23 professionals with firsthand experience with PDO management, either as regulatory board administrators, representatives from marketing firms, or PDO olive oil mill employees, were interviewed in this study.

promotion, and would provide links to existing sites and other resources. A single go-to resource for Valencian consumers would capitalize on the diversity of regional products and help to build up a broader brand recognition for the area as a whole. Furthermore, a survey of existing Valencian PDO and PGI sites revealed that none of them currently use any maps beyond a simple static map of their offices. Yet the very definition of PDO and PGI quality labels is geographic, and a dynamic web map would allow users to find vendors, browse recipes geographically, and explore the areas in which the products originate.

In recognition of the institutional challenges (small budgets, lack of coordination, and a dearth of skilled employees), as well as the potential of Web 2.0 innovations (user-created content, dynamic web design, and format standards for content aggregation and publication), the following *technical goals* are proposed:

- Implement the system with free and open source software.
- Support management of content by by employees with minimal technical skills in multiple, dispersed organizations.
- Make the platform extensible so that other Spanish regions could use it out-of-the-box with a small number of customizations.
- Enable users to create site content: information about PDO and PGI vendors and producers as well as traditional recipes with PDO and PGI ingredients.
- Integrate user-friendly geographic referencing of user-generated content.
- Visualize content in a map interface.
- Utilize existing online content and make Farm2.0 content available in standard formats for reuse.

These objectives are met by developing a geoCMS to facilitate the collection, management , and publication of spatially referenced content. The Farm2.0 system incorporates a user-friendly back-end interface for multiple administrators to manage a publicly visible site. This portal, *alimentaValencia*, allows registered users to contribute content in the form of geotagged PDO and PGI vendor or producer locations and regional recipes.

1.4 Methodology: tools and system design

A number of web content management systems (WCMS) and web mapping technologies were investigated for potential use in this project and are detailed further in Chapter 2. Ultimately, the following tools were chosen to provide optimal performance, high usability, and appealing interface design.

Software & platforms

Development of the Farm2.0 web map utilizes a combination of free, publicly available technologies to support the map interface and user-generated content, though commercial software application was used for graphic design.

- *Apache*[4] free of cost, open-source, standards-compliant HTTP web server.
- *MySQL*[5] free of cost, GNU General Public License relational database management system (RDMS).
- *PHPMyAdmin*[6] free of cost, open-source MySQL administrator
- *Adobe Photoshop* commercial graphics editor

4 http://httpd.apache.org/.
5 http://dev.mysql.com/.
6 http://www.phpmyadmin.net/.

- *Mozilla Firefox* with *Firebug*[7] extension free of cost, open-source browser and extension for editing and debugging during web development; used for Javascript and CSS
- *Wordpress*[8] free of cost, open-source publishing platform; used with a customized theme and plugin suite described in Chapter 3

Programming languages, APIs, and markup languages

- *Google Maps API*[9] free of cost javascript library; must comply with terms of service
- *PHP 5.2*[10] imperative, object-oriented server-side scripting language originally built and especially suited for dynamic web pages
- *Javascript*[11] an imperative, prototype-based scripting language for client-side web development
- *Cascading Style Sheets*[12] (CSS) a stylesheet language used to specify formatting and graphic styles displayed in a markup language for web documents
- *GeoRSS*[13] a schema to encode geographic objects into really simple syndication (RSS) feeds

1.5 Thesis outline

Topics covered in this thesis are outlined below.

Chapter 2 Background: the Web 2.0 and geocontent
This chapter begins with the proposal that geocontent is distinct from the traditional concept of geographic data. Geocontent formats, along with methods of collecting and publishing geocontent, are discussed.

Chapter 3 GeoCMS: managing geocontent
Geocontent management is described in within the established Web Content Management System (WCMS) framework. Existing platforms for managing geocontent are reviewed.

Chapter 4 Farm2.0 functional design
An overview of the Wordpress platform and its 'out-of-the-box' functionality is provided. This is followed by a detailed explanation of the the plugins and modifications used to meet requirements specifications of the Farm2.0 system. The chapter ends with a description of geocontent handling .

Chapter 5 Farm2.0 information architecture & graphic design
An overview is given of the Farm2.0 site structure, controlled vocabulary, and navigation tools. Graphic design requirements are discussed before explaining how a customized theme and icon set were implemented.

Chapter 6 Implementation and extensibility
Details are provided to describe the technical and administrative and steps that would be necessary to implement Farm2.0 platform. Further options for usage of the platform to manage additional geocontent are also suggested.

Chapter 7 Conclusion
A review of the system objectives is performed and possibilities for future work are proposed.

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7 http://getfirebug.com/.
8 http://wordpress.org/.
9 http://code.google.com/apis/maps/. Terms of service: http://code.google.com/apis/maps/terms.html
10 http://es.php.net/.
11 http://www.w3schools.com/jsref/default.asp.
12 http://www.w3.org/Style/CSS/.
13 http://georss.org/.

2 Background: the Web 2.0 and geocontent

The Web2.0 is characterized by the use of the internet as a platform for software and services that deliver continually-updated, user-generated technologies and information. By harnessing this collective intelligence with participatory architectures such as public application programming interfaces (APIs), social networking software, collaborative content classification, wikis, and blogs, the Web 2.0 establishes 'architectures of participation' that improve as they are used (O'Reilly, 2005).

These technologies, coupled with new location-aware consumer electronics, have provoked a fundamental paradigm shift in the discipline of geography (Crampton, 2008; Goodchild, 2007; McConchie, 2008; Turner, 2006). The increasing ubiquity of user-generated geospatial data and mash-up maps put together with open APIs have blurred the traditional roles of mapmaker and map reader. Meanwhile, strident advances in web programming enable dynamic sites with interactive multimedia maps, which have superseded paper maps as the predominant cartographic end-product.

Such transformations have not gone unnoticed by academics. Technical aspects of web mapping, or *cybercartography* (Fraser Taylor, 2003; Monmonier, 2005) is an active research topic. Data structures and processing are handled from a geoinformatic perspective (Badard, 2001; Jones, 2002) while specialists in Human Computer Interaction (HCI) evaluate the usability of web map interfaces (Nivala, 2007; Richmond, 2005; Koua, 2006). Further work has focused on the potential of online geovisualization for collaboration (Brodlie, 2005), knowledge discovery (Peuquet, 2002; Cartwright, 2004), and as components of a GIS (Kraak, 2004).

Citing their capacity to integrate distributed data sources, utilize multimedia, and involve a diversity of users in map creation, some have gone so far as to hail mash-ups as the future of Geographic Information Systems, a so called *GIS/2* (Miller, 2006). Applications that use online maps to facilitate Public Participation GIS (PPGIS) and Volunteered Geoinformation (VGI) (Goodchild, 2007; Haklay, 2006; Kingston, 2000; Sieber, 2003; Tulloch, 2002), have prompted other geographers to examine social issues such as credibility (Bishr, 2007) and power structures (Crampton, 2001).

Neogeography has been widely adopted as a term to describes work done "outside the realm of traditional GIS...people creating their own maps, on their own terms...by combining elements of an existing toolset (Turner, 2006)." There are fundamental (and often controversial[1]) differences between neogeography and the established discipline of GIS. Among them, geographic information itself has evolved to include a range of spatially referenced media, and it is this phenomenon that is the focus of this chapter.

2.1 A definition of geocontent

Geocontent, as referred to in this project, is distinct from the established concept of geographic data. Generally, *geographic data* refers to vector and raster files that spatiotemporally reference attribute values. Demographic, political, and environmental geographic data have become essential information sources in areas as diverse as consumer behavior, landscape ecology, and urban planning

1 See arguments made by Mary Spence, president of the Royal Geographical Society, (http://www.rgs.org/PressRoom/Annual+Conference+2008/future+of+the+map.htm) and the response of Ed Parsons, Geospatial Technologist of Google and Royal Geographical Society fellow (http://www.edparsons.com/2008/09/cartography-is-dead-long-live-the-map-makers/) debating the merits of online mapping. Also refer to commentary on the post , "Neogeography is not GIS, not LI" on the All Points Blog: http://apb.directionsmag.com/archives/3703-.html.

(Longley, 2005). This data has historically been analyzed by professionals using desktop GISs, though recent web technologies have revolutionized the field[2].

Geocontent, in contrast, refers to web content that has been spatially referenced. This content may be text, such as encyclopedia articles, news stories, books, or blogs. It could also be multimedia material such as videos, photographs, or music, see Figure 2.1. Geocontent thus includes geographic data, but in it's most simplified form: Latitude and longitude coordinates are added to the preexisting content as metadata tags.

Media type	Example	Geo-enabling method	Publication format
Encyclopedia entry	Wikipedia	Geotagging: author annotation using template tag Geoparsing: data extracted from Wikipedia dump by GeoNames	Coordinate link in article header GeoNames webservice (XML, JSON, or GeoRSS)
News article	Reuters	Geoparsing: RSS feed parsed by GeoNames	GeoNames webservice (XML, JSON, or GeoRSS)
Book	GutenKarte	Parses books from ProjectGutenberg, parsed by MetaCarta	On-site map
Blog	Blogger	Geotagging: author annotation in post interface	GeoRSS
Video	YouTube	Geotagging: author annotation during upload	On-site map, KML
Photograph	Flickr	Geotagging: author annotation during upload or automatically annotated from GPS data	On-site map, KML, GeoRSS, Geo, GeoURL, GeoTag
Music	Freesound	Geotagging: author annotation during upload	On-site map, KML

Figure 2.1 Examples of geocontent available on the internet.

At the time of this writing, there are 611,745 geotagged Wikipedia articles in the GeoNames database (GeoNames.org, 2009.), and over 2.7 million photographs have been geotagged on Flickr in this month alone (Yahoo!, 2009). Considering the rapidly growing market for location aware electronics including mobile phones, GPS navigation devices, and GPS-enabled digital cameras (Global Information, Inc. , 2008), the demand for tools to easily incorporate geographic data into online content will only increase.

2.2 Geolocation formats

There are several formats utilized to encode geographic location into metadata for multimedia content.

GML

In 1999, the Open Geospatial Consortium approved Geographic Markup Language[3] (GML) as a standardized XML grammar for encoding geographic information (Stefanakis, 2008). Although there are restricted GML profiles available for simplified use, the full model includes specifications for

2 Non-experts now widely participate in generating online maps through initiatives such as OpenStreetMap (www.openstreetmap.org/) and Google Map Maker (http://www.google.com/mapmaker). Platforms such as Geocommons (http://www.geocommons.com/) and Up2Maps (http://www.up2maps.net) enable users to find geographic data online and produce sophisticated cartographic visualizations for analysis. In the institutional arena, universities and governments are developing robust Spatial Data Infrastructures (SDI) for the to connect various GIS to share and standardize geodata sources and processing tools online. The European initiative INSPIRE (http://inspire.jrc.ec.europa.eu) is an example.

3 http://www.opengeospatial.org/standards/gml.

features (physical geographic entities), geometry (the shape of region), a coordinate reference systems, time, coverages, and even map styling specifications. Despite having been adopted by the US Census Bureau and Great Britain's Ordnance Survey, the format has not been embraced for widespread use by the mainstream IT sector (Singh, 2004), nor the general public (Maron, 2006).

HTML geographic tags

Another early standard, proposed in 2002 (Hansen, 2009.), was the GeoURL[4] format. It uses latitude and longitude coordinates contained within an HTML header:

```
<meta name="ICBM" content="39.470239,-0.37680">
<meta name="DC.title" content="My Website">
```

A similar effort, GeoTag[5] was introduced in 2007 and inserts an HTML tag in the following format:

```
<meta name="geo.position" content="39.470239,-0.37680">
```

A third HTML encoding, the Geo[6] is a subset of tags for the hCard microformat (used for encoding contact information for people and businesses):

```
<div class="geo">
   <abbr class="latitude" title="39.470239">N 37° 24.491</abbr>
   <abbr class="longitude" title="-0.37680">W 122° 08.313</abbr>
</div>
```

KML

Though all of the aforementioned formats are in use today, there is still no universal standard for spatial encoding. That said, two XML-based geographic formats have become ubiquitous on the internet, Keyhole Markup Language (KML) and GeoRSS.

KML[7] was developed for three dimensional geographic data in Earth Viewer, the virtual globe software that was acquired by Google in 2004 and renamed Google Earth. In addition to specifying feature, geometry, and time elements, KML also encodes attributes such as *BalloonStyle,* specifically for visualization in Google Earth and thus can be seen as complementary to GML (Lake, 2008). The huge popularity of Google Earth has prompted widespread adaptation of the KML format (Stefanakis, 2008), and the OGC approved KML as an open standard in 2008.

GeoRSS

The W3C developed the first GeoRSS, somewhat inadvertently, in 2003 (Schutzberg, 2006). W3C Basic Geo, often called geo:lat/geo:lon, adds a 'Point' class containing latitude and longitude values to XML documents. The format, originally intended as a RDF encoding, has nonetheless been widely adopted to encode RSS feeds. Although this version of GeoRSS is now deprecated, its widespread implementation continues (Doyle, 2009). Flickr, for example, includes W3C Basic Geo, in addition to GeoRSS-Simple, in their 'geofeed' (Catt, 2007).

GeoRSS-Simple extends the number of classes available for encoding, allowing the feed to represent a greater range of geographic properties, such as lines, polygons, elevation. It also include tags for describing features and relationships between features. It is meant, however, to be concise (Doyle, 2009.), so its most basic (point) encoding is accomplished in a single line:

```
<georss:point> 39.470239,-0.37680 </georss:point>
```

4 http://geourl.org/.

5 http://geotags.com/geo/geotags2.html.

6 http://microformats.org/wiki/geo.

7 OGC standard: http://www.opengeospatial.org/standards/kml/. Google documentation: http://code.google.com/apis/kml/documentation/.

GeoRSS-GML sacrifices simplicity for upward-compatibility. It is a formal GML Application profile and allows for support of more features and alternate reference systems (GeoRSS-Simple is confined to WGS-84).

```
<georss:where>
  <gml:Point>
   <gml:pos> 39.470239 -0.37680 </gml:pos>
  </gml:Point>
</georss:where>
```

Google Maps began supporting GeoRSS feeds in 2007 and in 2008, ESRI added the capability to view GeoRSS in ArcGIS Explorer (ArcGIS Explorer Team, 2008). Further support for GeoRSS feeds is also available from Mapufacture[8], a user friendly web-mapping application that allows users to aggregate GeoRSS feeds from multiple sources and view them on a customized map. Additionally, there are several services such as RSS2 Google Earth[9] that can convert GeoRSS feeds into KML files for viewing in Google Earth.

2.3 Content collection: geoparsing and geotagging

Since geocontent is generated by the spatial referencing of existing materials, it is not created per se. Consequently, geocontent collection involves acquiring a media item and then assigns coordinate values to it. Media may be obtained from a variety of sources including a really simple syndicate (RSS) feed, a collective multimedia repository such as Flickr or Youtube, or files from a personal computer. Once acquired, there are two ways to assign spatial coordinates to the content: geoparsing and geotagging.

Geoparsing

Geoparsing semantically analyzes textual data by identifying and ranking place names within the text (Scharl, 2007). The extracted location names are then sent submitted to a geocoding services which query gazetteers (place name indices) for retrieval of precise spatial coordinates including latitude, longitude, and altitude (Hill, 2002). One such geocoding service, GeoNames, compiles public domain geographic data including place names (toponyms) and postal codes. Their database, which contains over 6 million toponyms, is searchable and downloadable, free of charge, to the public. It is also accessible through various web services, including RSS & GeoRSS to KML[10] which accepts RSS feeds and outputs keyhole markup language (KML) files for viewing in a geobrowser such as Google Earth. Services, such as *findNearbyWikipedia*, utilize data that GeoNames retrieves periodically from Wikipedia dumps (GeoNames.org, 2009).

MetaCarta[11], a commercial company, also provides geoparsing and geocoding services free of charge. Gutenkarte[12] downloads public domain texts from Project Gutenberg, and then feeds them to MetaCarta's GeoParser API. Place names are extracted from the classic documents, matched with geographic coordinates, and visualized on an interactive map.

Because geoparsing is an automated technique, it can handle large quantities of data quite easily. It is not without its drawbacks, however. False positives can result from the extracting of a place name that belongs to multiple locations (e.g. Madrid, Spain and Madrid, New Mexico). A document may mention more than one place, or a place name may change over time. Measures are implemented to minimize errors, perhaps by considering language-dependent lexical cues or identifying the names of people to provide context for disambiguation. A set of rules can be

8 http://mapufacture.com/.
9 http://www.kovacevic.nl/hacks/kml/rss2kml.php.
10 http://www.nearby.org.uk/rss-to-kml.php.
11 http://ondemand.metacarta.com/.
12 http://gutenkarte.org/.

applied to prevent the assignation of a document to multiple places, or locate two documents with the same place names at nearby coordinates. Despite these sophisticated protocols, a small number of errors remains unavoidable (Scharl, 2007).

Geotagging

In general, geotagging must be done by users manually. Exceptions include data gathered by location-aware mobile devices and digital cameras, GPS navigation systems, and IP address geolocation. In all other cases, geotagging requires that a user specify the location of a given piece of content.

The HTML geographic tags described in 2.2 require users to obtain their latitude and longitude coordinates and modify their HTML files by hand. While these are relatively simple tasks and instructions are provided, the typical user with no web programming experience might not feel capable of implementing these tags.

Many multimedia sharing sites such as Flickr, Panoramio, YouTube, and Freesound also allow users to geotag media as they upload them. These interfaces, in contrast to the HTML geographic tags, are designed to be highly usable and offer automatic address geocoding, draggable map markers, and the ability to use both tools in combination to accurately plot their location.

Manual geotagging may allow more precision than geoparsing, but ambiguity is still an issue. Users, for instance, may accept the geocoded result of an address input without double checking to ensure that the intended location was chosen. A marker might appear to be correctly positioned at a low zoom level and submitted as a tag only to appear inaccurately positioned once it is displayed at a larger scale. Beyond this, a user may simply forget or misunderstand the source of a media acquisition.

Whether it is implemented through (manual) geotagging or geoparsing, the collection of geospatial content is ultimately dependent on a human reasoning. By placing a marker on a map or noting the name of a place in a text, the user assigns media an explicit metadata attribute to characterize their personal understanding of an implicit geographic characteristic. User-generated geographic data is thus dependent on qualitative spatial reasoning, and as the diversity of sources expands there will likely be increasing heterogeneity in the accuracy and precision of such data (Elwood, 2008).

The image in Figure 2.2 illustrates this phenomenon: The image represents about 1.2 million geotagged photos from Flickr, with each dot colored according to a (text) tag specifying the name of a state. It is striking that such distinct boundaries can be generated from these tags, but also important to notice that a handful of photos have been textually tagged with a state name that conflicts with the geotagged coordinate location.

2.4 Content publishing: mashup maps and syndication

In step with the rise of geocontent, the past few years have witnessed a veritable explosion of online mapping. Major media sources such as the New York Times now frequently provide interactive maps with user-generated content[13] to accompany their articles, while mash-up maps have become indispensable to users whether they're searching for an apartment[14], locating a recycling center[15], or keeping track of local events[16]. These examples demonstrate the enormous appeal of maps as a form of

13 For a recent example, see the NYTimes map of Twitter tweets in the US during the Super Bowl: http://www.nytimes.com/interactive/2009/02/02/sports/20090202_superbowl_twitter.html.

14 Housingmaps.com, made in 2005 and often cited as the first map mash-up, plots housing classifieds from Craigslist.org as an overlay in Google Maps (RIA News , 2006.): http://housingmaps.com.

15 Open Green Map provides a collaborative map for worldwide users to locate, comment on, and annotate resources supporting environmental activism (Parker, 2006): http://greenmap.org/dev/ogm/en/greenmap.

16 EveryBlock provides local news, events, crime, and public records in the Chicago area: http://chicago.everyblock.com/.

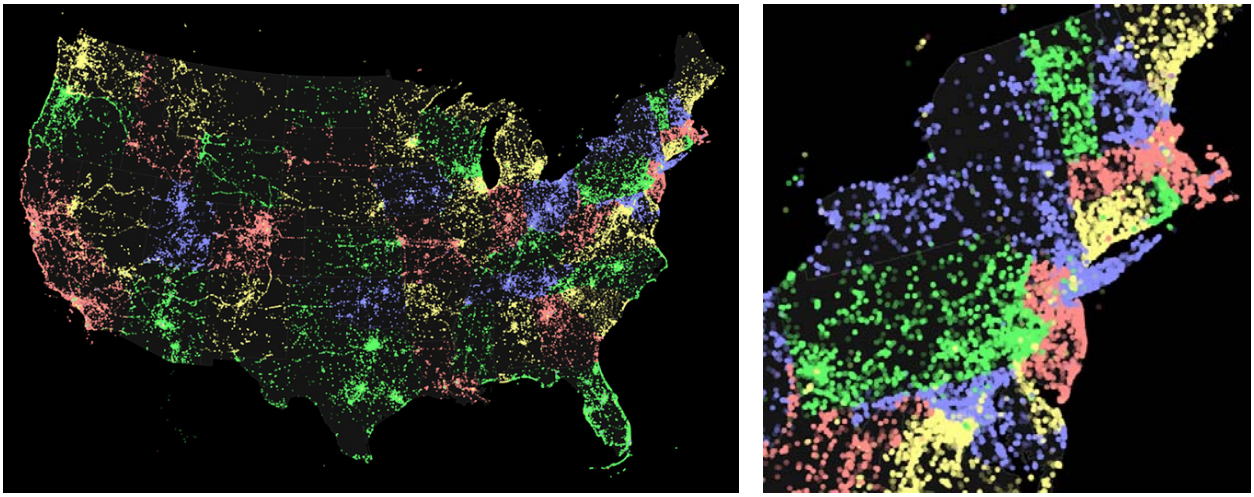

Figure 2.2 Boundaries of the lower 48 US states as delineated by user-supplied tags on Flickr photos. The right image shows a close-up of the northeastern US. This visualization[17] was created by Jim Bumgardner, is under Creative Commons license, and has been used with his permission.

content browsing, which, some argue, is attributable to the fact that they are an inherently good form of communication: Maps serve as an intuitive and efficient browsing interface because they display information on the Earth itself, an accessible and recognizable metaphor for users (Scharl, 2007).

Once coordinate values are attached to content, an information repository essentially becomes a set of spatial annotations. Flickr, Panoramio, Freesound, and YouTube all offer interactive maps of their geotagged content and also allow users to search for content by location. Offering another degree of complexity and sophistication, Google's MyMaps[18] application allows users to import and export both KML and GeoRSS formats and add their own locations to create personalized maps. These are may be embedded into websites or viewed on top of Google's extensive platform and thus enriched by services such as driving directions, public transportation information, and even Street View imagery in an ever-increasing number of cities.

UMapper[19], meanwhile, gives users a choice of base maps including OpenStreetMaps, Microsoft Virtual Earth, Yahoo Maps and Google Maps. Their rich Flash interface can import GeoRSS and KML feeds and provides a range of overlay options for creating lines, bounding boxes and circles with custom symbology. When completed, the map may be exported as ActionScript 3.0 or KML. Additionally, they offer analytics and wiki services so that users can open their maps up to collaborators and monitor viewing statistics.

Another project, worldKit[20], streams a variety of content including RSS feeds and Web Map Services (which can provide satellite imagery) onto a Shockwave Flash (SWF) web maps. It integrates several geocoding services, and functions as either a standalone map or as a component of a broader project. The platform has been used for range of applications, from neighborhood storytelling projects[21] to an interactive map of historic world population growth[22].

17 Available on Flickr: http://www.flickr.com/photos/krazydad/2986774792/.
18 Requires registration: http://maps.google.com/maps?tab=ol.
19 http://www.umapper.com/.
20 http://worldkit.org/doc/.
21 The Organic City: http://www.theorganiccity.com/wordpress/read-a-story?number=50.
22 History of Urbanization: http://worldkit.org/population/.

Although available for US locations at the moment, Outside.in[23] aggregates GeoRSS feeds so that users can browse content based on their location. They also offer GeoToolkit which allows users to embed maps into their web content, analyze statistics on map usage by site visitors, and publish their content to the Outside.in aggregator.

Outside of online mapmaking software and proprietary APIs (such as that of Google), number of users and organizations have developed their own maps using Free and Open Source Software (FOSS). OpenLayers[24], for example, is widely used to create dynamic web maps, and is capable of integrating data in KML and GeoRSS formats in addition to more complex OGC geographic data formats such as Web Coverage Services (WCS) for georeferenced raster data, Web Feature Services (WFS) for GML formats, and Web Map Services (WMS), for georeferenced map images and legend information. Such formats are designed for distributing geographic data for use in GIS analysis and are key to creating Spatial Data Infrastructures (SDIs)[2]. In general, these specifications are overly complex for geocontent, though several of the GeoCMS platforms discussed in Chapter 3 are capable of handling them.

23 http://outside.in/. GeoToolkit: http://outside.in/geotoolkit/welcome.

24 http://openlayers.org/.

3 GeoCMS: managing geocontent

Web 2.0 technologies and content publication methods require new paradigms of content management (Tramullas, 2005). Web content management systems (WCMS) are utilized by enterprises and institutions to facilitate the collection, management, and publication of online materials (Boiko, 2001). Traditionally these systems have offered simple scripting interfaces to enable the production of static HTML web pages that were then uploaded by a designated webmaster to a public web site via file transfer protocol(FTP) (Nakano, 2002). Visitor numbers and content volume have risen dramatically over the last decade, and it is also increasingly imperative to publish and aggregate content dynamically. As a result WCMS have evolved to incorporate sophisticated capabilities such as automatic versioning, intelligent error checking, and automatic updating. These new tools enable employees with minimal technical expertise to create and manage large quantities of content directly through a user-friendly back-end interface, while maintaining a clear, professional public site (McKeever, 2003).

The introduction of spatially referenced materials, however, adds new dimensions (quite literally) to a WCMS framework. In Chapter 2, we described the standard formats used to store the geographic data in geocontent, prominently KML and GeoRSS. It was explained that existing methods of attaching this data, geoparsing and geotagging, while imperfect, are widely adapted and can be implemented fairly easily through a range of services. Finally is also a wide appeal to interactive web maps and many platforms to support geographic content visualization. The missing component, then is the overall system of content management, a specialized GeoCMS, to integrate these methods and technologies. An examination of the parallels between web content management and geocontent management allow us to define the expected functionality of a GeoCMS, see Figure 3.1.

3.1 Functions of a GeoCMS

In WCMS terminology, the *collection* subsystem is used to both create content and acquire it from various sources. It must include interfaces for administrators, and possibly users, to write and upload media. If outside content requires reformatting or filtering, it must also handle these conversion tasks (Boiko, 2001; Tramullas, 2005). A GeoCMS adds the requirements necessary to collect geocontent including support for spatial referencing of written content or included media. Conversion of external content may also include geographic filters.

The *management* subsystem is the most complex component of a WCMS, as it integrates all components into a single framework. It incorporates the creation activities with the steps necessary for publication to online audiences. Additionally, the management subsystem provides separate interfaces for administrators and public users, and manages capabilities and access levels based on these roles. Finally, it supports distributed administration through a browser interface, metadata control, and automatic versioning (McKeever, 2003). A GeoCMS should support all these functionalities.

In a WCMS *publication* subsystem is used to disseminate the final product to end users. It utilizes customizable templates to automate the publication of content on-site and produces alternate information formats so that content can be utilized by various platforms and customers (Boiko, 2001). For on-site display a GeoCMS should be capable of presenting content in an interactive map, the structure of which can be paralleled with a typical WCMS template file. Alternate content formats typically provided by a WCMS include PDF documents or CSV files for spreadsheet use. In the case of geographic content, KML and GeoRSS are the predominant publication formats. Because these formats are standardized and many mapping APIs are available for public use, publication of geocontent in this format ensures allows various end users to tailor it to their specific needs.

Subsystem	WCMS requirements	GeoCMS requirements
Collection	• support for content creation; writing interfaces and media uploads • syndication and integration of content from external sources • content conversion	• support for content creation; writing interfaces and media uploads • support for spatial referencing of content through geoparsing or geotagging • syndication and integration of geocontent from external sources • geocontent conversion including spatial filters
Management	• support workflow between content creation and publication • separate interfaces for administrators and public users • management of access levels and capabilities based on user roles • provision of distributed administration capabilities including a thin-client, metadata control, and automatic versioning	• support workflow between content creation and publication • separate interfaces for administrators and public users • management of access levels and capabilities based on user roles • provision of distributed administration capabilities including a thin-client, metadata control, and automatic versioning
Publication	• on-site content publication • alternate content formats tailored to various users and platforms	• on-site content publication including interactive map • alternate content formats tailored to various users and platforms including GeoRSS and KML

Figure 3.1 A comparison of WCMS and GeoCMS requirements.

3.2 Existing geo-enabled WCMS frameworks

Several WCMS have begun to incorporate geocontent management. Interestingly, no previous academic publications discussing GeoCMS frameworks were found during this research, aside from a single article that acknowledges that Location Based Services rarely exploit such a platform (Raper, 2007). That said, there are several open-source platforms that have promising geospatial components.

TikiWiki[1], a PHP-based wiki platform, and PrimaGIS[2], an application for the the Plone[3] CMS, both integrate the MapServer[4] web mapping application and allow users to upload shapefiles and raster imagery. TikiWiki has yet to implement location attributes for blog entries, photos and other media (Martin, 2007). PrimaGIS is capable of geotagging media files using their *iGeoAware* interface. Both lack functionality for importing KML or GeoRSS. In both cases, dates on the documentation pages and broken links to example maps might indicate that the development of geo-enabling extensions has stalled, and no implementations were found for inspection. There are several other similar

1 http://info.tikiwiki.org/tiki-index.php.
2 http://www.primagis.fi/.
3 http://plone.org/.
2 http://mapserver.org/.

examples of WCMS platforms with apparent geocontent functionality, but poor documentation and few visible implementations. The remainder of this chapter will focus on four WCMS that have been recognized for their potential to handle geographic content, see Figure 3.2.

Midgard

The open-source CMS Midgard[5], was one of the first CMS to add a substantial toolset for aggregating and creating GeoRSS feeds in 2006 (Turner, 2006). This is done through a *position* library[6] that encodes locations for Midgard objects (articles, topics, etc.) according to the location of the author. Location information is obtained through manual entry, Plazes[7] data, or even through Flickr photo feeds. Once appended to content, the location data is published as GeoRSS tags in site feeds.

Drupal

Drupal[8], a widely used open-source CMS, has several modules that implement GeoCMS capabilities. These include Nice Map, a WMS client; KML Parser, for aggregating KML contents; and Location, which enables site content to be syndicated in GeoRSS. Recently, functionality has even been added that even allows users to aggregate KML and GeoRSS feeds into an RDF data store[9]. The platform has the advantage of having a highly active community of contributing users, and one can expect that their geographic extensions will continue develop at a fast pace. In general, the geo-enabling modules in Drupal focus on transformation between formats and associating content with locations rather than producing plug-in maps. Though Drupal is notoriously complex to configure (Daniūnas, 2008; Reilly, 2006), proponents of the system argue that the learning curve is significantly flattened with each version. Nonetheless, the remaining stigma may discourage adoption of Drupal as a GeoCMS for organizations and enterprises that lack skilled technicians.

Joomla!

Joomla![10] is another popular open-source CMS. Like Drupal, it has an extremely active user base that consistently contribute new extensions for the platform. Among these there are a variety of options to support GeoCMS functions. Google Maps Multipage[11], for example, enables users to load marker data from an XML file or GeoRSS feed and display them as markers in Google Maps or Google Earth. KML export is also available. WisRoGIS[12] is a particularly advanced extension that handles WMS and WFS layers in addition to GeoRSS and KML and also provides routing services based on OpenStreetMap's Routing Service. WisRoGIS, however, is a commercial extension that costs €53. In contrast to the Drupal modules which are almost exclusively free of cost (drupal.org, 2008.), a handful of Joomla!'s most powerful extensions are commercial.

Wordpress

Although frequently considered a specialized weblog platform, Wordpress[13] has been popularly implemented as a WCMS for several years (Bernier, 2006). It is regarded as having an extremely user-friendly interface and strong content classification functions (Tramullas, 2006), which has made it a practical content management platform for institutions such as libraries (Dodson, 2008.; Mitchell, 2008; Xiao, 2008), schools (Couros, 2006; Archambault, 2008), and science laboratories (Ikeno). High-profile implementors of Wordpress as a CMS include the United States Postal Service and the Ford Auto Show (Frangos, 2008). Functionalities that enable content management in Wordpress are

5 http://www.midgard-project.org/.
6 Description: http://bergie.iki.fi/blog/the-midgard-position/.
7 http://plazes.com/.
8 http://drupal.org/.
9 Description of this feature: http://www.developmentseed.org/blog/2008/dec/06/talking-about-places-you-dont-have.
10 http://www.joomla.org/.
11 http://extensions.joomla.org/extensions/photos-&-images/maps/5248/details.
12 http://extensions.joomla.org/extensions/photos-&-images/maps/5414/details.
13 http://www.wordpress.org/.

WCMS & Technologies	User base	Geo-enabling method	Geographic data formats
Midgard *PHP, MySQL, Unix*	Small but active.	• *position library:* location of author obtained through manual entry or Plazes, encoded as object attribute from position library	• exports GeoRSS
Drupal *PHP, MySQL, Any OS*	Large; very active.	50+ geo modules in Drupal.org directory, including: • *Location:* associates geographic coordinates with any type of Drupal content; geocodes addresses; proximity search; basis for other mapping modules • *XML to KML:* KML generated from incoming GeoRSS feeds or XML with latitude and longitude tags; site content available as KML • *Nice Map:* integrates with *Views* module to display maps for geotagged posts; provides increased flexibility over map design and styles • *Track:* upload data from a GPS for display in Google Maps	• exports GeoRSS • imports GeoRSS, KML; exports KML • imports WMS • imports GPX; exports KML
Joomla! *PHP, MySQL, Any OS*	Among the largest; very active.	25+ geo extensions in Joomla.org directory, including: • *Plugin Googlemaps:* most popular; displays one or more Google maps with content items; can add traffic layer or local search • *GMaps1.2:* displays Google maps with content items; custom icons; additional *Map List Module* to list all site maps • *WISroGIS 1.5:* commercial; OpenStreetMap routing service; interactive legend; multiple base map options • *XTC Maplink Module US Edition:* Flash map with links set to shapes so that visitors can browse content with map	• imports KML • none • imports KML, WFS, WMS; exports GPX routes • none
Wordpress *PHP, MySQL, Any OS*	Among the largest; very active.	25+ geo plugins in Wordpress.org repository, including: • *XML Google Maps:* User writes HTML link to geocontent source within post & map is created automatically • *UMapper plugin:* integrates Flash maps into site; Yahoo!, Google, Virtual Earth, OSM base maps; drawing capabilities • *GeoPress plugin:* location added with map, address, or tag; maps of single post, all posts, or by category; any Mapufacture base map • *GeoMashup plugin:* location added with map, or address; maps of single post, all posts, or by category; custom icons; interactive legend; Google basemap	• imports GeoRSS, GPX, KML, geocoded NextGen Gallery • imports GeoRSS, GPX, KML; exports KML • exports GeoRSS, KML, GPX, Geo & Adr microformats • exports GeoRSS, Geo microformat and GeoURL

Figure 3.2 *A comparison of geocontent support in four widely used open-source WCMS platforms.*

offered by plug-ins (discussed in Chapter 4). Similarly, a wide range of plugins are available to handle geocontent, see Figure 3.2. In contrast to Drupal modules that are used in combination to achieve customized location solutions, Wordpress plugins tend to be targeted toward an audience with less web-development expertise who desire simple one-plugin map implementations.

Numerous comparisons of WCMS platforms are available on the internet, yet the high speed of development in this field renders them obsolete fairly quickly. The CMS Matrix[14] offers one the most inclusive and up-to-date comparisons of capabilities and technologies. Because WCMS frameworks can often be downloaded from multiple sites and more than one time by a single user, it is difficult to quantify the number of installations of each framework that currently in use at any given time. In the absence of such data, a comparison of Google searches for the name of four GeoCMS frameworks is shown in Figure 3.3. This at least gives an impression of relative online interest in the various platforms.

14 http://www.cmsmatrix.org/.

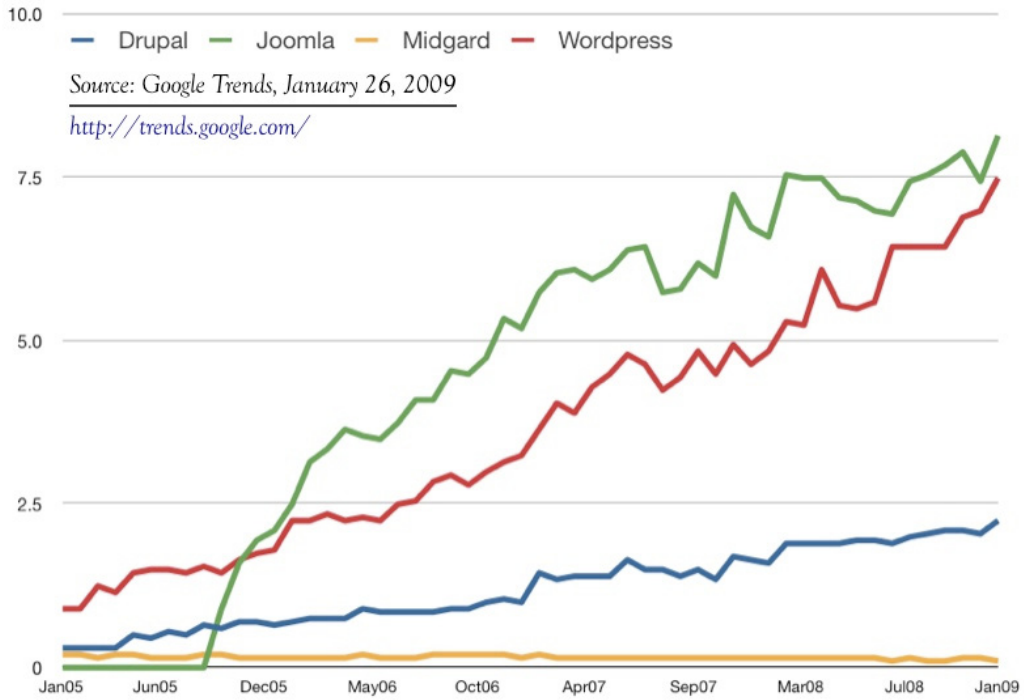

Figure 3.3 Google search volume index of Drupal, Joomla, Midgard, and Wordpress. Scale is based on the average worldwide traffic of Joomla in all years.

It is clear that there are several powerful open-source options for the management of geocontent and that extensions are available for all of these systems that implement many of the GeoCMS requirements listed in Section 3.1. Ultimately Wordpress was chosen as the WCMS platform for the Farm2.0 GeoCMS on the basis of its usability, thorough documentation, wide user support resources, and options for rapid customization through plugins and themes.

4 Farm2.0 functional design

Having chosen Wordpress as our WCMS platform, we will first give an overview of its basic system structure. This is followed by a review of the Farm2.0 system requirements and a description of the customizations that are necessary to implement those functionalities.

4.1 The Wordpress platform

Wordpress is self-hosted publication software, so it is installed on a server and edited online. PHP templates retrieve content from the database as they are requested from the client browser, and the HTML that appears onscreen is generated dynamically. This is known as dynamic publishing. Some publishing platforms such as Blogger and MovableType, use static publishing methods which create new HTML files as content is published or comments are made. Static publishing platforms have the advantage of loading faster, and they do not require the content to be hosted on the user's web server. However, since HTML elements such as headers and sidebars are duplicated on every page, static publishing requires much more space. Dynamic publishing, however, allows changes to content or styles, in addition to comments from users, appear instantly online. For these reasons, sites with dynamic content and actively contributing visitors are often best served by a dynamic platform (Douglass, 2005). An overview of the basic Wordpress structure utilized in Farm2.0 is shown in Figure 4.1.

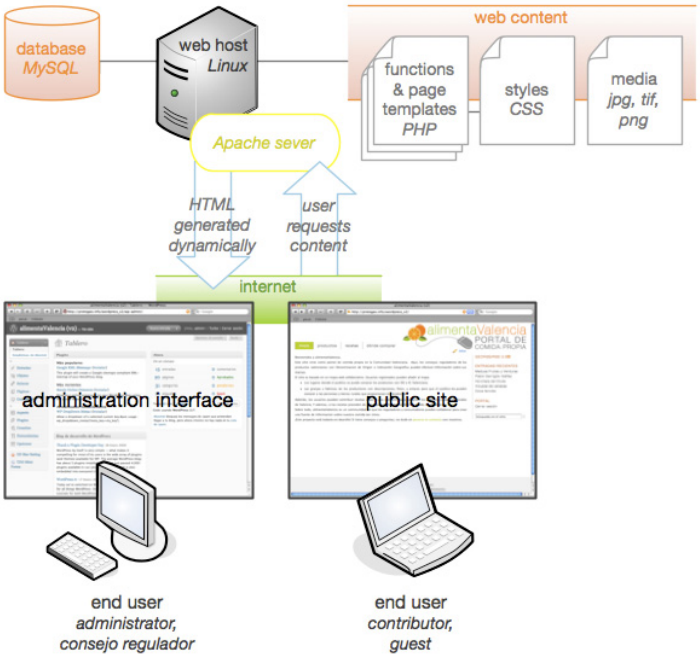

Figure 4.1 Wordpress is a self-hosted dynamic publishing platform.

The Wordpress platform is customizable through *plugins*, which add specific functionalities, and *themes* which control the way the content is displayed. There are a number of plugins and themes that are regularly used to implement WCMS capabilities. Farm2.0 theme and style choices will be discussed in Chapter 5, while the remainder of this chapter will cover the use and customization of plugins to meet system requirements.

4.2 Requirements analysis and implementation

The technical goals of Farm2.0 were specified in Section 1.2. While the core Wordpress platform already enables some of these functions (a separated administration panel and automatic versioning, for example), while others have to be implemented through plugins and further customizations. Figure 4.2 details the Farm2.0 requirements specifications and implementations in the framework of

the GeoCMS functional requirements defined in Section 3.1. A list of all plugins used, with links to documentation and downloads, is available in Appendix A2.

	GeoCMS requirement	Farm2.0 specification	Farm2.0 implementation
Collection	• support for content creation; writing interfaces and media uploads	• users add information & photos about PDO and PGI vendors/ producers as well as recipes	• TDO Mini Forms plugin
	• support for spatial referencing of content	• users are able to easily geotag their contributed content	• GeoMashup widget in TDOMF plugin
	• syndication and integration of geocontent from external sources	• geotagged Flickr photos available as layer on interactive map	• overlay uses Flickr & Google Maps APIs
	• geocontent conversion including spatial filters	• photos are filtered spatially by region and thematically by tags	• filter by region and tags with Flickr API
Management	• support workflow between content creation and publication	• non-spam content from registered users appears on site instantly	• Askimet plugin & TDOMF reCaptcha widget prevent spam
		• social filtering of content through ratings and comments	• comment function in WP core; ratings through GD Star Rating plugin
		• use of PHP templates to ensure content consistency	• customized K2 theme templates
	• separate interfaces for administrators and public users	• separate administrative back-end available to administrators	• WP core
	• management of access levels and capabilities based on user roles	• public may register to contribute content; administrators given capabilities to modify content	• Register Plus plugin registers users; capabilities set with Role Manager plugin
	• provision of distributed administration capabilities including a thin-client, metadata control, and automatic versioning	• browser-based administrative access; controlled vocabulary for content classification, automatic versioning and back-ups	• WP core for browser access, categories, & versioning; Wordpress Database Backup plugin to schedule & perform backups
Publication	• on-site content publication including interactive map	• recipes and vendor/producer locations available as single posts on pages with links to interactive map of all content	• customized K2 theme templates, GeoMashup plugin
	• alternate content formats tailored to various users and platforms including GeoRSS and KML	• site content available as GeoRSS with additional Geo microformat and GeoURL tags	• GeoMashup plugin

Figure 4.2 Overview of Farm2.0 requirement specifications and plugins used to meet them.

Content creation

In Wordpress, there are two main content types, *pages* and *posts*. Pages are meant for more permanent content that users need to appear styled in a certain way through specific page templates. Posts, in contrast, are used for new content, and are organized into categories so that their display can be managed collectively (Douglass, 2005). In Farm2.0, pages include the *Inicio* (start) page, indexes of recipes and posts, and the interactive map. Each product has its own page as well, and the regulatory board for that product is capable of modifying the content on that page through the administration panel. Discussion of the page content type is revisited in Chapter 5.

In Farm2.0, users cannot create pages. Instead, public users add content in the form of posts. This content may be a recipe, a PDO/PGI producer, or a PDO/PGI vendor. Users should be able to

spatially reference their content and attach additional media, in the form of uploaded photos. Whereas in the standard Wordpress platform content creation is performed from the administrative back end, public users should not have access to this interface and therefore cannot create posts. We have modified this with a plugin, TDO Mini Forms that builds a form to turn user-generated content gathered from a form into a post. The plugin comes with a set of widgets that allow the creation of custom fields, such as "phone number" so that content elements can be retrieved individually from the database. There is a widget that displays the GeoMashup plugin interface so that content can be spatially referenced within the form. Users to search for a location by name, drag a marker on an interactive map, or perform a combination of both actions to set a location for their content. The interface for post submission is shown in Appendix A1.

Content creation also includes the syndication, and conversion if necessary, of outside data. In the case of Farm2.0, geotagged photos from Flickr should appear as optional map layers. The overlay itself is handled by customizing the javascript in the GeoMashup plugin by adding a *GGeoXML* object with the *addOverlay* function from the Google Maps API. In this case, the XML object being imported is a Flickr feed of geotagged photos in Valencia. The purpose of including these photos on the map is to give users a feel for the natural and cultural context of PDO/PGI food products, it is necessary to filter out photos that are irrelevant and inappropriate. This is done by adding tags to the feed parameters so that included photos are not only filtered spatially, but thematically as well. Two Flickr overlays are available in the map, one for photos tagged *naturaleza*, *cosecha*, *granja* (nature, harvest, farm) and another for photos tagged *comida* (food). The resulting overlays are dynamic, so they will include different photos as the Flickr repository grows. Examples of the overlay are shown in Figure 4.3.

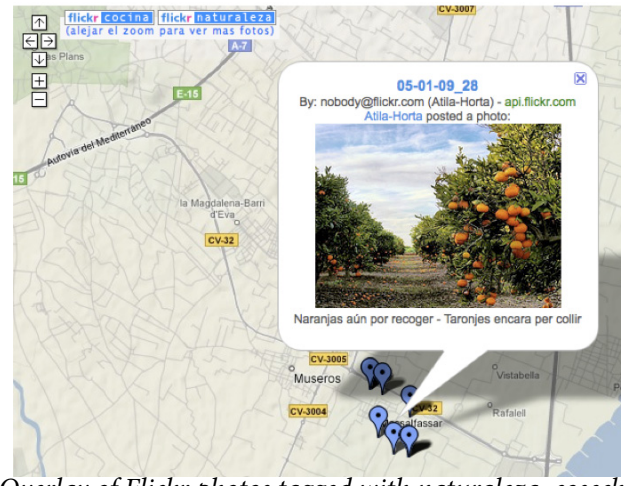

Figure 4.3 Overlay of Flickr photos tagged with naturaleza, cosecha or granja.

Content management

Comment spam, content posted in web sites to promote a user's own site, is a continual problem that plagues websites where users have the capability to add comments or content (Douglass, 2005). Wordpress supports comment moderation, but this problem is complicated for the Farm2.0 system by the aforementioned modifications to allow users to publish posts. In order to combat spam, two plugins are used. Askimet runs submitted content through a hundreds of filters to determine whether content is spam, and is available as a Wordpress plugin. The TDOMF plugin allows form submissions to be run through the Askimet service before publication. Additionally, TDOMF includes a reCaptcha widget. ReCaptcha takes phrases from scanned manuscripts that computers cannot read through Optical Character Recognition (OCR).[1] In TDOMF, content will not be accepted unless the user

1 ReCaptcha services actually use their spam filtering device to help digitize information archives, such as books and newspapers, for internet use. For more information see: http://recaptcha.net/learnmore.html.

correctly types the letters, ensuring that they are not mechanized spam posters (often called spambots).

Another element of managing content could also be considered a type of content creation; the use of social filtering through user-generated ratings and comments. Wordpress includes commenting capability by default, while users are given the ability to rate posts through the GD Star Rating plugin. These functionalities allow site visitors to evaluate post content based on existing ratings and comments or add their own.

The Register Plus plugin is used by Farm2.0 to extend Wordpress registration handling. Register Plus utilizes the site logo on the registration and login screens to maintain graphic consistency. (Normally the Wordpress logo appears on these screens.) It also allows custom emails to be sent to users upon registration, utilizes the previously mentioned reCaptcha widget, and redirects public users to the page they were previously on once they log in. (Without the plugin, users are taken to the administration panel.)

Wordpress has a built in role management, but Farm2.0 requirement specifying administrator-only access to the administration panel complicates with this default functionality. To define user levels and capabilities, the Role Manager plugin was installed. This allows public users to contribute posts through TDOMF while restricting their access to the back-end interface. For a complete listing of roles and capabilities, refer to A3 in the Appendix. Roles are implemented for one or more *Administrators*, who have full capabilities including Wordpress update, plugin installation, page creation, and role management. The *Consejo Regulador* (Regulatory Council) role, given to each of the individual regulatory councils of every PDO/PGI product, allows modification of one product page as well as the ability to moderate comments. Once a user registers, they are automatically given the role *Colaborador* (Collaborator), and can contribute posts and comments once they log in with the password emailed to them by Register Plus. Posts will not appear until they have been approved by a Consejo Regulador or the Administrator. Wordpress also integrates the use of *gravatar*, globally recognized avatars, which are photos or icons attached to a user's email address. Increasingly popular, any user can choose their avatar by registering at Gravatar.com[2]. Their chosen image will then show up automatically next to their comments on any of the numerous websites that use the system. In Farm2.0, this comments, ratings, and gravatars help to lend a social-networking aspect to the system and foster a feeling of community.

The Wordpress platform, as discussed in the introduction to this chapter, already implements a separate, browser-based administrative interface, see Appendix A5. Versioning is also done automatically, so previous content on pages can be restored if needed. The WP Database Backup plugin provides regularly scheduled database backups. Backups may be saved to the server, downloaded, or emailed to a specified address.

Category management is also available in the Wordpress platform by default. In Farm2.0, the Administrator role has all category management capabilities. TDOMF automatically categorizes recipes as *recetas* and stores, producers, or informal sale points as *comerciantes*. Users can then choose the products under which their post will be categorized, and have the option of choosing multiple products for a single post. More information on categories is available in Chapter 5.

Content Publication

As a content publication platform, Wordpress handles most aspects of content publication with PHP templates that retrieve data dynamically from the database, as described in Section 4.1. In addition to the templates included in the K2 theme, several custom page templates were created. Creation of the customized styles and graphics is discussed in Chapter 5.

2 http://gravatar.com/.

Map publication is handled through the GeoMashup plugin, which automatically implements the core GeoCMS functions in Farm2.0. The latitude and longitude data obtained by the GeoMashup widget is stored for each post. A PHP template tag is added to the template for single posts to display a small map on each page to display the origin or location of a recipe, farm, or vendor. There is also a link on each post to view the location on the global map containing all posts. The GeoMashup version implemented in Farm2.0 is actually a beta that is to be released soon for download. In this version, the legend is interactive, so various categories of icons can be turned on and off. If the global map is linked to from a product page, it only shows locations that are in that product category and a button appears that allows viewers to switch on all posts. Further details on the cartographic choices and functions in the map are detailed in Chapter 5.

GeoMashup also automates publication of Farm2.0 geocontent using several of the geocontent standard formats. GeoRSS Simple tags are added to the site's RSS feed, while Geo microformat and GeoURL tags are also encoded in individual post pages.

4.3 Geocontent flow

The flow of geocontent in the Farm2.0 system begins with a user geotagging their content through the GeoMashup widget in TDO Mini Forms. Geotagging is accomplished by utilizing the Google Maps API either though their geocoding service (for address entry), or a map listener that records coordinates upon a click event. The user may re-search or move the marker. The latitude and longitude of the marker at the time the post is saved is stored in a GeoMashup-created table in the Wordpress database. When the post is displayed, a PHP template tag retrieves the coordinates from the database and displays them on a small Google Map with a generic marker. Below the map, a link to the global map is displayed. When clicked, the user is taken to the global map which is centered on the post from which they came.

If the user goes to the global map through the top menu on the site, all posts are displayed on the map and the view is centered on the most recent post. Turning on and off categories in the interactive legend toggles the display of posts in that category through dynamic queries to the GeoMashup database. Clicking on a marker in the global map reveals an excerpt of the post and a hyperlink to the single page. When the user is viewing the page for a specific PDO/PGI product, a link in the sidebar takes them to the global map with only locations in that product category toggled. Any time when the global map is rendered without all posts displayed, a button to display all posts appears.

The Flickr API services are used to aggregate geotagged photos for display on the map, These are filtered by theme and region, as previously discussed.

When the RSS feed for the site is syndicated, database contents are parsed into XML format and GeoMashup adds GeoRSS Simple tags to each post. The GeoRSS feed can be accessed from a sidebar link on every site page besides the map itself. Users can subscribe to the feed and display it as an overlay in their own maps using the API of their map provider. Geocontent flow in Farm2.0 is illustrated in Figure 4.4.

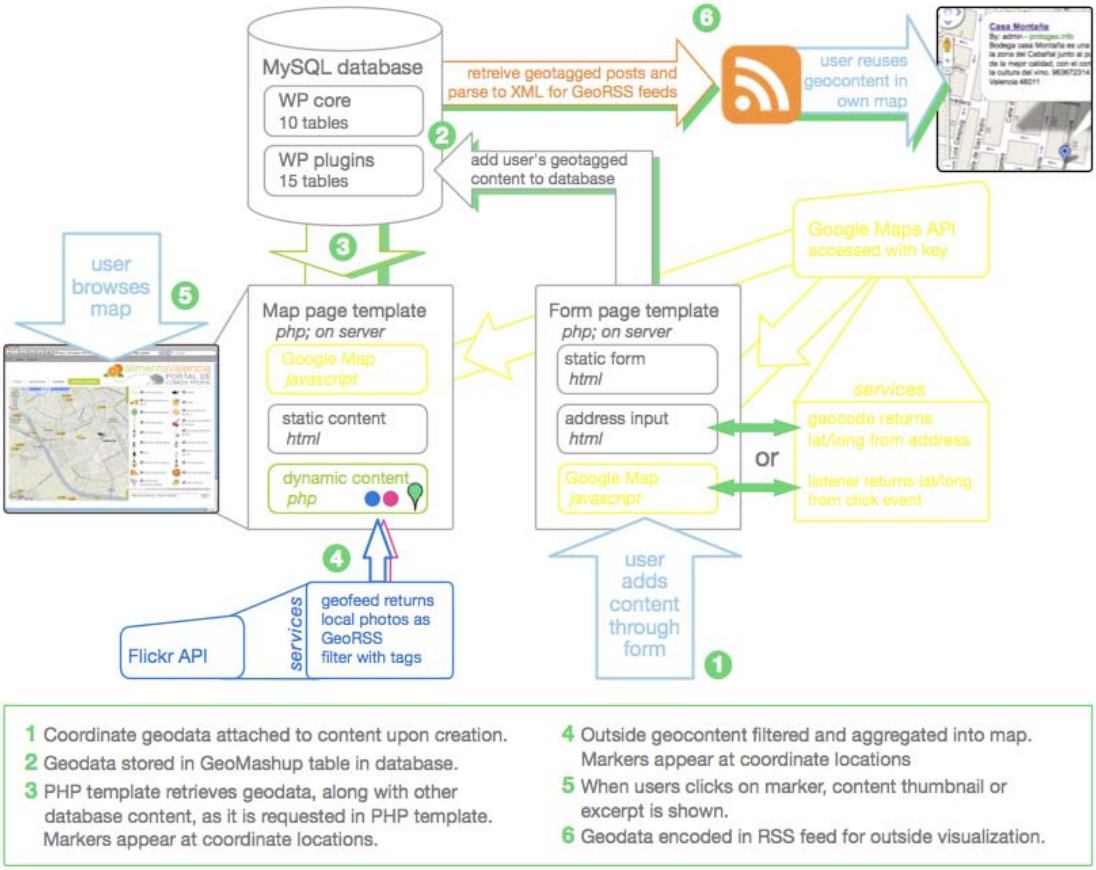

Figure 4.4 Geodata flow in the Farm2.0 system.

In this chapter we have reviewed the requirement specifications of the project and described the tools used to implement GeoCMS functionality in the Farm2.0 system. Overall, existing capabilities of the Wordpress platform, used in combination with a set of plugins, has proven to provide powerful capabilities for managing user-contributed geocontent.

5 Farm2.0 information architecture & graphic design

The technical structure of the Farm2.0 system as discussed in the previous chapter cannot stand alone. To the contrary, the functionalities supported by the system must be substantiated by a usable, intuitive information architecture. Additionally, the graphic design of the site must support site usability and create visual appeal. In this chapter, an overview is given of the Farm2.0 site blueprint, controlled vocabulary, and navigation tools. Graphic design requirements are discussed before explaining how a customized theme and icon set were implemented.

5.1 Information architecture

Information architecture involves the organization and labeling of websites to support findability and usability (IAI, 2008). The process begins with the logical definition of granularity and relationships between site components. In the case of Wordpress, the out-of-the-box architecture was originally designed primarily for use of the platform as a weblog, and posts, essentially blog entries, were the only built-in content type. By default, posts are displayed in reverse chronological order as the central content, with other information, such as hyperlinks or a search box, visible in sidebars, headers or footers. However, a number of PHP template tags allow users to sort and display posts, links to posts, or post excerpts in these areas with great flexibility. For example, users frequently have links to their most popular or recent entries shown in a sidebar.

As an increasing number of users have begun to use the software as a WCMS, however, the system has evolved to handle an additional content type: Since the release of Wordpress 1.5 in 2005, users can also create "static" pages. Though they are still generated dynamically by templates, pages are static in the sense that they exist apart from the usual category/date hierarchy (Lynch, 2005). Pages can be given permanent locations in the site and maintain a separate hierarchy through the use of *subpages* that are assigned to *parent* pages.

Farm2.0 makes extensive use of pages to organize content. The top menu displays the four parent pages, *inicio* (start), *productos* (products), *recetas* (recipes), and *Dónde comprar* (where to buy). The start page has a short description of the *alimentaValencia*[1] site including an explanation of the PDO and PGI quality labels and a contact link to email the site administrator. The sidebar that is visible on all pages except the map has links to the site's GeoRSS feed, a list of the five most recent contributions to the site, the login page (unregistered users see registration information on this page instead), and site search. The search results page displays a list of posts (vendors or recipes) that contain the search terms.

The product parent page has a list of the PDO/PGI products from Valencia.[2] The product names are links to subpages for each product. These product subpages contain photos and descriptions of the products along with hyperlinks to the product regulators' external sites. They also contain dynamic sidebar links to a list of contributed recipes and the interactive map. These links are dynamic in that they attach a PHP parameter to the URL that instructs the search results page template or map page template to display only recipes or map markers in that product's particular category (details in Section 5.2).

The recipes page contains a link to the form users can use to add a recipe, a link to browse recipes in the map, an interface for browsing recipes by category (see Section 5.2), and an alphabetical list of all recipe posts. Similarly, the where to buy page contains a link to the form for users to add a vendor, a

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1 Farm2.0 is meant to be extendible, and every implementation of the system should have a name that reflects the location and language of the region that it promotes. The name alimentaValencia comes from the Spanish word alimentar, which is a verb meaning to feed (a person or animal), to nurture or cherish (a belief), and to boost (an ego or motor).

2 At the time of this writing, subpages have been created for only 12 of the 17 products. Information for these pages was duplicated from the Ministero de Medio Ambiente y Medio Rural y Marino: http://www.mapa.es/es/alimentacion/pags/Denominacion/.

link to browse vendors in the map, and an alphabetical list of all vendor posts. Figure 5.1 illustrates the organization of pages, posts, and links in a site blueprint.

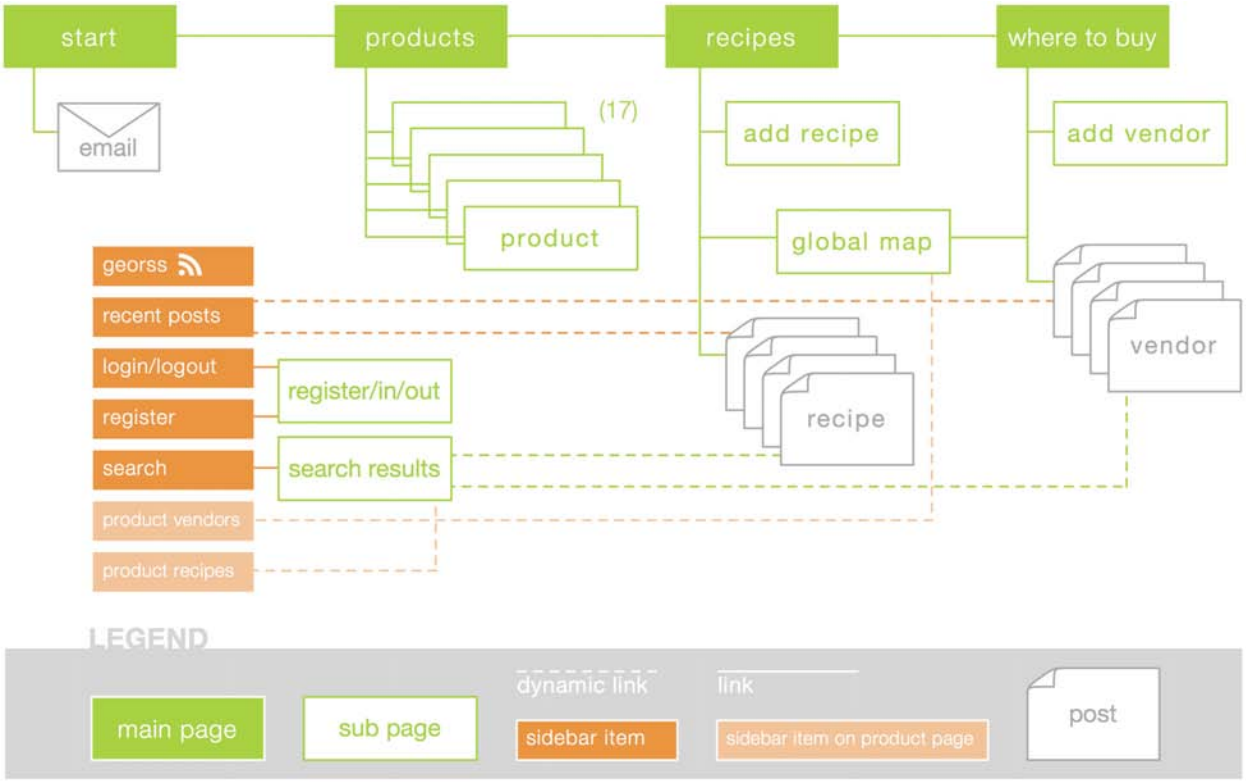

Figure 5.1 Farm2.0 site blueprint.

Information architecture implementation

In the Wordpress platform, page layout is dictated by *themes.* A theme is a set of files that control the graphical interface of a site as well as its underlying structure. The default theme is, again, best suited to blogs. However, the platform utilizes modular PHP component storage so that core functionalities are separated from layout components (Wordpress.org, 2009). This allows developers to create customized Wordpress themes, over 500 of which are available free-of-cost from the Wordpress theme repository. The popular K2 theme[3] was selected for use in Farm2.0 because it is extremely well-documented and has a broad user-base that provides many support resources. The K2 theme was set to display the Farm2.0 site using single column page layout with a header, footer, and sidebar. This framework provides the basic site structure for the pages, posts, sidebars, and links defined above. Theme customization is discussed further in Section 5.5.

5.2 Farm2.0 controlled vocabulary

Controlled vocabularies are a set of terms that are used throughout the site to support searching, browsing, and general content management (Morville, 2006). Wordpress provides *categories* to facilitate consistency in content labeling, and templates can be created to display content from a particular category in a certain way. Categories are defined by the administrator and can be organized into a hierarchy of *parent categories*, and *child categories*.

As stated above, by default Wordpress pages are exempt from categorization. In the Farm2.0 system, however, it was necessary to create a single reusable template for product pages that could contain dynamic links to recipes and vendors for that product in the sidebar. Consequently, the Page Category

3 http://getk2.com/.

Plus plugin was used to assign each page to a product category. A custom template for the sidebar on product pages retrieves the page category using a Wordpress template tag *get_the_category*. The category is then passed to the URL of the hyperlinks so that the search results page or map page display only posts from that category. Similar methods are used in templates throughout the site.

```
<?php
$getcategory = get_the_category();
$category = $getcategory[0]->term_id;
$getcategory = get_the_category();
<?php $category = $getcategory[0]->term_id;
   echo "<a href=http://protogeo.info/wordpress_v2/recetas/resultados?prod=
   $category id=special>"; ?>recetas con <?php the_title() ?></a><br/>
<?php
   echo "<a href=http://protogeo.info/wordpress_v2/?page_id=42&map_cat=
   $category id=special2>"; ?>dónde comprar <?php the_title() ?></a><br/>
```

The TDO Mini Forms plugin can be set to automatically categorize content into a particular category. In Farm2.0, all content submitted through the recipes form is categorized as a recipe, and all content submitted through the vendor form is categorized as a vendor. The plugin also includes widgets that enables users to further categorize the content. In both forms, users are required to specify the subcategories (product, vendor type, and recipe type) that apply to their submission. This ensures metadata consistency in user-generated content and maintains the controlled site vocabulary. The categorization interface utilized in the vendor form is shown in Figure 5.2.

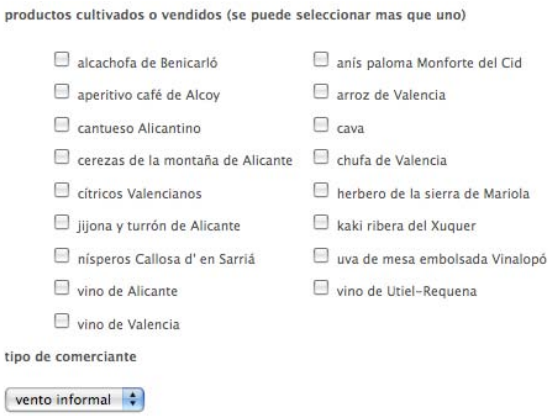

Figure 5.2 Users are required to categorize their content as they submit it. Widgets in the TDO Mini Forms plugin support this.

Multiple categories can apply to posts. In the case of vendor content, one or more product categories and a single vendor type must be assigned. Recipes are slightly less strict. The recipe repository should serve as a draw to the entire website, and it becomes a more valuable resource as it grows. Taking this into consideration, the recipe submission form encourages users to submit any regional dish, and are given the option of submitting recipes that do not contain any PDO/PGI product. Therefore, they can categorize their recipe either as the subcategory *ningun producto de PDO o IG* (no PDO/PGI product) or into one or more of the product subcategories. They are also required to indicate the type of recipe they are submitting by choosing a *tipo de plato*. Farm2.0 controlled vocabulary is shown in Figure 5.3.

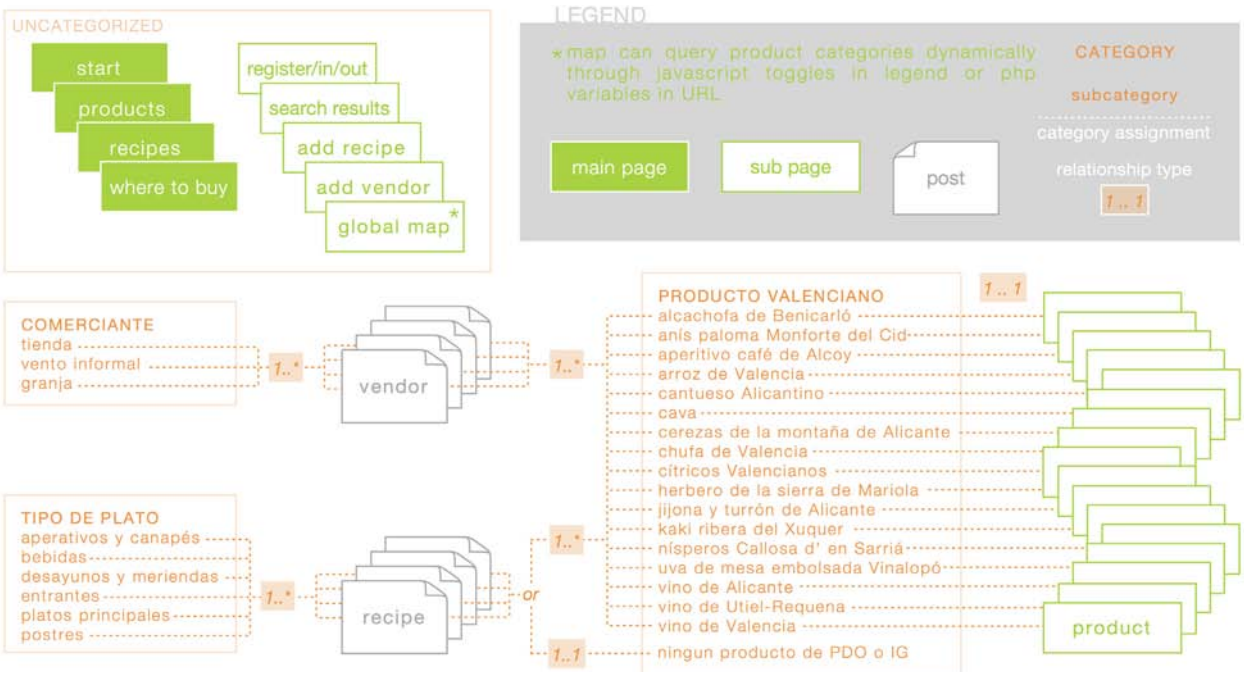

Figure 5.3 An overview of the controlled vocabulary implemented in Farm2.0.

In addition to rigid taxonomic content labels, Web 2.0 applications often implement fluid, user-generated content classifications, *folksonomies*. Users can tag content with words or phrases, and these tags become useful for browsing and filtering. In Section 4.2, we described how Farm2.0 utilizes tags on Flickr photos to create relevant map overlays. Users are also able to supply *etiquetas* (tags) for content they submit to Farm2.0. These tags are visible in posts, as shown in Figure 5.4, however they are not further utilized in the current Farm2.0 vocabularies. Further potential for this type of classification is discussed in Chapter 6.

Figure 5.4 User-supplied tags, etiquetas, are visible in post content.

5.3 General site navigation and search

Simplicity was a major objective of the Farm2.0 information architecture. A shallow page hierarchy was used so that all pages are accessible directly from one of the parent pages that appears in the main menu throughout the site. Additionally, through the use of Wordpress' built-in permalink settings, all Farm2.0 URLs are *human-readable*, meaning that they contain logical words and structures that reflect site structure. Such URLs are considered extremely helpful to increase web site usability (Nielsen, 1997). In Farm2.0, urls contain terms from the controlled vocabulary in an order that reflects the site's page hierarchy and URL-friendly versions of content titles. For example, the URL of a recipe entitled "Agua de Valencia" will read:

`http://protogeo.info/wordpress_v2/recetas/agua-de-valencia/`[4]

4 The alimentaValencia site is currently served from on the author's personal web host. Ideally, the "http://protogeo.info/wordpress_v2/" portion of the URL would be replaced with something more appropriate such as "www.alimentaValencia.es".

Aside from the map, every page displays a sidebar that has links to the most recent posts along with a search box to find content with specific words. Unfortunately, while internet search engines have become an excellent means to find good sites, intra-site keyword searches don't always support user tasks (Hearst, 2000). Unless users know the exact term to search for or advanced searching functions are implemented, site searches may often return empty results (Hearst, 2000). There are extensions for Wordpress that provide more powerful searching capabilities, notably the popular Search Everything For this reason, we provide additional navigation aides including a simple browsing interface for recipes and special geographic browsing tools in the map.

Recipe browsing

Within sites, comprehensive overviews of site information organized into stable and meaningful categories facilitates information retrieval and increases the user's understanding of site information. (Kules, 2006). A study on web searching that provided a particular investigation of recipe searches showed that users usually perform a combination of searching and browsing methods to find a recipe. It was suggested, therefore, that a browsing interface arranged by categories should be provided. The categories should be regular (for instance, an appetizer category should not appear if there are no categories for other meal types), and the number of results within each category should be visible (Hearst, 2000).

To implement this interface, assistance was provided by Robert Felty, the developer of the Collapsing Categories plugin for Wordpress. A special version of the plugin that enabled complete exclusion of certain categories (vendors in this case) and content types (pages) was created[5]. The resulting interface is shown in Figure 5.5.

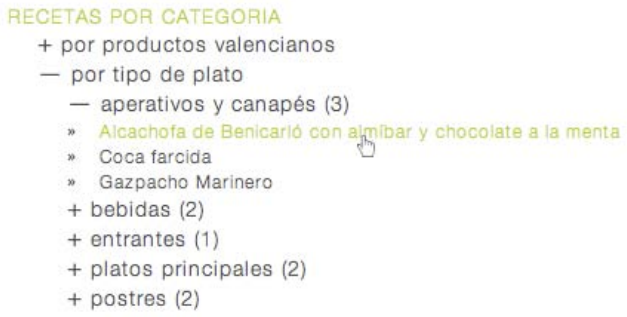

Figure 5.5 The Collapsing Categories plugin is used to create a user-friendly recipe browsing interface.

5.4 Geocontent navigation and search

Geocontent navigation can be considered in parallel to general web site navigation, and must also support content browsing, exploration, and search, see Figure 5.6. The Farm2.0 interactive web map has been designed to support content drill-down through layer toggling. As previously explained, if a user is directed to the map from another page on the site, the map will reflect their route of entry. If they come from the page of a specific post, the map will be automatically centered on the location of that post. If they have arrived from a product page, the map will display posts that match the product. In this case, the map is limited to particular posts when it is opened, so a button appears at the top of the map to allow the user to display all layers. They can also use the interactive legend to toggle Farm2.0 content or add layers from the Flickr geofeed with buttons on the other side of the screen.

In studies on web map usability, map size was highlighted as one of the most important factors affect the efficiency and ease of map navigation (Haklay, 2008; Harrower, 2003). With this in mind, users are able to collapse the legend entirely so that the Farm2.0 map window is visible at a full-page width.

5 The version of the Collapsing Categories plugin implemented in Farm2.0 is available from the Wordpress repository: http://wordpress.org/extend/plugins/collapsing-categories/download/. (Development version).

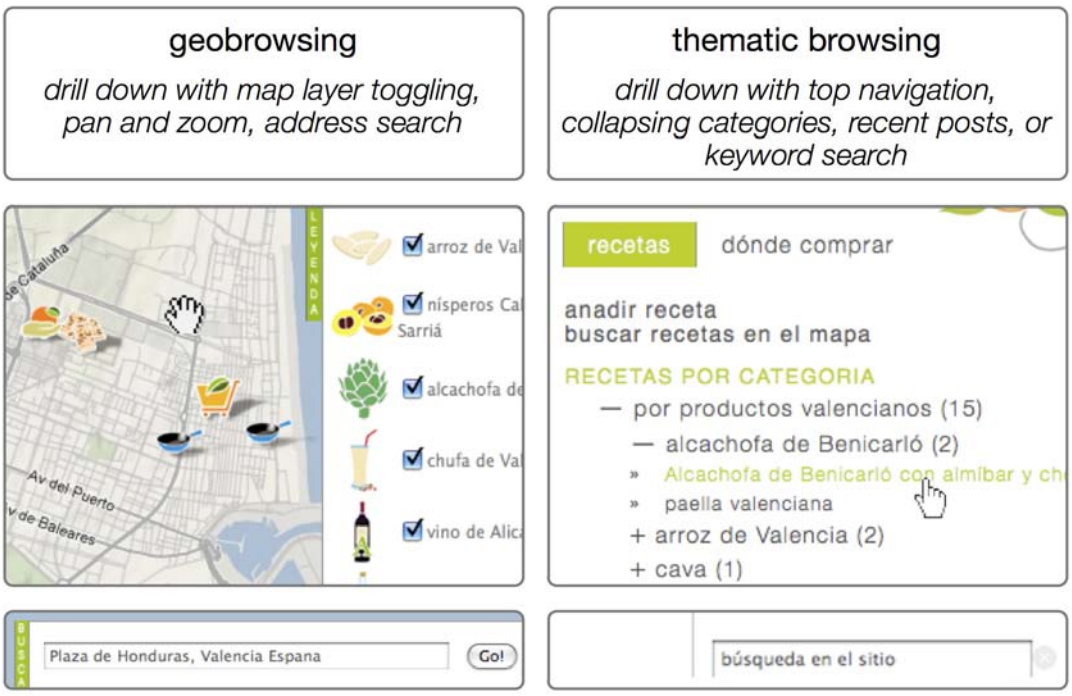

Figure 5.6 Parallels between browsing geocontent and other site content.

They can use the Google API zooming and panning functions. Pan and zoom have been considered optimal tools for online map browsing since optimal map scales and extents are dictated by a users own screen resolution and browsing objectives (Haklay, 2008).

The map is loaded using the Google Terrain base layer because its relatively subtle symbology makes map markers easy to view. Additionally, some studies have shown that users may find satellite imagery unusable (Skarlatidou, 2006). That said, a user may change the map type to the default Google Maps layer, Satellite imagery, or the Hybrid layer which combines these two.

The interactive legend, various base layer options, and support for dynamic hyperlinks to limit map content are all optional functionalities provided by the GeoMashup plugin. The collapsing action of the legend and the Flickr layers were implemented by adding additional javascript to the *custom.js* file in the GeoMashup plugin. This method of customization is ideal, for it allows users to tailor the map extensively. Since they retain all of their personalized changes in a single file, that can be set aside and restored should they wish to update the plugin by installing newer versions of all other files.

In addition to *fuzzy navigation* tasks that are accomplished visually through direct map manipulation, it is also important to allow users with a *precise navigation* target to visualize it quickly (Harrower, 2005) To support this type of objective, modifications were made to the map javascript and page layout to incorporate a collapsible search box. Users can enter the name of a town or an address and the map will re-center to the coordinates returned by the Google Maps geocoding service. Such a function could be considered the counterpart to a keyword search of the site.

Finally, when users click on a map marker, they are given an excerpt of the post within an information window. If the user is simply looking for details on store hours or a phone number, the content in the information window may be sufficient. If they wish to read further, clicking on a hyperlink provided in the window will take them to the full post display on a non-map page. From there they can return to the map by clicking on map link provided in the post or by using the browser's back button.

5.5 Graphic design

Although aesthetics have historically been overlooked in the fields of human-computer interaction (HCI) and information technology (IT), an increasing number of researchers are investigating the relationship between aesthetics and usability (Karvonen, 2000; Bertelsen, 2004; Hassenzahl, 2004; Norman 2004). In a paper provocatively titled, "What is Beautiful is Usable", Noam Tractinsky and his colleagues published findings from experiments that tested the correlation between interface usability and users' perceptions of its beauty. They found that aesthetics have a strong impact on users' initial perceived usability of an interface and, furthermore, this impact endures throughout usage to strongly affect users' conclusive evaluation of interface usability (Tractinsky, 2000). While these results have been challenged by some (Hassenzahl, 2004; De Angeli, 2006) and the link between aesthetics and usability remains contentious. However, it is important to remember that a basic objective of the Farm2.0 system is product *promotion*, and appealing graphic design is regarded as an essential aspect of branding and sales strategies (Schmitt, 1997; Gobé, 2001; Holland, 2001; Crilly, 2004).

The alimentaValencia brand

As discussed in Chapter 1, studies have repeatedly highlighted the need for unified marketing approaches that promote recognizable regional brands (Murphy, 2002; van Ittersum, 2007; Sanz Cañada, 2005; Briz, 2007). To accomplish this, a logo, icon set, and color scheme was developed to give the entire alimentaValencia website a unique, appealing, and coherent "look and feel". The overall site logo incorporates one of the most iconic Valencian food products, the orange. A corresponding color palette, font set, and favicon[6] were compiled to integrate the brand identity throughout the site, see Figure 5.7.

Figure5.7 Styles chosen for the alimentaValencia brand identity.

Style implementation

An important factor in choosing the K2 theme was its built-in support of customized Cascading Style Sheets (CSS). CSS became a W3C standard for style specification in 1996. By attaching style sheets to structured web documents (HTML or XML), designers can control the display of page elements. Style sheets are stored separately from the documents themselves and called through a tag in the document header. This allows designers to reuse CSS and apply site-wide changes through a single edition. In comparison to inline HTML or XML styles, CSS require significantly less storage space on the server and allow pages to load more quickly (McFarland, 2007).

A special stylesheet was created for the Farm2.0 system that implements the colors and fonts described above. This stylesheet was uploaded to the server and K2 theme settings were changed through the administration interface that instructed the theme to override its default styles with the custom stylesheet. CSS is built to accommodate multiple style sheets in this manner, and applies styles according to the the inheritance rules and override rules documented in its specification[7]. On certain pages in Farm2.0, the GeoMashup, TDO Mini Forms, Collapsing Categories, and GD Star Rating also

6 A favicon is a small icon that appears in the browser's address bar and bookmark menu.
7 http://www.w3.org/Style/CSS/#specs .

take precedence over default K2 styles. Figure 5.8 illustrates the effect of the system's themes and styles.

Figure 5.8 Custom themes and CSS are used to control page layout and element styles in Farm2.0.

Adding photographs

Research into the marketing of quality food products propose that promotional materials should emphasize both the extrinsic attributes of a product - craft, origin, and brand - as well as its intrinsic qualities such as tastes, appearance, and aroma (Hervieu, 2007; Briz, 2007). In Farm2.0, the alimentaValencia brand identity and information about quality labels on the start page reinforce the products' brand attribute. Craft, in the form of production techniques, are presented in the textual descriptions of each product on its page. Finally, origin is conveyed through the use of maps to provide a geographic context for production.

However intrinsic qualities present a slightly more difficult challenge. Taste and aroma are not easily conveyed online, though recipes do help to emphasize taste characteristics. It is necessary, therefore, to ensure that product appearance is leveraged to its full promotional potential. The use of digital photos would seem to be the obvious way to accomplish this, yet professional photography can be quite costly, and stock photography sources are unlikely to have images of all our regional products. Luckily, the Flickr photo-sharing site has a sizable repository of images under Creative Commons[8] licenses. We were able to find rich professional-quality images of our products for display on the site. If available, images that were used that showed the products in cultivation, as this reveals aspects of cultural and natural origin that are not normally visible to urban consumers.

Unfortunately, majority of quality photographs available were for non-commercial use. Effectively, if the alimentaValencia site were actually to be implemented, the photographers would have to be contacted directly and as asked permission to use their work for this purpose. In the case that this permission were denied, it would be necessary to find another image resource. At the time of this writing, the site remains an educational venture. Attribution is visible on all images, with a link to the author's Flickr photo page and to the Creative Commons license. An example of this display is shown in Figure 5.9.

8 Creative Commons is a non-profit organization that provides free licenses and legal tools to help content creators share their content while retaining any rights that the require: http://creativecommons.org/about/.

Figure 5.9 An image used, with attribution, from the Flickr Creative Commons repository.

Users are also able to upload photographs with their post content. The TDO Mini Forms plugin automatically generates a thumbnail image and records its URI path in the database. The image is then called with a PHP tag in the single post template.

Custom map icons

Web mapping has redefined many cartographic paradigms including icon symbology. In their book, *Web Cartography: Developments and Prospects*, Menno-Jan Kraak and Allan Brown include a discussion of map icons in online maps. They recommend the use of pictorial symbols for map icons but insist that the symbols must relate to real world objects with which the user is familiar. Noting the lower resolution afforded in an online environment, they also suggest that web map icons should be larger than their paper counterparts. Lastly, they point to the use of shadows to make the symbols stand out from the base map layer and invite the user to click on them (Kraak, 2001).

With these considerations in mind, a set of custom symbols was created for the alimentaValencia site. Using Adobe Photoshop, symbols were created for each PDO/PGI product, vendors, and informal sales. A symbol for recipes was produced later by modifying a free stock icon available online.[9] To produce shadows for the icons, Shadowmaker[10] a free online service was used. This application allows users to upload their icon images, and it automatically generates a sheared grayscale image for download. The custom javascript file in the GeoMashup plugin was then modified with functions from the Google Maps API to render the custom icons on the map. The resulting effect is shown in Figure 5.10, while a complete view of the icon set is available in Appendix A6.

Figure 5.10 Custom map symbols appear in the Farm2.0 web map.

9 http://www.iconspedia.com/icon/pan-764.html.
10 http://www.cycloloco.com/shadowmaker/.

Additional icons

Recognizing the proliferation of standard icons online, we chose to implement several additional icons in the Farm2.0 system. The most familiar is the RSS feed icon, which has become commonplace on many websites. Most web users will recognize the icon instantly and know that they can click on it to subscribe to a site's RSS feed. Since Farm2.0 is GeoRSS, we couple the icon with a textual label that alerts users to this extra functionality. Along the same lines, the GeoTag icon is also being adopted by many sites to denote geotagged content. The GeoMashup plugin automatically places the GeoTag icon in single post maps. A third icon we have used is the Flickr logo, also familiar to many web users. We have combined the logo with text to create buttons that turn on and off the geotagged Flickr photo layers in our map. These additional icons are shown in figure 5.11.

Figure 5.11 Additional icons were included to alert users to familiar functionalities.

6 Implementation and extensibility

This chapter provides an assessment of the requirements that would be necessary to implement the Farm2.0 alimentaValencia site in the Valencian Community. Subsequently, we will discuss the possibilities for extensibility in additional regions and for other content types.

6.1 Implementation requirements

As it stands, the Farm2.0 system is not technically ready to be deployed without modifications to the custom style sheets. While the site appears as expected in Safari, Firefox, Chrome, and Camino, browsers that are relatively compliant with W3C CSS standards. Internet Explorer, on the other hand, has several significant bugs in CSS rendering that can affect page layout (McFarland, 2007). Although the percentage of web users utilizing Internet Explorer has steadily decreased in the past several years, the browser is still used by nearly half of web users worldwide (w3schools, 2009). It would be essential, therefore, to revise Farm2.0's custom CSS before deployment.

Apart from this, the site is fully functional. It has been tested in its current state to debug plugin settings and template modifications. Several users have registered and contributed recipes and vendor locations, and the system has behaved as intended. The only issues that remain to be worked out apply to the existing content on the product pages of the site.

Due to time constraints, only 12 of the 17 product pages were made. This is a simple issue to address, for a page template has already been made and only the text content remains to be written. However, as discussed in Section 5.5, the use of Creative Commons Flickr photos might be problematic. If an agreement could not be made with the photographers, it is possible that the regulatory councils might have their own photographs to use.

Web-hosting

The entire site exists as a MySQL database and files on a web server at the moment. Database content can be easily exported for transfer to another database. Similarly, it should pose no great challenge to transfer contents from the Wordpress folders to another host. The new host would need to have a MySQL database, version 4.0 or greater, and a server that implements PHP version 4.3 or greater.

Cooperative management

An administrator, preferably with some web development experience would be necessary for implementation. The administrator could create user roles for individual regulatory councils, allowing them to edit content on their product page and moderate comments. The ability to create private posts that are only visible to certain user roles might prove helpful for facilitating communication between the various non-public user roles.

6.2 Extensibility

Extensibility of the Farm2.0 system was a significant objective of this project, and the overall system is indeed extensible. Requirements for extensibility are listed below.

In other Spanish communities

The Farm2.0 system could be implemented in additional Spanish regions providing that a few modifications are made. Another community would have to create new subcategories under the product parent category. This is easily accomplished from the Wordpress administrative interface. It would also be necessary to make new product pages to describe products from that region. As mentioned above, this is simply a matter of filling in an existing template.

A different logo and favicon should be created, and if desired, a new color palette and set of fonts should be chosen as well. These styles could be applied to the custom stylesheet and they would be instantly applied site-wide. It would also be preferable to have a new icon set produced, though the

GeoMashup plugin does supply different colored map markers for specific categories should that pose a problem.

The custom javascript for the GeoMashup plugin would need to be modified to reflect new category names and icon image URLs. If the number of PDO/PGI products in the community were to exceed 17[1], it would be necessary to modify the CSS styles on the map page so that the legend could accommodate more icons. Alternatively, an additional level could be added to the category hierarchy so that similar products (Andalucia, for instance, has 16 wine labels and 11 olive oil labels) products could be assigned the same map icon. Finally, the TDO Mini Forms settings, accessible from the administrative panel, would need to be changed to reflect the new category types.

Cumulatively, these modifications should take an experienced developer less than a day to implement. Afterward, the hosting and administrative requirements would match those described above for the alimentaValencia site.

Further applications

The special suite of plugins and templates integrated into the Farm2.0 system have made it an effective GeoCMS. It is not necessary, therefore, to limit potential applications to the promotion of Spanish agricultural products. The system as it is could readily handle other user-generated text and photo content, and further modifications would enable it to manage video or sound clips. Though "Farm2.0" might be misleading name for a platform used by a heavy-metal web portal to manage geotagged songs and concert videos, the possibilities for applications of the system is quite broad.

1 Andalucia, Castilla la Mancha, Castilly y Leon, Cataluña, and Galicia all have over 20 registered PDO/PGI products.

7 Conclusion

In this closing chapter, we will review the initial objectives of our work and assess the extent that they have been met. Subsequently we will suggest future work to improve the system.

7.1 Discussion of results

The fundamental goals of the Farm2.0 system were to provide online information about the meaning of PDO and PGI labels, educate consumers about the natural and cultural contexts of production for each product, and allow users to locate retailers where products may be purchased. These goals have all been met.

The technical goals begin with the requirement that the system be implemented with free and open-source software. With the exception of the commercial software used to create logos and icons, the Farm2.0 system uses the Wordpress publishing platform, a free theme and free plugins that are available for download under a General Public License, and the Google Maps and Flickr APIs. Beyond the technologies themselves, extensive support was provided by various user-bases including the Wordpress, K2, TDO Mini Form, and Google Maps API forums, along with the GeoMashup mailing list. The ability to achieve our results through these innovative technologies and social networks should be viewed as a testament to the open-source movement.

The remaining technical goals have also been satisfied. Using the Farm2.0 system, employees with minimal technical skills in dispersed organizations can easily manage content. Registered site visitors are able to produce site content and georeference it through a user-friendly interface. The content is visualized through an interactive web map and available for reuse in several standard geocontent formats.

The project was not without its shortcomings, however. The Internet Explorer browser incompatibility and legal issues surrounding the use of Flickr photos are significant drawbacks to the system as it currently stands. These challenges are by no means insurmountable, but the do need to be addressed for the Farm2.0 to be considered fully successful.

7.2 Future work

There are several unimplemented functionalities that we think would greatly enhance the system. To begin with, the potential of a Farm2.0 folksonomy is not fully realized. Users are only able to tag their own content as they create it, and user-generated tags are not utilized by the current content search and browsing interfaces. It would be ideal to allow any registered user to add tags to any post content and to provide a tag-based browsing interface.

Similarly, the star ratings that are awarded by users could be incorporated into content browsing or utilized to generate a sidebar list of the most highly-rated posts. Additionally, the Collapsing Category plugin could be modified so that multiple instances of the plugin could display distinct categories on different pages. This would enable the vendor page to include categorical browsing like that of the recipe page.

Currently, geographic search is only available from the map interface, but it would be preferable to retrieve a text list of the nearest vendors from the vendor page itself. Another geographic functionality that we would like to implement is a KML export option. This can currently be achieved through use of a PHP script created by a GeoMashup user, but the results are unreliable and the export does not sort posts into category layers, nor does it apply custom icons. It should be mentioned that, although we chose to use the standard Google Map base layers in our map, the GeoMashup plugin is currently able to display posts on Google Earth using the GE browser plugin should the user specify that in plugin settings.

Finally, in order to truly mobilize all stakeholders in the Spanish quality label institution, Farm2.0 could incorporate further resources for the rural growers and producers. This need is well-articulated in a study of quality labels in Spanish agro-food systems:

> To move forward from mere 'territorial proximity' to 'organized proximity', it is necessary to network all the rural players in a collective project where local know-how and new externally-transferred knowledge are hybridized. (Sanz Cañada, 2005)

There are certainly a wide variety of tools that could be used to support communication between rural producers. For example, the creators of Wordpress, have developed a complementary software, bbPress[1] which could be installed to extend Farm2.0 with a forum for farmers and manufacturers. This could be used to disseminate news, share advice, and discuss organizational initiatives.

1 http://bbpress.org/.

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Appendix

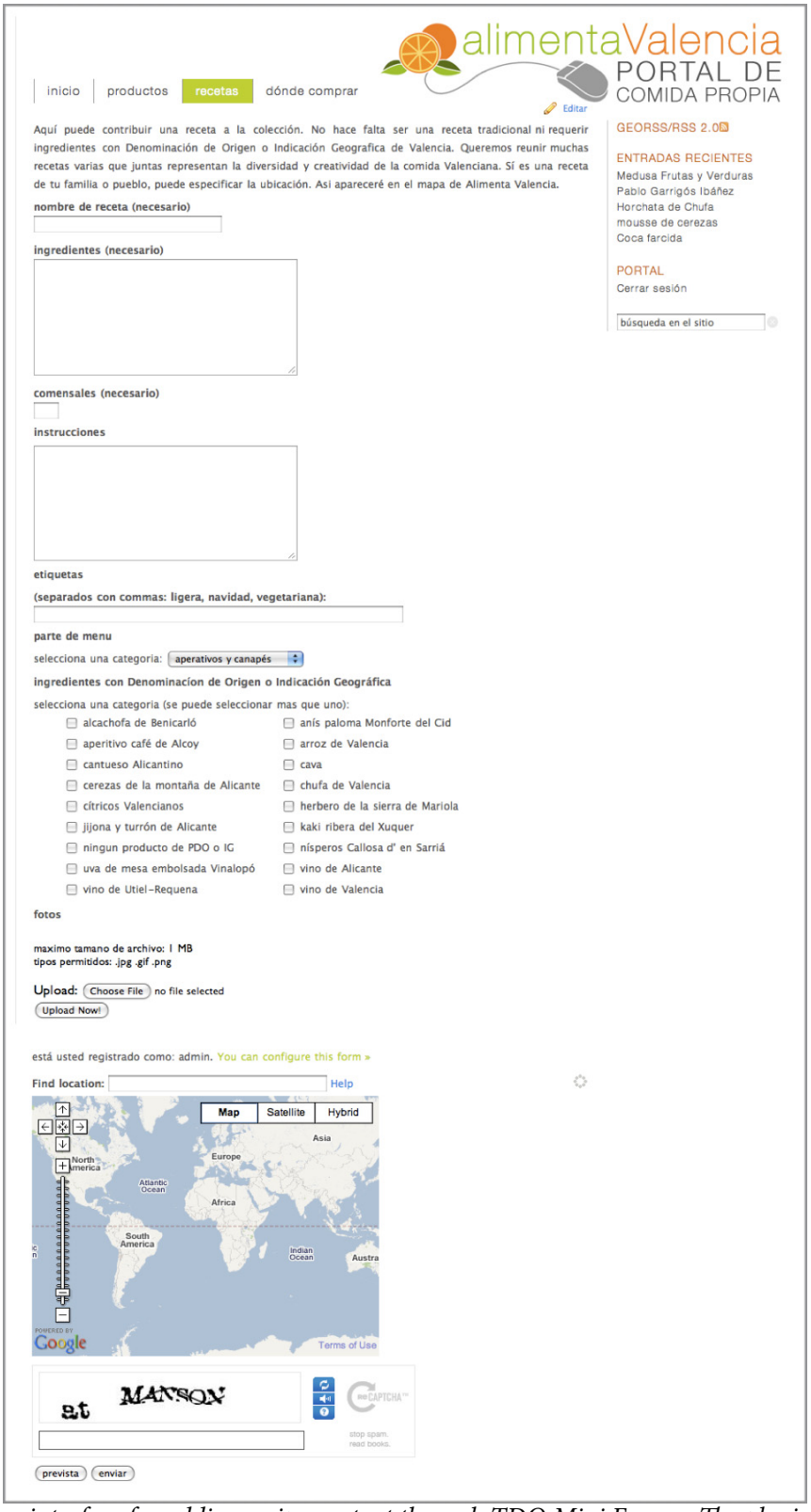

Figure A1 User interface for adding recipe content through TDO Mini Forms. The plugin has category selection widgets and a GeoMashup widget enabled.

Plugin	Description	Download
Askimet 2.2.3	Checks comments against the Akismet web service to see if they look like spam or not. Flagged spam can be reviewed in the administration panel. By Automattic.	akismet.com/download/
Collapsing Categories 0.8.5	Uses javascript to expand and collapse categories. By Rob Felty.	blog.robfelty.com/plugins/
GD Star Rating 1.0.9	Allows set up of a rating system for posts, pages, and comments. By Milan Petrovic.	www.gdstarrating.com/
GeoMashup 1.2beta2	Adds maps to individual posts and allows plotting of posts on global map. By Dylan Kuhn.	code.google.com/p/wordpress-geo-mashup/
MiniMeta Widget 4.0.2	Customizes default Wordpress sidebar widget with login and administrative links. By Daniel Hüsken.	danielhuesken.de/portfolio/minimeta/
Page Category Plus 2.2	Supports the assignment of categories to pages. By Andy Staines.	www.stuff.yellowswordfish.com/page-category-plus
Register Plus 3.5.1	Enhances registration page with custom logo, Captcha and email validation, and more. By Skullbit.	skullbit.com/wordpress-plugin/register-plus/
Role Manager 2.2.3	Provides extended management of user roles and capabilities. By Thomas Schneider.	www.im-web-gefunden.de/wordpress-plugins/role-manager/
Shockingly Simple Favicon 1.7.0	Allows easy specification of custom .ico image to appear in browser bar on site pages. By matias s.	wordpress.org/extend/plugins/shockingly-simple-favicon/
TDO Mini Forms 0.12.6	Creates custom posting forms to allow site visitors to submit posts. Numerous widgets and facilitated form "hacking". By Mark Cunningham.	thedeadone.net/download/tdo-mini-forms-wordpress-plugin/
Wordpress Database Backup 2.2.2	On-demand backup of Wordpress database. Backups can be saved to server, emailed, or downloaded. By Austin Matzko.	www.ilfilosofo.com/blog/wp-db-backup

Figure A2 Details of all plugins used in the Farm2.0 Wordpress site.

Capability	**Administrator**	**Consejo Regulador** *regulatory council employee*	**Colaborador** *registered public user*	**Visitor** *unregistered public user*
install, update & activate plugins				
install, switch, & update themes				
manage categories				
manage options				
create, edit, & delete users				
manage roles				
create & delete pages				
edit own pages				
edit others' pages				
post				
edit own post				
edit others' posts				
upload files				
comment				
moderate comments				
read posts				
rate own post				
rate others' posts (once)				

Figure A3 Farm2.0 roles and capabilities.

Product	Consejo Regulador (Regulator)	Product Type
Alcachofa de Benicarló (artichoke)	D.O.P. Alcachofa de Benicarló	Vegetable
Alicante (wine)	D.O. Alicante	Wine
Anís Paloma Monforte del Cid (anise liqueur)	Bebidas Espirituosas Tradicionales de Alicante	Spirit
Aperitivo Café de Alcoy (coffee liqueur)	Bebidas Espirituosas Tradicionales de Alicante	Spirit
Arroz de Valencia (rice)	D.O.P. Arroz de Valencia	Rice
Cantueso Alicantino (thyme liqueur)	Bebidas Espirituosas Tradicionales de Alicante	Spirit
Cava (sparkling wine)	Denominación Cava (multiple communities)	Wine
Cerezas de la Montaña de Alicante (cherries)	I.G.P Cerezas de la Montaña de Alicante	Fruit
Chufa de Valencia (tiger nut)	D.O.P. Chufa de Valencia	Vegetable
Cítricos Valencianos (citrus)	I.G.P Cítricos Valencianos	Fruit
Herbero de la Sierra de Mariola (herbal digestif)	Bebidas Espirituosas Tradicionales de Alicante	Spirit
Jijona y Turrón de Alicante (nougat)	I.G.P Jijona and Turrón de Alicante	Confection
Kaki Ribera del Xuquer (persimmon)	D.O.P. Kaki Ribera del Xuquer	Fruit
Nísperos Callosa d'en Sarrià (kumquat)	D.O.P. Nísperos Callosa d'en Sarrià	Fruit
Utiel-Requena (wine)	D.O. Utiel-Requena	Wine
Uva de Mesa Embolsada Vinalopó (table grape)	D.O.P. Uva de Mesa Embolsada Vinalopó	Fruit
Valencia (wine)	D.O. Valencia	Wine

Figure A4 Protected Designation of Origen and Protected Geographic Indication food products in Valencia, Spain. Two designations of origin, Castelló and El Terrerazo, both wines, are not represented in the Farm2.0 map. They are not currently managed by centralized regulators, so there is no readily accessible source of information for either product.

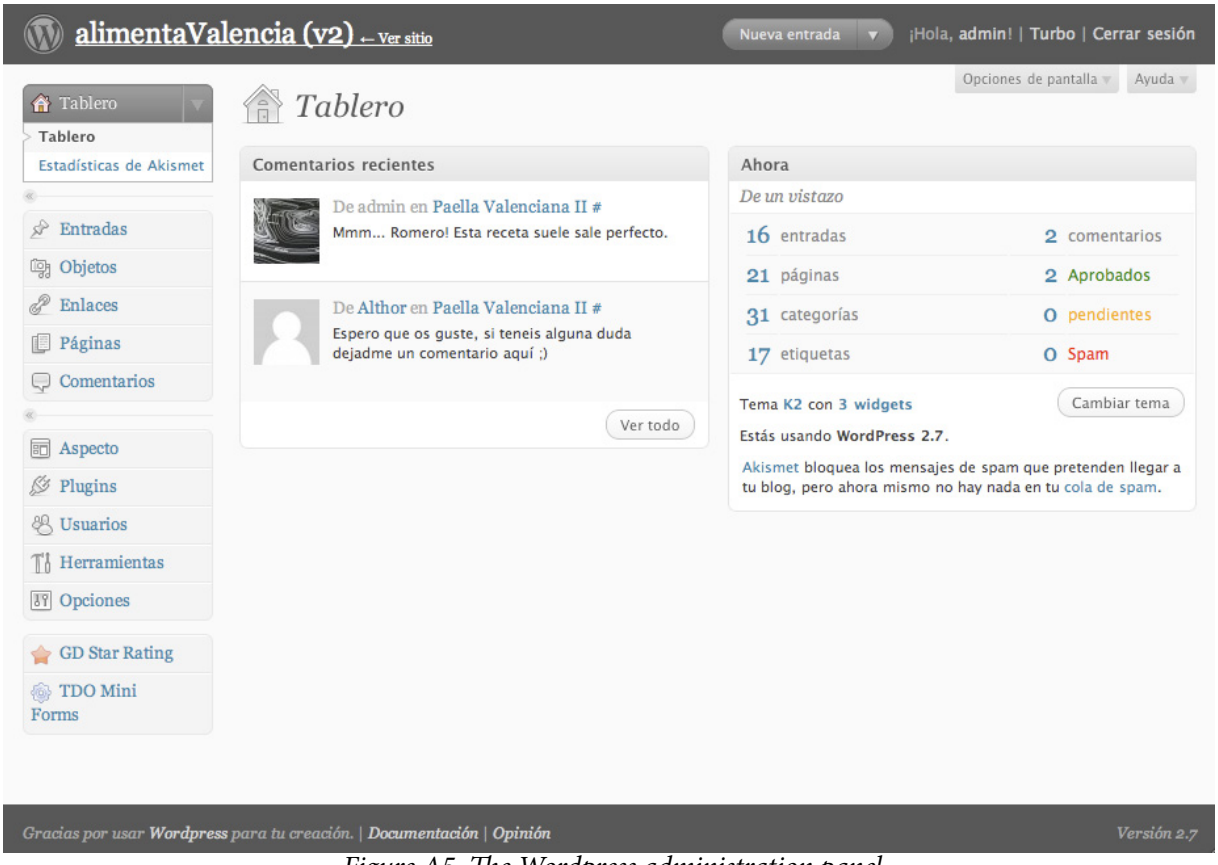

Figure A5 The Wordpress administration panel.

Product	Icon
Alcachofa de Benicarló (artichoke)	
Alicante (wine)	
Anís Paloma Monforte del Cid (anise liqueur)	
Aperitivo Café de Alcoy (coffee liqueur)	
Arroz de Valencia (rice)	
Cantueso Alicantino (thyme liqueur)	
Cava (sparkling wine)	
Cerezas de la Montaña de Alicante (cherries)	
Chufa de Valencia (tiger nut)	

Product	Icon
Cítricos Valencianos (citrus)	
Herbero de la Sierra de Mariola (herbal digestif)	
Jijona y Turrón de Alicante (nougat)	
Kaki Ribera del Xuquer (persimmon)	
Nísperos Callosa d'en Sarrià (kumquat)	
Utiel-Requena (wine)	
Uva de Mesa Embolsada Vinalopó (table grape)	
Valencia (wine)	

Object	Icon
Receta (recipe)	
Tienda (commercial vendor	
Ventos informales (informal vendor or farm)	

Figure A5 *Custom map marker symbols in Farm2.0.*