

ONLINE SYSTEMS FOR INTEGRATING THE SAFETY, STRATEGY, AND STOKE OF BACKCOUNTRY ADVENTURE

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ABSTRACT: The primary focus of avalanche centers is disseminating safety information, guides focus on logistics and client care, retailers and product manufacturers on customers' experience, and backcountry users on their social connections and personal experience; however, there are very few examples that integrate these concepts into one package. Compartmentalizing the focuses does a disservice to the backcountry user's need for a holistic look at their adventure, to ensure a safe, enjoyable, and memorable experience. This paper shares information about the theory and practice of how to integrate multi-faceted information on a website content management system (CMS). The contextual-based system featured in this presentation integrates video, pictures, geo-tagging, route planning, avalanche terrain features, stability tests, avalanche observations, social media, weather, and more. An example of the integration is the use of taxonomy and geo-coordinates to bundle related content on a single website page such as a snow observation with a sidebar of related video and pictures from a different group's enjoyable experience in that same locale. Another example is an avalanche professional not only showing their snow observation results but also providing Global Positioning System (GPS) tracks of their tour route along with annotations on key decisions that lead to that route and ski line. The focus of the paper is on Drupal, a common CMS used by avalanche centers, but the concepts are applicable to other platforms, along with discussion of emerging Software-as-a-Service (SaaS) such as Avatech. We develop and maintain two avalanche center websites, and produce weather and winter recreation information on other websites.

KEYWORDS: technology, multi-media, website, content management system, CMS

1. INTRODUCTION

Like moths to a fire, humans seek to enjoy living and recreating in the mountains. Because we love the mountains so much, we voluntarily enter the danger zone of avalanche risk. Were it not for this impulse, avalanche centers and snow safety information would be largely unnecessary.

We seek out winter adventures for a variety of reasons. Planning and attention to safety are an integral part of the process for most. Several entities serve the backcountry user, each with a different mission. The primary focus of avalanche centers is disseminating safety information, guides focus on logistics and client care, and retailers and product manufacturers on customers' experience. There are very few examples that integrate these concepts into one package. Planning, implementing, and reflecting on the winter recreation experience is a systematic process.

This, combined with the importance of enjoying the moment, is a holistic endeavor that is part of the human experience of backcountry adventure. Compartmentalizing the focuses does a disservice to the backcountry user's need for a holistic look at their adventure, to ensure a safe, enjoyable, and memorable experience.

In this paper we share our ideas and application of concepts to better integrate a variety of informational objectives in a single online venue.

2. CONTENT MANAGEMENT SYSTEMS

A content management system (CMS), "is used to manage and control a large, dynamic collection of Web material (HTML documents and their associated images). A [Web Content Management System (WCMS)] facilitates content creation, content control, editing, and many essential Web maintenance functions. Usually the software provides authoring (and other) tools designed to allow users with little or no knowledge of programming languages or markup languages to create and manage content with relative ease of use" (*Wikipedia*, s.v. "Content Management

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System"). The most recognized CMS are Drupal, WordPress, and Joomla (Bantam 2011). These rely on communities of developers that produce code, troubleshoot, and authorize finished products for public release and updates.

These systems are open-source (OSS); their code is freely made available, and can be modified and redistributed (St. Laurent 2004). OSS makes it easier for developers and users to harness the power of the system, yet customize it for every distinctive need. More importantly, OSS is typically backed by a large group of developers and experts who can troubleshoot errors and provide support, leaving the end-user not feeling abandoned, or having to pay a cost to resolve an issue.

Software-as-a-Service (SaaS) is a subscription-based software that updates automatically, can be used on any operating system (OS), and are typically cloud computing-based products that are hosted on a central server (Wohl 2008). Social media like Facebook, Instagram and Twitter are SaaS examples. All three offer targeted users a platform to add and share a variety of information and media.

Key to the reason for CMS is the ability to control information and users. The system allows for control of who sees data and who can submit data, along with the interaction of these two factors. Information security and privilege control are why CMS exists. Another key reason for CMS is the ability keep a database of information that can be presented in a variety of ways.

2.1 Modules

Plugins are integral building blocks for a dynamic CMS. These are scripts of code to add to the core system. Drupal (wwwDrupal.org) calls these "modules." An example of a common Drupal module is Views, which allows for table and grid displays of data. Another example is Emfield, which accommodates videos from sites like Vimeo or YouTube for a seamless embed of a player and thumbnail images. Most Drupal websites have dozens of modules installed to give it the functionality needed for their emphases.

2.2 Mobile

At the inception of avalanche-related websites, mobile devices like smartphones and tablets did not exist. However, the recent widespread availability and access to mobile platforms have put pressure on avalanche centers to offer their

websites in a mobile-friendly format—whether as a separate site, or just one responsive design.

3. AVALANCHE CENTER WEBSITES

We conducted a study of CMS uses at 23 agency and non-agency avalanche centers in the United States. Most have adopted CMS for their interface with the public. While most centers use widely-known CMS, there are a few that do not, or use less-popular systems. Statistics are presented below (Tbl. 1):

Tbl. 1: Websites in U. S. Avalanche Centers

Type of Platform	Total
Drupal	10 (43.5%)
WordPress	7 (30.4%)
Custom	4 (17.3%)
Django	1 (4.4%)
Joomla	1 (4.4%)

3.1 Recent Models

The Wallowa Avalanche Center (www.WallowaAvalancheCenter.org) in Joseph, Oregon is a fledgling organization that adopted the Drupal CMS to interface with the public. Similarly, the Central Oregon Avalanche Association (www.COAValanche.org) in Bend, Oregon runs its system on Drupal. These were adopted for consistency with many other centers using Drupal at the time.

Drupal is a powerful, yet complex system for managing users and data. It runs on the industry-reliable Linux Apache MySQL PHP (LAMP) stack. It allows for both anonymous and account-based information to be submitted by organization-employed users with special privileges. The complexity of Drupal makes it difficult to manage by a single person at an avalanche center. The benefit is that the Drupal-based site can present diverse avalanche data, such as weather station displays, geographic representation of user-reports, tables that organize data, and much more. The aforementioned avalanche centers have demonstrated how small organizations with limited staff and funding used a powerful CMS to exponentially grow a national and international audience using a website as the primary engagement with the public.

The reason these two centers are identified, is because we have developed the recent websites for both organizations and several of the concepts in this paper are seen successfully in action on

their websites. Other concepts have also been piloted on our websites, namely the Snow Project displayed on the La Grande Ride website (www.LaGrandeRide.com/snow).

4. METHOD

There are several elements of the Drupal CMS that, synchronously working together, create a robust interface for the end-user. Several functions are identified in this section for improving the safety, strategy, and stoke for backcountry adventures.

4.1 Webpage

A webpage in a CMS takes different elements of the database, and compiles them into a visual display for the audience. These elements operate on a coded template that the web browser decodes for the display. Cascade Style Sheets (CSS), or simply "stylesheets," help give it the desired look.

In Drupal, the page is called a "node." These nodes have several fields (e.g. author, temperature, location, type of avalanche). In addition to the main content, sidebars and other elements can be added that have a site-wide display. Drupal calls these "blocks." For example, you can have a block with text or images that only shows on certain pages by using contextual references. In this example, it could be a pro observer that is "powered by" a specific sponsor. The block would automatically show the sponsor logo on any observation page that is authored by the sponsor's respective observer.

Another example would be to have a media feature that shows only on a page that is labeled with a certain taxonomy term. Perhaps a video about "Bear Valley" should show alongside an observation about "Bear Valley." Other elements tagged "Bear Valley" could also be represented on that page. You may also want a customized way of displaying other content that a user has created, like a list of their recent observations. The Views module can be employed to display this type of information in a block, also using contexts to filter out irrelevant data.

4.2 Taxonomy

A taxonomy is a scheme of classifications. The use of taxonomy in Drupal allows an author to "tag" content with specific terms. For example, a snow observation report for Breckenridge could be tagged with several terms like, "Peak 8, Sawmill

Gulch, Breckenridge." Additional taxonomy types can be created to better categorize information. Keywords could be an open free-tagging system, while you may also have a standalone category consisting of a predefined list of terms such as modes of travel (e.g. snowmobile, ski). These distinctions not only allow for clustering of related content but it also leverages control for website administrators to display applicable content based on context. When combining taxonomies with views or blocks, seemingly limitless combinations of information can be provided to better make sense of the data in the system.

4.3 Geo-coordinates

Information can also be affiliated with locations in the CMS. We see this commonly used at avalanche centers for observations, whereby the latitude and longitude coordinates for their observation are displayed as a marker on a map so the user understands where the information was obtained. However, often there are other types of information that pertain to different coordinates on the same outing. Additional markers can be allowed in the data entry form to display things like multiple snowpit and stability tests, avalanche start zones, injury incidents, and other geo-tagged annotations. Once in the database, the points can be utilized for display on comprehensive interactive maps.

Photos and videos taken during a backcountry adventure are important for both stoke and documentation. Knowing where the photo took place is valuable. Using a GPS-enabled camera allows for the coordinates to be attached to the photo. Coordinates can then be saved, stored, and displayed on maps using the CMS.

4.4 Global Positioning System (GPS) Tracks

GPS-enabled devices have become increasingly ubiquitous in use. Any device capable of recording, storing, and offloading GPS data can be used in a backcountry adventure. Sather (2014) outlines the use of GPS systems relative to recreation. After collecting data from a physical GPS device, data is uploaded to the Drupal CMS. At this point, it can be displayed or manipulated in several ways. Most prominently is a mapping application that shows a user's GPS route, or track (see Section 4.5). Other statistical information is gleaned from the data such as elevation gain or loss, average altitude, maximum elevation, and distance.

4.5 Maps

A plethora of recreation and backcountry data can be placed onto interactive online maps with an application programming interface (API) authorization provided by Google or other mapping products. Drupal-based modules assist with the mapping and geo-coordinate usage on websites. We have developed custom-programmed maps for the LaGrandeRide.com and other projects that also integrate with the Drupal system for avalanche center websites (see Fig. 1).

The versatility of maps allows the ability to add any variety of markers (waypoints) and polylines (tracks). The Google Maps API supports custom “tiles.” Tiles are 256 by 256 pixel images that make-up the terrain, street, or hybrid overlays one sees when looking at a map. Again, in the LaGrandeRide.com example, custom tiles are used to show higher resolution terrain. While Google is the primarily used mapping API, Esri GIS and others are also available for many mapping projects.

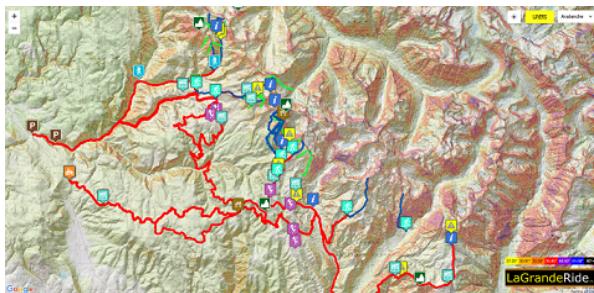


Fig. 1: Example of an external mapping application that is powered by the Drupal CMS database.

4.6 Media

There are very few better ways to share the stoke of a backcountry adventure than taking some photos or a video. Using Drupal lets content authors upload photos and link to their videos posted to Vimeo, Facebook, YouTube, and so forth. Combining this with taxonomies, maps, or geo-coordinates gives a more versatile media feature within the site.

4.7 Other features

Because Drupal is an OSS, there are almost an unlimited number of features to offer website visitors. Snowpit observations are standard snow safety tests that are created electronically using programs like Avatech’s snowpit editor, SnowPilot, or Microsoft PowerPoint to present the diagrams. LaGrandeRide.com and Wallowa Avalanche

Center utilized the first snowpit SaaS, called the Online Snow Layer Displayer (OSLD). This platform, using Drupal CMS for input and database management, allowed observers to enter in relative snow information that would compile and display a plot within the website page display.

Weather information is of paramount importance to snow safety. Through the use of Drupal CMS, we have implemented multiple features to include, store, archive, and preview important weather data feeds including stations owned and managed by the avalanche center.

5. RESULT

Like pieces of a puzzle, the code, modules, and information combine to form an intelligible online interface that the public interacts with from their various devices. While the information is most important, an intelligible design is essential to guide the audience to the right information. Fig. 2 provides a screenshot of an intentional strategy to present information in a simple and clean way, that is also mobile friendly.

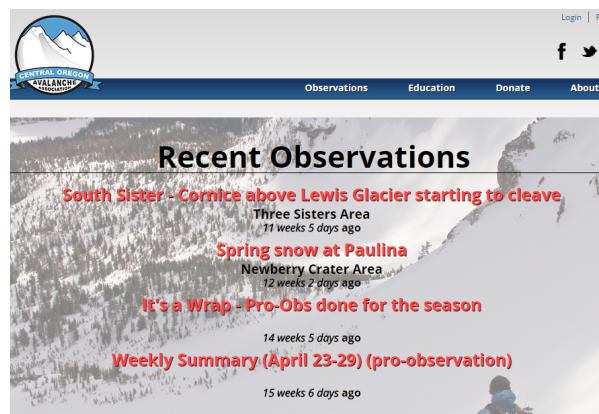


Fig. 2: The Central Oregon Avalanche Center website provides important information up front in an appealing design.

Fig. 3 showcases how we have combined modules, styles, blocks, nodes, and other elements to create an inviting display that offers crucial information to the public. In this particular example, a podcast covering snowmobiling and cornices is prominent on the front page for website viewers to engage with immediately.

Also in Fig. 3, the recently issued proprietary weather forecast by *LG Weather* (www.LGweather.com) is displayed at the top right for a user’s quick glance. On the right, a sidebar

with a block shows the latest tweets posted by various pre-determined content creators.

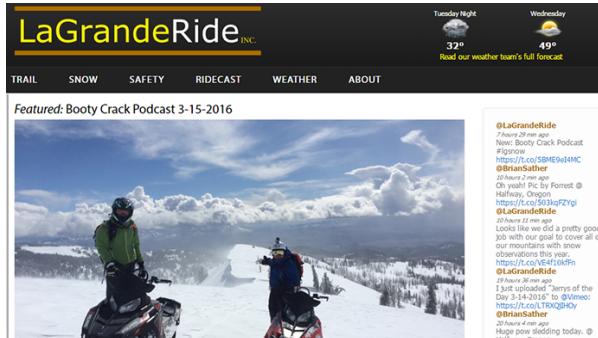


Fig. 3: The LaGrandeRide.com website exhibits concepts of integrating safety, strategy, and stoke of backcountry adventures.

5.1 Information

Data-rich presentations of information are pulled from the database for themed displays. These presentations can be done with a few different options. Most commonly, Views are used by website administrators to set up tables, grids, lists, or other tabular displays of information. In Fig. 4, a table-styled view lists recent snow observations. The columns include date, time, report title, links, observer qualifications, and more.

Feb 26, 2016 8:40 PM	Grateful Ridge Naturals
Feb 25, 2016 1:37 PM	Dixie Butte 2-24 (Pro Ob)
Feb 23, 2016 2:50 PM	Big Sheep (Pro Ob)
Feb 19, 2016 7:03 PM	Wind slab developing in Angell E
Feb 18, 2016 7:51 PM	Wing Ridge (Pro Ob)
Feb 18, 2016 6:54 PM	Thursday 02/18/16 Quickie Repor
Feb 16, 2016 7:30 AM	AIARE L1 -Wing Ridge (Pro Ob)
Feb 14, 2016 7:00 PM	Sunday 02/14/16 Quickie Report I
Feb 7, 2016 11:22 PM	Super Bluebird Sunday
Feb 6, 2016 8:23 PM	Getting the runs on Mule Peak
Feb 5, 2016 9:24 PM	Blue-grav Gnatcatcher Day on Mu

Fig. 3: A View in Drupal showing a list of all recent observations; includes columns designated by website administrators.

In the avalanche community, weather data is important for scientists, observers, and the public. Geographical displays of weather information are a nice way to bring real-time conditions to users, with the associated location so they have a better understand of the data (Fig. 5). These data feeds

have proven to be some of the most accessed features on our websites.

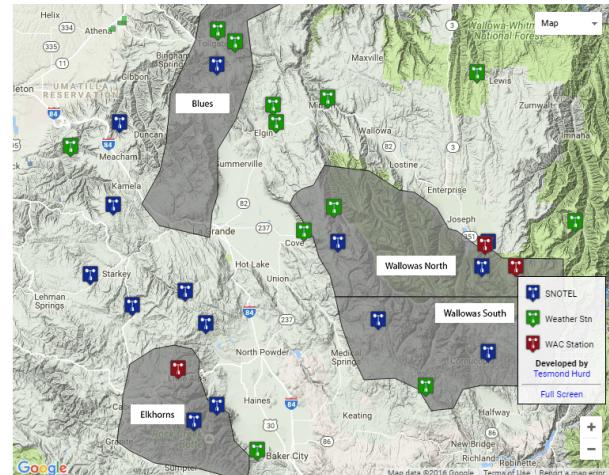


Fig. 5: A map of various weather stations in the region specific to the Wallowa Avalanche Center's area of interest.

5.2 Strategy

Planning is an important part of the safety message and the Drupal system can be a very helpful adventure strategy tool. Recommended route plans developed on the Drupal system have powerful features and benefits. In turn, these can be featured alongside snow reports using associations such as taxonomy or geo-coordinates. Fig. 6 demonstrates related recent observations alongside a written guide for accessing a backcountry ski location.

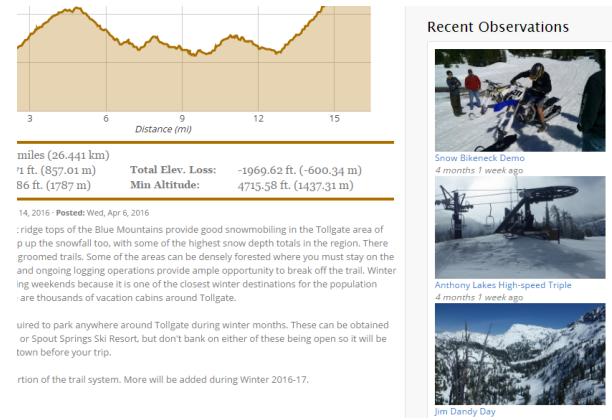


Fig. 6: A route planning guide with recent snow observations that pertain to it.

Special planning elements should be integrated into the textual or graphical display, such as avalanche shading, recent avalanche activity, dangerous terrain traps, and so forth. When

professionals go out on a field report, it will be helpful to show their route choices, so that others may mimic model examples (see Fig. 7).



Fig. 7: A mapping application that shows a ski tour approach, ski lines, and avalanche slope shading, recent observations, and a caution marker indicating prior avalanche activity.

Annotations can also be provided using the Drupal CMS, whereby a professional observer can place a marker on the map and note why they chose a certain course at the crux of a route (see Fig. 8). This could be in the form of an audio, text, or video annotation.



Fig. 8: Various markers on a map denote different information. A media marker, shown with the pop-up window, allowing users to watch videos or listen to audio.

When employees are out in the field, a CMS should be used for documentation and safety. This is also helpful as an operating procedure for liability reasons. A route planning form should be submitted online in advance so others may monitor their progress. For example, an observer files a route plan before going out for their regular observation. On the form, they include information like start time, intended destination, alternate routes, link to Spot or Delorme live tracking, emergency contact, names of others in party,

estimated finish time, and more. This can trigger an email or other notification to designated avalanche center officials so they can monitor their progress or communicate as needed using cell phone or amateur (ham) radio (see Stebbings and Pridmore-Brown 2013). The loop is closed when the party is safely home and someone changes their status in the system. We have been successfully involved in practices like this with our local avalanche centers.

5.3 Stoke

The message should go beyond the safety information and strategy. Users identify with the fun elements, especially a ski culture that is rich in “gnar-ism” and hyperbole. Facebook, Twitter, and Instagram are common current platforms used for sharing within this culture (Isaac 2013). Media features can highlight the fun that results from a well-executed safety plan during green light conditions (Fig. 9).

s point is not only illegal, but also pops you out under a ridge with a lot of snow above you and finger that you don't want to be rumbling under.

e to Medical Springs and up Big Creek and sled on a different road into Main Eagle. The zoomed trails and is relatively mellow the entire way.

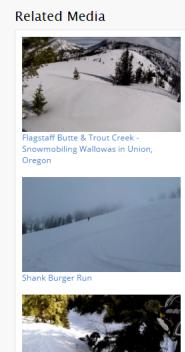


Fig. 9: A sidebar block with relevant media content related to the main content.

With the Drupal system, a photo tagged with a certain element can accompany a report (see Fig. 9). Additionally, through modules and feeds, social media should be integrated co-actively between Drupal and the originating social media platforms (see Fig. 10). The presentation and sharing of this information fulfills the safety, stoke, and strategy concepts presented in this paper.

Snow Feed

@LaGrandeRide

3 months 2 weeks ago

I just uploaded "Flagstaff Butte & Trout Creek - Snowmobiling Wallows in Union, Oregon" to [@Vimeo](#):

Fig. 10: An example of a Twitter feed integrated into Drupal, and displayed on a site.

6. DISCUSSION

All of the aforementioned elements are important in the process of backcountry travel. The Deming Cycle coined the Plan, Do, Check, Act (PDCA) process of managerial control (Deming 2000; Moen and Norman 2010) and these are basically the elements presented here, except in this case we will call it "Adventure Control." Too commonly, avalanche centers focus solely on snow information: the plan (advisory) and check (observations). How can the message better identify with the audience in a more comprehensive way? We want to experience adventure in a safe, fun, and controlled way and a CMS is a method that can organize and control this cycle. The CMS can associate and feature the stoke (the "do"), more detailed route strategy (plan), crowd-sourced field reports (check), and more. The synthesis of this information provides a more complete picture of backcountry adventure, with which we can examine what needs improvement. This is where we "act" as part of the control process, by adjusting our plans as needed to improve safety and enjoyment. Thus, the winter backcountry *Adventure Control Cycle* is Plan, Stoke, Observe, and Correct.

The end-game advantage of presenting a more holistic presentation of information is a more practical experience for the user, who after all is a whole person. A multi-faceted approach to information presentation avoids the pitfalls of an overly specific focus that is devoid of contextual references. A good analogy of holism is a weather forecasting center, which not only provides forecasts, but also information on storm chasing, user reports, live radar, weather station data, webcam streams, and other comprehensive information that affects people's daily lives.

Compartmentalized information on different internet venues yields a narrow focus that ignores the needs of a whole person. For example, a user that watches only big mountain ski clips on a YouTube channel would only see the skiing, without all the steps that go into the safety of the skier. This gives a false sense of reality and may prompt the user to recklessly and spontaneously charge big ski lines. A more balanced approach is to show a 360-degree view of an adventure that provides more information perspectives to improve one's knowledge of and motivation to experience adventure.

On the down-side, the CMS also becomes useful in the grieving process when fatalities and injuries happen. The same processes that also help us

enjoy adventure are used to share in the celebration of life when loved ones are lost in the mountains. Details are documented on mistakes that contributed to tragedies to help the community learn from and make sense of what has happened.

6.1 Other Examples

The implementation of concepts provided in this paper are becoming increasingly ubiquitous in many sectors. There are far too many examples to cover thoroughly here, but we will share a few.

Avatech (www.Avatech.com) was newcomer to the avalanche scene with a web-based snowpit editor, reports, and route planning for the 2015-16 season. Just recently they have started a limited launch of Mountain Hub, a more integrated approach that is in line with the comprehensiveness we are recommending in this paper. At the time of our manuscript preparation, these elements are too new to discuss in action. Hopefully they successfully realize the concepts and we can count on the longevity of this platform and data as an ongoing public resource.

The Powder Project (www.PowderProject.com) also uses crowd-sourcing to gather information with a focus on route planning, ski lines, and written guides for accessing the backcountry for ski touring. Destinations are mapped, reviewed for their difficulty, and feature several geo-tagged pictures.

6.2 Sporting Goods Industry

Sporting goods manufactures like Scott, Dynafit, and others highlight the fun people have with their products. They also use web systems to integrate media and other information for the public as value-added and ethical responsibility associated with their products. This past season, snow sports manufacturers Salomon and Atomic of the Amer Sports Corporation launched an online tutorial educational system titled Mountain Academy (www.MountainAcademy.salomon.com). This provides an online module-based sequence of media-rich information using a CMS. Backcountry Access (BCA) provides online safety resources that integrate video and other multimedia (see www.backcountryaccess.com/learn-avalanche-safety). Other media rich examples are present at popular sites like Black Diamond TV, Red Bull TV, and YouTube channels. These feature stories, stoke, entertainment, tragedy, safety, and more.

6.3 *Journalism*

Powder Magazine's widely-acclaimed The Human Factor 1.0 (www.powder.com/the-human-factor-1.0) and 2.0 (<http://features.powder.com/human-factor-2.0/chapter-1>) integrates elements of story, safety, and audio in an elegant way that is a good mix of entertainment, information, safety, and the human experience.

7. CONCLUSION

Content management systems have been cooperatively developed by communities of coders. Harnessing systems like this and realizing CMS potential can result in a multi-faceted showcase of information for winter recreation. While there are many cloud-based resources available, the advantages of the open-source Drupal system are its strength and public-ness. With the right developers' skill-set, the concepts provided here can be part of a single website system where a community of contributors provide information-rich content to capture the attention of a diverse audience.

Winter adventure stakeholders should adopt a holistic approach to the information they present to ensure its relevance to the public. With sufficient support, the database can become a valuable resource. This data should be tightly controlled and managed by an unbiased association of trusted and credentialed people. Drupal and other CMS allow for management and control of data like this. The information can later be manifested in different ways as web technology continues to evolve. As the database grows over time, it becomes an increasingly useful historical log and research tool.

CONFLICT OF INTEREST

We co-own La Grande Ride, Inc. (including its weather division, LG Weather) which is contracted for website services by avalanche centers and other recreation information entities. Some of the products discussed in this paper are proprietary developments by La Grande Ride, Inc. We work primarily on a volunteer basis providing a variety of recreation information services free to the public, including information referenced in this paper.

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