

My-Engg.org: A Novel Social Networking and eLearning Solution for Engineering Community

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Abstract— My-Engg.org (My-Engg) is a social networking and eLearning portal for the Engineering community. The goal of My-Engg is to bring together students, teachers, scientists, engineers, experts, and other interested parties by providing a new approach to connect with others in the Engineering community, thereby helping to start collaborations and communication among them. My-Engg connects users via branches and nodes of the hierarchical tree structure of Engineering, where the leaf nodes are the classes associated with the courses which can be dynamically added thus creating a unique, hierarchical based social networking structure by integrating it with novel eLearning methodology. My-Engg users can join at any level of the tree and collaborate with other users interested in these courses. My-Engg is built upon the Drupal open source content management system. This paper discusses My-Engg in detail, its concept and contributions to the Engineering education, its implementation details, and its efforts to become an information hub for all the stakeholders in the Engineering community.

Keywords— My-Engg, Drupal, Social Networking, eLearning, Web 2.0, Engineering, My-Engg hierarchical space-tree

I. INTRODUCTION

My-Engg.org (My-Engg) is a social networking and collaborative eLearning portal for the Engineering community. In an effort to bring together Engineering students, teachers, scientists, engineers, experts, and other interested parties. My-Engg provides a unique mechanism for connecting people within the Engineering community and sparking new communication among them. My-Engg social network is organized into a hierarchical tree that follows the relationships of courses provided in Engineering educational communities. This structure produces a unique social graph connecting users and content in new ways and will function as a primary point of entry for the data assembly and education/outreach initiatives of the Engineering Society. By integrating with new and existing online tools and data repositories, My-Engg is also able to aggregate and connect many resources that are currently scattered around the Internet.

A. My-Engg Hierarchical Space-trees

My-Engg hierarchical tree structure is a branching diagram showing the evolutionary relationships among various parts of Engineering educational society. This branching diagram is called as My-Engg Space-tree. My-Engg Space-tree classifies groups based on various parts of Engineering community in a hierarchical manner. My-Engg connects users via branches and nodes of the hierarchical tree structure of Engineering, where the leaf nodes are the classrooms associated with the course subjects and the non-leaf nodes are just groups. These can be dynamically added thus creating a unique, hierarchical based social networking structure. Each node in a hierarchical tree structure represents education field, branch, course, major, semester, subjects and classroom as you go down the tree. My-Engg hierarchical space-tree structure is according to the VTU syllabus. However it can be modified to suit any other University syllabus. This idea of hierarchical tree structure is picked up from the My-Plant [1] [2] which is part of the iPlant Collaborative [3].

B. ELearning

The tradition Classroom learning model has existed since Centuries. Here, the teacher is supposed to stand in front of a group of students and deliver lectures, leads discussions and evaluates them. In this model, a teacher may only impact students in the immediate classroom. Also students must learn at a fixed time when the teacher teaches.

As against the above, the eLearning refers to using electronic applications and processes to learn. It provides convenience, portability, selection, flexibility, higher retention, greater collaboration and global opportunities and most importantly it is learner-centred as against the traditional model which is instructor-centred.

ELearning is the educational methodology that takes advantage of electronic media and modern information communication and technologies (ICT) in education to address the continuing needs of students [4]. “The use of network technologies to create, fosters, delivers, and facilitates learning, anytime and anywhere is called eLearning” [5].

E-Learning can give students much greater control over their own learning experience while giving teachers an opportunity to further meet the needs of individual students in a digital age [6] [7]. Classroom learning will continue to have an important role to play but as in [8] has identified, "it will be a different role from in the past" and no longer the "default delivery system".

Of late, web-based eLearning systems are gaining popularity, with the advances in internet technology such as E-Tutorial for ArgoUML [9], Virtual-learning system [10] [11], MOOC (Massive open online course) [12]. Being online these systems provide an opportunity to learn any course/subject from any part of the world anytime. E-Learning is helpful in saving of resources in terms of time, money, and paper, etc., that will improve accessibility to course instructors, as well as students. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming and downloadable video and audio, may be with sub-titles in many languages.

C. Social Networking

Modern social media has been enhanced by the development of user-driven, collaborative, and interactive web applications. Social media and social networks have grown to be dominant forces on the web. Although the scientific community has long relied on the Internet to facilitate collaboration and research, this has largely been limited to passive resources such as data and literatures repositories, literature databases such as ACM, IEEE, and Google Scholar and innumerable blogs.

Only recently have education-focused social networking sites become more prevalent. To our knowledge, My-Engg is the first social networking site dedicated to Engineering for the purposes of connecting users and their data with the rest of the community. More importantly, My-Engg is the only social networking site that associates its members with one another according to a hierarchy. An Engineering node-based social network, based on the hierarchical space – tree will provide a useful structure for relationships and communication between groups of students who study these subjects.

Scientists engaged in systematic research often develop subject-specific research interests that will be of interest primarily to others engaged in research on the same subjects. This structure not only permits groups of scientists but also permits groups of educators as well as the students and also engineers and industrialist to communicate and share data only with those who share the same taxonomic interest, while not burdening others who participate in the social network with what they may view as extraneous information.

My-Engg serves as a centrally located, freely accessible resource for users worldwide to collaborate, create, and view content. By developing a web presence for the Engineering domain, My-Engg builds on established social networking technologies to accomplish the goal of making research and

discoveries available to scientists, experts, students, educators, engineers and the general public.

II. MY-ENGG GOALS

My-Engg is an eLearning and social networking community for Engineering students, teachers, scientists, engineers, experts, and other interested parties to share information and research, collaborate, and stay on top of the latest developments in Engineering education.

The purpose of My-Engg is to offer, improve and facilitate a better learning environment for students of Engineering community worldwide by incorporating social networking concepts into eLearning system, thus providing better connectivity and greater amount of flexibility through distance education for engineering society at large.

The primary goal of My-Engg is to provide a robust social networking and eLearning web application that enables those interested in Engineering to associate with others that have similar interests. The communication resources provided My-Engg enhances social networking by email, chat, discussion forums, blogs, polls, contact form, messages, news, calendar, web conference, and groups. This association does not require any a priori knowledge of others that share a user's interest; rather the network actively creates groups of users according to the relationship of their interests. The social network is organized as a hierarchy, such that the connections between interest groups follow the hierarchical tree of Engineering studies. These interest groups are referred to as Classroom at the leaf node and as Engineering Group at the non-leaf node. Users can join any number of Groups and Classes according to their interest. Each user has a news feed that is personalized with posts from Engineering Group they have joined and from their colleagues on My-Engg.

The secondary goal of My-Engg is to provide the community with a mechanism for information collection and sharing. A hierarchy has been established, where content posted to a group is propagated up along the tree. Parent Groups are the aggregation points of information regarding related child groups. The data collected at each node includes images, articles, links, discussion forum, and files concerned with it and its sub-groups. The classroom is the aggregation point for information regarding a related group of Engineering subject. The data collected in each classroom includes description, news, articles, topics, links, discussion forum, assignment, quizzes, resources, grades, and files concerned with the subject lectures by the particular class instructor. As a result of the hierarchical organization of My-Engg, the content is automatically categorized and organized according to the hierarchical tree.

Another goal is to develop My-Engg so that new technologies can be integrated as they emerge both from the technology landscape at large and from within Engineering. Social media technologies and trends evolve rapidly,

necessitating a flexible approach to their integration and use to avoid quickly having an outdated site.

There exists a vast amount of useful sources of information on the Internet for the Engineering society, including in addition to these dedicated science tools, researchers are using other web technologies like YouTube, Google, and Wikipedia to improve collaboration and enhance their research. My-Engg seeks to unify these existing tools and information sources without replicating them or requiring users to duplicate effort or content.

A key component of My-Engg's mission is to develop a robust Education, Outreach and Training (EOT) effort. The goal is to develop cyber-infrastructure that bridges the gap between students, educators, and researchers, thus provide the tools and platform that will help educators and students engage in technological inventions and discovery.

The disadvantage of eLearning is lack of feedback and potentially more frustration, anxiety and confusion. These issues can be solved by incorporating social networking with eLearning concept. Not only that the collaboration between peer learners is enhanced, but also global opportunities and understanding will increase.

In this work we attempt to provide in eLearning, the social networking concept in an innovative way. Here Engineering students, teachers, scientists, engineers, experts, and other stakeholders are brought together providing an innovative approach to connecting with others in the Engineering community. The group structure provided here is a hierarchical tree structure as against flat, where users are connected via branches and nodes, where the leaf nodes are the classrooms associated with the subject which can be dynamically added. Further the interior nodes will be subject, semester, major, course, branch and field as we go up the tree. With each node a manager is associated who can participate as well as moderate the group activity which is below his level. Further only the root manager called "Admin" is authorized to allow for addition of groups and classrooms at various levels in the hierarchical tree i.e., a user has to take permission from the root manager to start a group at a certain point in a tree and a teacher has to take permission from the root manager to start his classroom for a particular subject at a certain point in a tree as the subject's child node. An initial draft of this work is presented in [18].

III. IMPLEMENTATION DETAILS

My-Engg social networking application was developed using open-source and open-API software tools. The Drupal content management system (CMS) [13] and its extensions were used to implement the core application. Other tools used include Apache httpd, MySQL, PHP, HTML, JavaScript, CSS [14], jQuery, Java Script InfoVis Toolkit (JIT) [15], Flash player, Google, and YouTube. The rest of this section discusses requirements analysis and highlights some key

implementation details and the efforts put forth for a successful launch of My-Engg.

A. Requirement Analysis and Design

From the initial stages of development, we discussed with a broad range of Engineering educators, scientists, as well as students develop the core requirements for My-Engg. They were a driving force behind the development of My-Engg and helped to ensure that it included features targeting the needs of the Engineering community.

Based on this feature set and the goals set forth, we identified the major characteristics that the technology should provide: an underlying CMS, social networking capability, extensibility, and a rapid development (RAD) cycle. Table I shows the requirements analysis matrix comparing prospective solutions as evaluated during development phase.

TABLE I
 REQUIREMENT ANALYSIS MATRIX

	CMS	Social Networking	Extensibility	RAD
DASE	◆			
Joomla	◆	◇	◇	◆
Drupal	◆	◇	◆	◆
Wordpress	◇	◆	◇	◆

- ◆ - Does very well
- ◇ - Has the capability
- Does poorly or lacks the capability

My-Engg needed to include a fundamental toolkit of social networking capabilities. These included the ability to form social connections with other users outside of their respective groups in the My-Engg hierarchical tree structure as well as being able to message privately to those users. Each user will have a searchable, personalized profile page that will display information about their My-Engg activity, including group memberships and their social graph, and allow other users to discover and connect with them. Users should also be able to share short status updates like Twitter or Facebook statuses. A unique feature that My-Engg needed was the ability for the group structure to reflect the hierarchical structure of a My-Engg tree. This feature is needed to be supported either natively or should be developed and integrated with the core software.



Fig. 1 System overview of My-Engg.

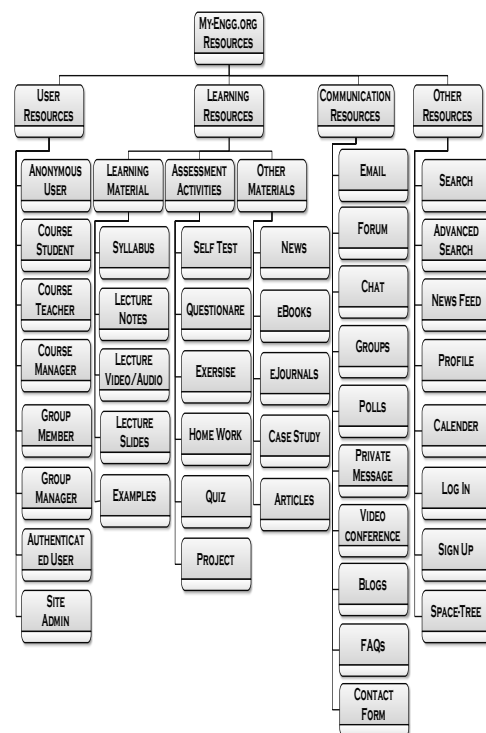


Fig. 3 Component Diagram of My-Engg

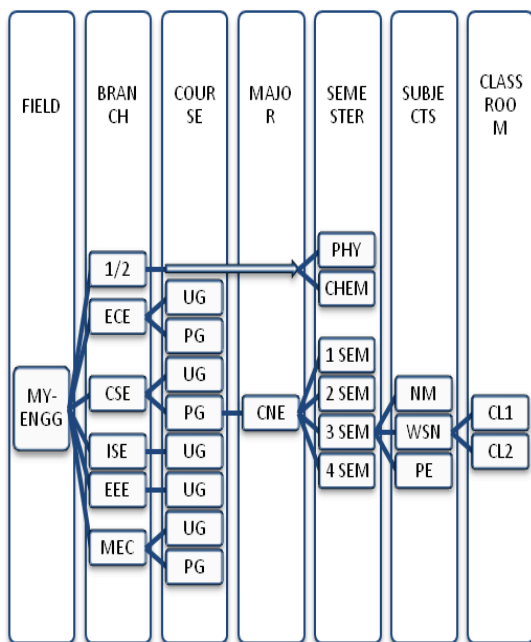


Fig. 2 Structural Diagram of My-Engg

Based on the requirements analysis, the Drupal CMS was selected for implementing My-Engg. In addition to fulfilling our requirements, Drupal also offers a rich library of community developed and supported extensions.

The design consists of system overview (system architecture), structural diagram (project proposal), component diagram (resource diagram), simple and detailed use case diagrams, sequence diagrams, context and level-0 data flow diagrams and decomposition diagram. Edraw was used to prepare the design diagrams. Some of these diagrams are as shown below.

Fig. 1. Shows the System Overview. Fig. 2. Shows the Structural diagram. Fig. 3. Shows the Component Diagram of My-Engg.

B. Drupal modules

Code units in Drupal are called “modules”. Modules partition the functionality of Drupal into logically organized functional groups. Modules exist for core functionality as well as for Drupal extensions. Extension modules can either override default core functionality or add new functionality to the system. Several existing Drupal modules were identified for integration in My-Engg along with the new functionality that would need to be developed. Diligence was used when selecting community modules to ensure that any modules integrated into My-Engg were actively supported and did not have extraneous dependencies.

One community module that was used is Organic Groups (OG) [16]. This module in particular deserves attention because it provides the basic “interest group” and social networking functionality for My-Engg. Much of the rest of the My-Engg functionality, including the hierarchical network structure, was built on top of the OG module. This module facilitates the creation and management of groups within Drupal. It allows users to join groups, post content to those groups, and engage in topical discussion. The OG module and related OG sub modules can dynamically grant permissions to users as they navigate between groups they have joined. The OG module also designates a user or users as “managers” for each group, actively involving the community to maintain and cultivate relevant content in their group.

Another community module was used is Classroom [17]. The classroom is a simple but flexible eLearning module. It allows creating courses containing resources, assignments and similar kind of stuff. The Classroom module also designates a user or users as “managers” for each group, actively involving the community to maintain and cultivate relevant content in their group. On similar grounds it also designates a user as “teacher” for each group, actively involving the community to maintain and cultivate relevant content in their respective Class. Course managers can manage teachers and students. But, if they're only managers, they can't perform teachers' tasks (as creating assignments). Anyway, a user could be a manager and teacher for the same course.

The Quiz module provides tools for authoring and administering quizzes through Drupal. A quiz is given as a series of questions, with only one question appearing per page. Scores are then stored in the database. This module provides tools for online courses (Audio and Video enabled), Self-learning programs, Training programs, and Supplementary classroom activities. The quiz module is a framework which allows you to create interactive quizzes for students by the teachers. It allows for the creation of questions of varying types, and to collect those questions into quizzes. The teacher will be able to create question sets, drag and drop tasks, multiple choice tasks, fill in the blanks, dialogue cards, board game, presentation, and flash cards for enhanced self test and interactive learning.

With the help of the Course and Quiz modules, OG provides fully functional groups and classrooms for different courses in the Engineering community. This is later integrated with the JIT for its complete functionality and dynamic flexibility. The leaf nodes in the My-Engg Space-tree are the classrooms associated with their respective course subjects and the non-leaf nodes are just groups which can be dynamically added. These can be dynamically added thus creating a unique, hierarchical based social networking structure. Each node in a hierarchical tree structure represents education field, branch, course, major, semester, subjects and classroom as you go down the tree. Thus create a unique, hierarchical based social

networking structure by integrating it with a novel eLearning methodology for Engineering Education.

Other eLearning features or content types that had to be developed or required specific customizations for My-Engg are the Course page and Course response, Book page, and Resources.

The Course page and Course response are the basic course description page and the response page for the classroom.

A Book page is a page of content, organized into a collection of related entries collectively known as a book. A book page automatically displays links to adjacent pages, providing a simple navigation system for organizing and reviewing structured content.

The Learning Resources of My-Engg includes Learning material, Assessment activities, and other material. The Learning material includes the Classroom material pertaining to the Course subject such as the syllabus, lecture slides, notes, video/audio, examples, interactive learning activities, etc. The Assessment activities consist of Classroom activities undertaken by teachers, and by their students in assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged. Sometimes the student's marks on the test are taken as the indicator of his or her understanding of the topic. Some of the Assessment activities which are added to the course are Self Test, Peer Assessment, Questionnaire, Exercise, Homework, Quiz, and Project. The Other material in the classroom provided for better eLearning facilities are News, eBooks, eJournals, Articles, and Case study.

Some of the content types which are used to build the basic structure of the website pages are pages and stories.

A *Page*, similar in form to a *story*, is a simple method for creating and displaying information that rarely changes, such as an "About us" section of a website. By default, a *page* entry does not allow visitor comments and is not featured on the site's initial home page.

A *Story*, similar in form to a *page*, is ideal for creating and displaying content that informs or engages website visitors. Press releases, site announcements, and informal blog-like entries may all be created with a *story* entry. By default, a *story* entry is automatically featured on the site's initial home page, and provides the ability to post comments.

The primary module that was developed for My-Engg was the Group and Subgroup module. This module extends OG functionality to produce the hierarchical structure of the hierarchical social network. Groups from OG become class within the hierarchical tree. In the typical social network, and in OG by default, interest groups do not have any inherent inter connectivity. Activity in one group is partitioned from the rest of the network such that the content, posts, and discussions that the user sees is only from the group or groups to which the user subscribes. Subgroup enables a user with the proper permissions to build group hierarchies (or tree) by nesting groups under other groups. Simple or complex group

hierarchies can be easily created. When a hierarchy has been established, content posted to a group can be propagated up, along the tree. Separate propagation settings can be applied to content propagation.

The hierarchical structure of the My-Engg network enhances the typical interest group structure with hierarchical relationships between Groups and Classrooms themselves. Beginning from the root node, My-Engg, the network grows as a tree, following the general structure of the hierarchical tree of the Engineering study cycle. Fig. 4 shows a section of the My-Engg network.

The relationships among group nodes in My-Engg can be extended to their content, which is used to create content mashups at each node. This gives the user additional opportunities for content discovery. For example, consider three groups from Figure 1: CSE, UG, and PG. The groups UG and PG are within the group node CSE. Users who are interested in joining a group dedicated generally to all CSE branch could join only the CSE group. Postings from the UG and PG groups would also apply to CSE. As a result, the postings made in these child group nodes, as well as their descendant group nodes, would "bubble" up the tree to CSE group and other ancestor groups higher up the hierarchy. The group nodes UG and PG on the other hand are related as siblings and would not share content between them.

Another key development within My-Engg was a module to integrate the JIT visualization library with Drupal. Since the hierarchical nature of the My-Engg network is a primary feature that sets it apart from other social networks, highlighting this feature for the user is crucial. Without a way to visualize the hierarchical relationships among group nodes, the hierarchical organization of the network would not be apparent to the user. The JIT produces interactive visualizations, one of which renders tree data. My-Engg uses this to visualize the social network as a tree, displaying the groups in My-Engg and letting the user click around the network to explore the groups that are available. As each group node is selected, a contextual menu gives users the ability to navigate to the group home page or discussions, join that group or subscribe to an RSS feed for the group. Since the JIT library uses only JavaScript, PHP, CSS, and HTML, it does not require any additional plug-ins to run in the browser, unlike many other visualization libraries that require Adobe Flash Player or Java. The JIT visualizations work in any JavaScript-enabled browser including mobile browsers.

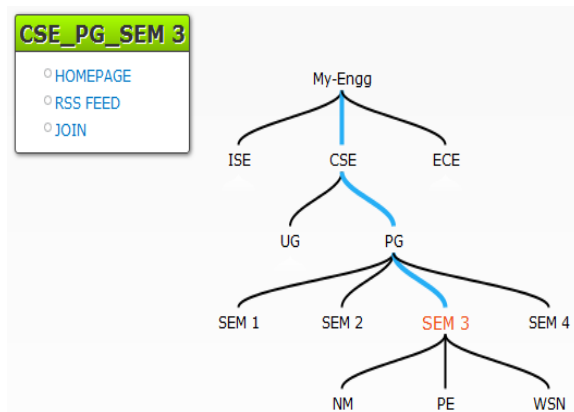


Fig. 4 A partial view of the My-Engg network as rendered by the JIT module. The tree represents the hierarchical relationships among My-Engg groups and acts as the organizing principle for the entire network.

Many of the required social networking capabilities on My-Engg were provided either by Drupal core or by other community modules that were integrated. A community module, appropriately called User Relationships, manages user's relationships. My-Engg uses this module to enable mutual, two-way relationships between users. Once both parties have confirmed the relationship, they appear in each other's list of "colleagues".

The communication between the various kinds of users in greatly enhanced by various modules such as the blogs, discussion forums, comments, email, faqs, private messages, contact form, polls, chat and web conference.

A blog is generally used to share large amounts of information with other users, with the information flowing one way, from the blog owner to other visitors.

A Forum topic is the initial post to a new discussion thread within a forum. People can then discuss this topic by adding their comments to it. A forum is most often used to allow our site visitors to chat amongst themselves. It's important to us to build community interaction and encourage communication among the users of our site of a particular group or classroom. My-Engg provides a forum for each node in the hierarchical tree structure, i.e., Each group and classroom have their own forum, where related discussion about the concerned topic takes place.

Commenting allows My-Engg site visitors to post replies to the content within a node, which allows a discussion on the topic at hand directly with the author as well as with one another.

A Contact form is a way to get in touch with you just by filling out and submitting the form. Thus provide valuable suggestions and feedback to the administrator.

The Frequently Asked Questions (faq) module allows users with the 'administer faq' permission to create question and answer pairs which they want displayed on the 'faq' page. The 'faq' page is automatically generated from the FAQ nodes

configured and the layout of this page can be modified on the settings page. Users will need the 'view faq' permission to view the 'faq' page.

A *Poll* is a question with a set of possible responses. A *poll*, once created, automatically provides a simple running count of the number of votes received for each response.

Private message allows My-Engg site visitors to send private messages to each other.

Chat allows visitors of My-Engg site to chat with each other privately or together in a public chat room. It logs the user conversations so that they can be later viewed in message Inbox.

The web conference system enables universities and colleges to deliver a high-quality learning experience to remote students. It supports sharing of slides (PDF, PPT and any document readable by Open Office), webcams, whiteboard, chat, voice over IP (using Free SWITCH), and presenter's desktop. It can record and playback sessions (slides, audio, and chat), runs on Mac, UNIX, and PC computers, and is supported by a community of developers that care about good design and a streamlined user experience.

Other social networking features had to be developed or required specific customizations for My-Engg. Drupal provided basic user profile page, search and advanced functionality, but these were insufficient for the social networking needs of My-Engg users.

The profile page was expanded to include information such as professional and engineering information, user statuses and group membership.

The basic user search functionality provided by Drupal allowed users to search for each other using only the internal username. The search functionality was expanded to search by first name, last name and email address, as well as allowing partial matching of the criteria. Results are scored depending on how strongly a result matches the criteria and sorted accordingly.

Additionally some more features like calendar, news feed, SignUp/login, and My-Engg space-tree were customized and added. My-Engg hierarchical space-tree is a hierarchical tree layout with advanced contraction and expansion animations with path search functionality help tray, full screen expansion, minimizing and hiding, and each node having its own node info specifying the related homepage, rss feed, and join.

Thousands of sites (particularly news sites and blogs) publish their latest headlines and posts in feeds, using a number of standardized XML-based formats. Formats supported by the aggregator include RSS, RDF, and Atom. Categories allow feed items from different feeds to be grouped together. For example, several engineering-related feeds may belong to a category named Engineering. Feed items may be grouped automatically (by selecting a category when creating or editing a feed) or manually (via the *Categorize* page available from feed item listings). Each category provides its own feed page and block. Add a feed in RSS, RDF or Atom

format by specifying the name of the feed (or the name of the website providing the feed), the fully-qualified URL of the feed, the length of time between feed updates, and category of news.

Multiple different news feeds are available to users on My-Engg. There is the complete site-wide feed that shows items from all groups in the network. This feed is available to all users and anonymous visitors on the My-Engg homepage. Each group node features a feed on the Group home page that shows items only from that group and its descendant groups. In addition to these public feeds, each user has a personalized feed that is available to them when they log in. This user feed displays items posted by the user's colleagues as well as posts from groups that the user has joined.

C. Dynamic role assignment

My-Engg uses both static and dynamic role assignment to determine user permissions. The goal was to eliminate complexity by keeping the number of user roles to a minimum in order to reduce the need to actively manage user roles. Table II shows a complete listing of user roles and descriptions.

The Drupal framework provides the default anonymous user and authenticated user roles. Anonymous users have read-only permissions for all content and are limited from viewing member profile information, course and group listing. Visitors can create accounts but administrator approval is required. Authenticated users have read/write permissions. These roles are not specifically assigned to users; until a user logs in to My-Engg, he/she has anonymous permissions. After logging in, authenticated user permissions are granted. A user must specify the role (teacher/student) he/she wants to be during registration to the site. The Course manager performs the management duties of the course such as managing the teachers and students in the classroom.

Two additional dynamic roles exist for Group members and Group managers. The management of these roles is handled using data provided by the OG module. When a user is viewing a Group page, i.e. The Group homepage or any content page posted in that Group, OG provides the Group "context" to the user session. Using this context, it can be determined what role the user should be granted within that context: Group member, Group manager, or neither. This allows members of a Group to have permissions to post content in Groups they are members of but not in other Groups. It allows Group managers to perform management duties in Groups they manage, but not in Groups where they are not managers. Organic Groups provide the basic dynamic role management. The Group module extends OG's role management features to other areas of My-Engg. The boon of this dynamic role management is that the system manages the role assignment, automatically granting and revoking permissions to users as they traverse between Groups in the network without the need for interaction by Group managers

or system administrators or necessitating specific roles for each Group.

TABLE II
 TABLE OF USER ROLES IN MY-ENGG SOCIAL NETWORK

Role Name	Description
Anonymous User	Able to view content except member profiles
Authenticated user	Able to view all content and member profiles, maintain a member profile, and comment on posts
Group member	Member of a group; can post content and start or participate in discussion forums
Group manager	Management duties for a group; drives the content and activity in a group
Course student	A student in a classroom; can start or participate in discussion forums, take quizzes and assignment, view course resources and results and give response
Course teacher	Teacher of a classroom; drives the content and activity in a classroom such as course description, resources, assignment and quizzes
Course manager	Manager of a classroom; manage teachers and students
Site admin	Perform site-wide administration activities

D. User-generated content

As mentioned in section II, Groups are the aggregation points for all content in My-Engg. The Group provides members a forum for discussion, a gallery to upload and share images, and a virtual file share for documents and other files. The members of each Group drive the generation of content in their Groups. Managers curate their Groups by providing structured posts, configuring Group settings and metadata, and moderating the content in the Group. Managers can also link their Group to other related resources on the Internet.

My-Engg also lets users add metadata to content, such as geographic data on uploaded images. These metadata can enhance the user experience and enable additional user interaction with content. In the case of geographic data, by “Geo-tagging” images those images can be shown on a map using Google Maps API. Users are also able to search for images based on the geographical location where the images were taken.

E. User-directed growth

For reasons discussed previously (section I-A), My-Engg is not intended to be a representation of every known group in the hierarchical tree of Engineering network. The users of My-Engg not only provide the content that is available on the

network, but they also direct the growth and future of the network. As the My-Engg user base grows and interest for new groups also grows, the network will expand and change to include those additional groups. My-Engg began with an initial set of basic Groups and Classrooms representing major points in the hierarchical tree. Members of the community continue to suggest additional Groups and Classrooms that they would like to see represented in the network.

Users can suggest new Groups by submitting a group suggestion form on My-Engg. Group suggestions require users to provide basic information including the name, description, and placement within the My-Engg network. Users are encouraged to assume ownership and management duties of the Groups they suggest. Submissions are entered into an approval queue where they are discussed and voted on by members of the Group. This can also be used by experts from industry to suggest industry-oriented courses. Fig. 5 shows the group submission and approval workflow.

Anticipating the continued growth of the My-Engg network, this approval process can be localized to specific sub-trees of the network. Group submissions include information about the potential placement of the new Group in the network. The sub-tree of the network that would contain this new Group can be identified and the Group Review Board that will vote to approve the new Group can be assembled ad hoc from managers of Groups in this sub-tree. This allows Group approval to scale as the My-Engg network grows.

It is important to note that the relationships between Groups are dynamic and can change as new Groups are added to the network. Therefore, the relationship of content and users in a given Group with the content and users in other Groups can evolve over time. When new Groups are added to the network, these interconnections are updated in real time and are reflected immediately. Although the actual categorization of content or membership of users does not change, the changes to the network will be reflected in messages from new Groups and others appearing in feeds through message bubbling (see section III-B).

In the case that a large Group is expanded into a parent Group with sub-Groups, some manual reorganization may be required. Users may want to update their membership of the parent Group to specific sub-Group (s). Also, it may be desirable to migrate content posted in the parent Group into a more specific child Group. As the network grows, it may become necessary to develop a migration tool and workflow to notify Group members of the changes in their Group(s) and assist in the re-categorization of their content.

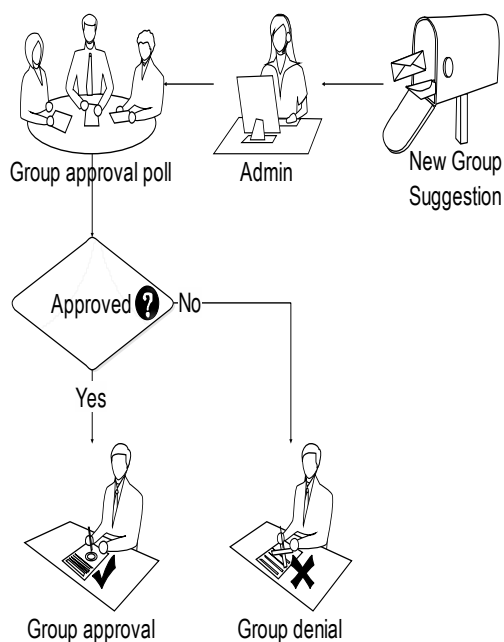


Fig. 5 Group submission and approval workflow

IV. RESULTS

My-Engg provides different assessment techniques for the teachers evaluate their students with the help of a variety of quizzes and assignments. The results are sent to email address of the student. At the end of test, a feedback is provided indicating the total points and total score by displaying the student's answers and the correct answers for all questions along with the score for each question. Fig. 6 shows feedback results of a quiz taken by the student.

The results and statistics are provided to the teacher in assessing their students. The result page displays various attendees with their username, start time, finish time, test taken duration, score and completion of evaluation.

The statistics are provided with the help of activity chart, top scorer chart, status chart, and distribution chart. Fig 7 shows the Activity chart which represents how many times the quiz has been taken in the last 30 days. Fig 8 shows the Status chart which represents the status for all attempts made to answer this revision of the quiz. Fig 9 shows the Top scorers chart which represents what question takers have the highest scores. Fig 10 shows the Distribution chart which represents the distribution of the scores on this quiz.

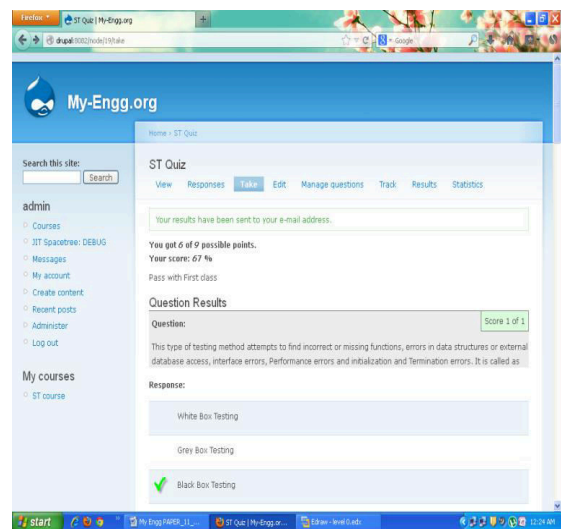


Fig. 6 Feedback results of a quiz taken by the student

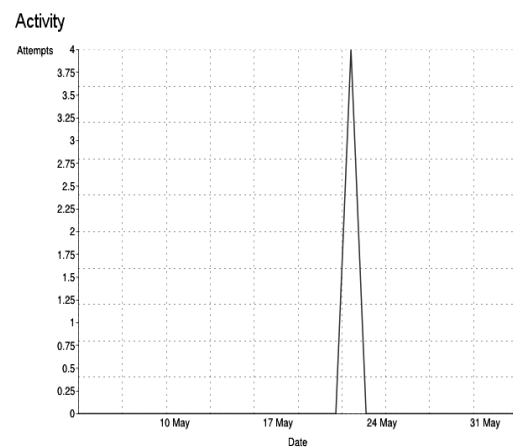


Fig. 7 Activity chart of Quiz for last 30 days

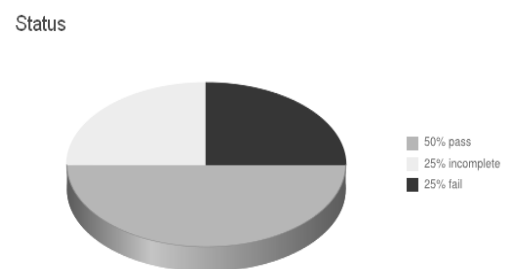


Fig. 8 Status chart of the Quiz.

Top scorers

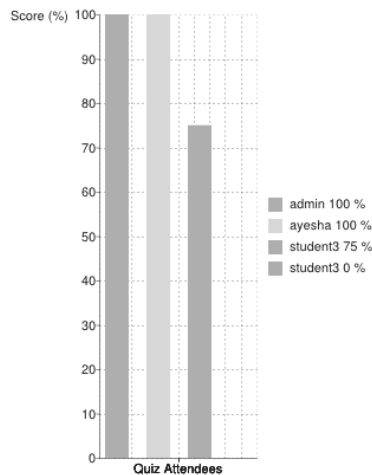


Fig. 9 Top Scorers of the Quiz

Distribution

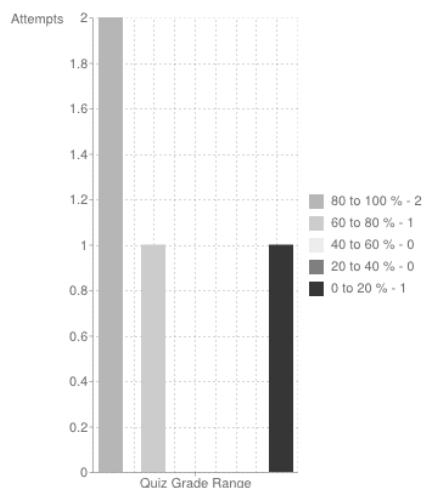


Fig. 10 Distribution of scores on Quiz

V. CONCLUSIONS AND FUTURE WORK

My-Engg provides an open and easily accessible service to allow educators and students access to unique tools and to engage and interact directly with industries, scientists and researchers.

My-Engg is a unique social networking and eLearning platform with the active creation of groups and classroom content according to an underlying hierarchical structure of Engineering education.

The above work can be carried forward in many ways. The feature set for the My-Engg social network can be extended. My-Engg also presents unique research opportunities in terms of data mining and social network analysis.

There are additional social networking features that will be integrated into My-Engg like user blogs and additional ties into existing network services like Facebook, Google+, Twitter, LinkedIn etc.

Through analysis of the data within the network, new social graphs can be constructed to describe the relationships between users, groups, posts, and other communication pathways. This will provide greater insight into how people use social networks and how social networks develop, evolve, and contribute to education. Ultimately, the knowledge gained from these studies will be used to create the next generation of social networks.

The work can be implemented using other content management systems such as WordPress, Joomla, etc., and comparative study of performance can be done.

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