

**DEVELOPMENT AND VALIDATION OF A WEB INTERFACE
FOR RESEARCH MANAGEMENT IN KERALA
AGRICULTURAL UNIVERSITY**

by

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(2011- 11- 168)

THESIS

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DECLARATION

I hereby declare that this thesis entitled “Development and validation of a web interface for research management in Kerala Agricultural University” is a bonafide record of research done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, fellowship or other similar title, of any other University or Society.

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CERTIFICATE

Certified that this thesis entitled “**Development and validation of a web interface for research management in Kerala Agricultural University**” is a record of research work done independently by ~~Smt.~~ **Shely Mary Koshy (2011- 11- 168)** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her.

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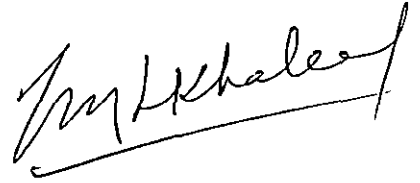
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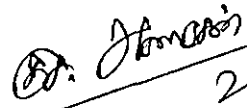
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Introduction

1. INTRODUCTION

Information and Communication Technologies (ICTs) are emerging as an important tool for development world-wide. The usage of ICT helps in processing, analyzing and disseminating information. Obviously, ICT can have a dramatic impact on achieving specific social and economic development goals as well as play a key role in broader national development strategies (Digital Opportunity Initiative, 2001). Information Communication Technologies are no more confined to assist high-end research and development; the new technologies have made significant improvements in the life-styles and the efficiency-levels of all sectors of economy. The agricultural sector is also gearing itself to make optimal use of the new Information and Communication Technologies.

Information Communication Technologies can be used in various fields of agriculture. Richardson (1996) identified the application of ICT in various fields of agriculture which includes economic development of agricultural producers, development of community, for various research and educational activities, for the development of small and medium enterprises and also for media networks. There are various ICT services which help to increase the growth of agriculture in a sustainable way. These services help to maximize agricultural production and productivity.

Information Communication Technologies has been seen by research and development managers as one means of helping to deal with the problems and issues that have arisen with the expansion of international research networks (Howells, 1995). By the utilization of ICT tools the information management has become easier in organizations. It helps an organisation to do the traditional activities by introducing new methods which are easier and faster when compared to the

traditional tools for information management. Thus ICT can very well be utilized for agricultural research management too.

Kerala Agricultural University (KAU) is the prime organisation in Kerala involved in agricultural research in addition to a few ICAR institutes and NGOs. The research support for the sustainable development of the agricultural sector of the State is rendered by KAU in partnership mode in close association with the research institutions managed by the Indian Council of Agricultural Research, Development and Commodity Boards, and Departments of the State and Central governments. The KAU sets research agenda through consultation with the farming community, and the extension personnel as well as based on need assessment by the faculty, and the state and national agencies and institutions engaged in development and research. Prioritization and relevance are set by the Faculty Research Committee (FRC) of KAU.

Research activities in Kerala Agricultural University are organised and conducted at six Regional Research Stations, 16 Research Stations, some specialised centres of research and studies, instructional farms, and in the laboratories of various departments of the constituent colleges. At present, 676 research projects are in operation including Plan Projects of the State, and All India Co-ordinated Research Projects/ Network projects in various fields of agriculture, horticulture and forestry, and externally aided projects funded by Government of India, Indian Council of Agricultural Research (ICAR), Indian Council of Forestry Research (ICFR), Department of Science and Technology (DST), Department of Bio-Technology (DBT), Kerala State Council for Science, Technology and Environment (KSCSTE), State Horticultural Mission (SHM), Kerala State Planning Board etc. In addition, PG and PhD research projects are also being undertaken. All these research and development activities of KAU are processed at the Directorate of Research (DoR).

There is a need for setting up of priorities of the activities which are undertaken by DoR. These activities include research and development, formulation of research and development programmes, aggressive monitoring, proper and critical evaluation, impact assessment of research output so far generated, evolving viable technologies, compilation, documentation, publication and providing information base. In addition, the DoR also act as a knowledge centre of the University in providing information to the planners and policy makers in the State and Central government. It is very difficult to manage and monitor all the research projects by the research administration without a Management Information System (MIS). A Management Information System is a computer based system which helps in providing information that is needed to manage an organisation efficiently and effectively. A web interface which can be integrated with the data base will solve this problem of managing and monitoring of all the research projects by the research administration to a large extent.

For increased utility, what required is the stakeholder's need based and demand driven web portal interface design. A Web portal is a web site for specific audience that compiles an array of content for providing various services which includes search engines, directories, news, e-mail and chat rooms etc. (Piennar 2003). Such a need oriented interface would act as information providing cum research administration platform for improved research management. In this backdrop, the present study was undertaken with the following objectives.

1.1 Objectives of the study

The study was undertaken with the following specific objectives:

1. To analyse the needs of researchers with regard to research management in Kerala Agricultural University

2. To analyse the needs of research administrators with regard to research management in Kerala Agricultural University
3. To lay out a web interface for research management
4. To conduct an end - user assessment of the developed interface so as to suggest appropriate modifications.

1.2 Scope of the study

There are a number of research works that are being undertaken in KAU by the DoR. Hence it would be very difficult for the DoR to manage and monitor all the projects without web support. A web portal integrated with a data base would help to solve the problem with research management to a certain extent. The data base will have a collection of structured data, unit of information or data records, independent of any application in a computer memory and will serve the need of multiple users. With the help of this, information can be stored, modified, and extracted based on the needs of the researchers and research administrators making the research management comfortable. The web interface developed would act as a good prototype for developing the web portal integrated with the database for research management in KAU. The Directorate of Research can take up further value addition, up gradation and updating.

For increased utility, what required is the stakeholder's need based and demand driven web portal interface design. The web interface developed as part of the study is based on the felt needs of researchers and research administrators in KAU. Such an interface will be interactive, easily accessible, and meet the requirements of both the researchers and research administrators. Thus a web interface developed is a good initiative for quick and efficient research management in KAU. Further, the study identified the contents to be included in the portal, based on the perception of both researchers and research administrators. Thus it would lead to a need based web

portal interface which would be more useful rather than the one made based on assumptions. Besides, the end user assessment of the developed web interface would be useful for fine tuning and develop the web portal by the Directorate of Research, KAU. In these perspectives, the study has immense scope, scientific and immediate practical utility.

1.3 Limitations of the study

The present study was undertaken as part of the Master's degree programme of a student researcher. There was a constraint of time and resources for the researcher that limited more in depth analysis. Due to this, the researcher could not collect and edit the contents to be included in the web portal. Since this study is one of the pioneering attempts of this kind, there was dearth of sufficient literature. Further, the questionnaire method had constrained interaction with the respondents. Still, the study was done with utmost care to make it as objective as possible.

1.4 Organization of the thesis

The study is reported under five chapters. The first chapter deals with introduction that highlights the objective, scope and limitations of the study. A systematic review of literature relevant to the study is presented in the second chapter. The third chapter describes the methodology adopted which includes the locale of the study, selection of respondents, data selection and statistical tools used. *The fourth chapter is devoted to results and discussion and the fifth chapter summarizes the major findings of the study and conclusions drawn from the analyses.* The references, appendices and abstract of the thesis are given at the end.

Review of literature

2. REVIEW OF LITERATURE

The review of literature was done to derive a conceptual base for the study.

The collected literature is presented in the following sub heads:

- 2.1 Information needs of researchers/research administrators
- 2.2 Research management in organisations
- 2.3 Web portal- Concepts, definition and meaning
- 2.4 Format of presentation of website- preferences of users
- 2.5 End user assessment of the websites/e- materials
- 2.6 Constraints in using websites/e- materials

2.1 Information needs of researchers/ research administrators

Krikelas (1983) described three types of information needs for the scientists namely updating in their field of specialization, some specific piece of information and the need for an exhaustive search.

Ellis (1989) proposed a behavioral model based on the analysis of a detailed description of information-seeking activities by social scientists. In this model, the decision of whether the information found is sufficient to meet a user's needs is dependent upon chasing and evaluating references as well as systemically identifying content that is of interest to the user. The author characterized six different types of information activities: starting, chaining, browsing, differentiating, monitoring and extracting. He further emphasizes the information-seeking activities, rather than the nature of the problems or criteria used for determining when to stop the information search process.

Mudannayake (1989) noted that the agricultural scientists' main purpose in seeking information was to learn the latest developments in their fields and to support their current research work. Approximately 56 percent of the agricultural scientists did their literature searches by themselves, while others obtained the assistance of research assistants and librarians. Although more than 50 percent of the respondents were not using their own card indexes and reprint files, there was a response which indicated a keenness to maintain them in future. The main tools used for learning of new publications were abstract journals, reviews and library acquisition lists.

Premssmit (1990) reported that academic medical scientists in Thailand needed up-to-date information on various research studies for identification of their research topics and relevant methodologies.

Grefsheim *et al.* (1991) noted that scientific meetings were the most frequent and exchange of valuable scientific information. They also pointed out that personal communications were important as scientists could get useful information far before it was published.

Masoomi (1992) in his research on "a survey of information needs of specialists of pharmaceutical sciences" gave a suitable plan for meeting their own needs showed that difference of job and field of activity causes difference in information needs. and the kinds of information resources according to needs were different.

Creth (1993) commented that "information professionals must articulate and act upon a vision of making adequate amount of information available to health professionals so that their information needs can be met effectively".

Wilson (1994) points out that the scope of information-seeking behavior research is vast and many new concepts and methods are being developed with the help of this research. It is clear that the study of human information-seeking behavior is now a well-defined area of research.

Leckie *et al.* (1996) noted that “work roles and tasks largely determine information needs, while a number of factors ultimately affect which sources and types of information are used in a given situation.

Devadason and Lingman (1997) viewed that the understanding of information needs and information-seeking behavior of various professional groups is essential as it helps in the planning, implementation, and operation of information system, and services in work settings.

Hansen (1997) reported that there are differences in users goals and tasks in their information seeking activity. The most frequent goals were: finding information to write a paper/thesis/report, gathering information for a project, and learning about the database content and topics.

Zhang (1998) stresses that a thorough understanding of user information needs and information seeking behavior is fundamental to the provision of successful information services.

Shanmugan (1999) and Yang (1998) point out that many studies had revealed several factors such as cost, past success, accuracy, reliability, comprehensiveness, usefulness, currency, response time, accessibility, technical quality, and format contribute to the selection and use of different information sources by scientists.

Bashiri (2001) in his research on “assessment of information needs of researchers of researches of natural resources research centers and flock affairs and agricultural ministry” reported that among needed information resources books, periodicals publications and magazine, information banks and internet were used more.

Zawawi and Majid (2001) reported that biomedical scientists use a variety of information sources to satisfy their information needs. Biomedical scientists who were solely involved in research work considered journal articles as the most preferred information source. On the other hand, researcher-cum-lecturers considered books as the most preferred information source in meeting their information needs. Both categories of scientists also considered interaction with colleagues as an important source for satisfying their information needs. The study also revealed that in spite of having access to modern and up-to-date digital information sources, most respondents still preferred using printed materials. Nonetheless, CD-ROM was the most utilized IT based source. For the Internet-based information sources and applications, e-mail was the most popular while other applications were used infrequently.

Dalton and Charnigo (2004) found that several researchers mainly historians mentioned that they had called a halt to research when they felt they had enough to write, even if other sources promised to yield additional information.

Foster (2004) remarks that both external and internal contexts serve to frame information needs, thereby framing the conditions under which those needs become satisfied. He found that users’ knowledge that they had enough information emerged as an iterative process of questioning whether they had acquired sufficient material to meet the present information need.

Kuhlthau (2005) depicts the information-search process as a sequential set of intellectual stages: becoming aware of the lack of knowledge or understanding (initiation), identifying a problem area or topic (selection), exploring the problem (exploration), defining the problem (formulation), collecting relevant information (collection), and explaining what the person learned (presentation).

Padmaiah (2005) states that the agricultural researchers often experience problems in the course of their work, which may manifest themselves as information needs. If these needs are fulfilled, researchers can conduct quality research and generate utilizable information. This information can then be used by end-users such as farmers to boost agricultural production and thus enhance the general development of a country. One useful but underutilized source of agricultural information is 'unpublished reports'.

Mugwisi *et al.* (2012) said that the information needs of the researchers and extension workers were numerous within the agricultural discipline and covered the major areas of animal science, crop science, agricultural engineering, and advisory and policy development.

2.2 Research management in organisations

Cohen *et al.* (1972) stated that the decisions in universities concerning aspects of research, teaching and administration appear to get made in independent streams, with limited consideration being given to how each of those decisions will interact with those coming out of other streams.

Gibbons *et al.* (1994) points that the massification of higher education and scientific research, the effect of research and innovation on the welfare states and the

importance of knowledge production as a competitive advantage affects research organization's forms, roles and missions.

Wiig (1994) explains that central premise behind organizational knowledge management is that all the factors that lead to superior performance – organizational creativity, operational effectiveness, and quality of products and services – are improved when better knowledge is made available and used competently. For any knowledge management programme to succeed or even take off the ground, the first and foremost important step is for senior management to understand what knowledge management entail.

Clark (1998) identified five management pathways towards the establishment of entrepreneurial universities:

- The strengthened steering core
- The expanded developmental periphery
- The diversified funding base
- The stimulated academic heartland
- The integrated entrepreneurial culture.

According to Davenport and Prusak (1998), most knowledge management projects have one of three aims:

- (1) to make knowledge visible and show the role of knowledge in an organization, mainly through maps, yellow pages, and hypertext tools;
- (2) to develop a knowledge-intensive culture by encouraging and aggregating behaviors such as knowledge sharing (as opposed to hoarding) and proactively seeking and offering knowledge;

(3) to build a knowledge infrastructure-not only a technical system, but a web of connections among people given space, time, tools, and encouragement to interact and collaborate.

Liyanage *et al.* (1999) claims for a new perspective on managing research based on linking “existing knowledge of an organization with new knowledge generated across organizational and network boundaries.

Anand *et al.* (2000) note that most organizations do not possess all required knowledge within their formal boundaries and must rely on linkages to outside organizations and individuals to acquire knowledge.

Nooteboom (2000) calls dynamic fields, organizational innovation derives from knowledge exchange and learning from network connections because they gain access to new information, expertise, and ideas not available locally and can interact formally, free from the constraints of hierarchy and local rules.

Alavi and Leidner (2001) refer Knowledge Management Systems to a class of information systems applied to managing organization knowledge, which is an IT-based system developed to support the organizational knowledge management behavior.

Di Sarli (2002) identified the following good practice at institution level in the management of research:

- Clear definition of the mission of the university
- Definition of priorities in research fields
- Definition of policies to balance fundamental and applied research
- Definition of policies to support local development

- Definition of policies of social accountability and operational transparency in the use of public and private funding.

Duderstadt and Womack (2003); Harman and Sherwell (2002); Pilbeam (2006) and Weber, (2004) explained that entering partnerships with businesses, securing philanthropic donations and selling new services all represented common strategies for increasing funds for research.

Szulanski (2003) said that the rise of the knowledge economy has helped organizations to recognize that knowledge assets are rapidly becoming their most precious competitive advantage and that learning to manage those assets better has become a competitive necessity.

Ong and Lai reported that (2004) a repository Knowledge Management System needs a rich set of features to satisfy the broad requirements associated with creating, managing, and utilizing the knowledge, including intranets, document/content management systems, search engine, office suites, and enterprise information portals.

McFadyen and Cannella (2004) have recognized knowledge as one of the most important resources of the 21st century and received considerable attention in the management literature.

Mintrom (2008) requested the university administrators seeking to improve the research function of their respective universities to be more careful in monitoring research outputs and explore ways to raise quality and productivity.

2.3 Web portal- Concepts, definition and meaning

Murray (1999) classified the web portals into four types:

- **Information Portals:** These portals provide information to users
- **Collaboration Portals:** These portals connect users and provide facilities for them to collaborate in activities
- **Expertise Portals:** These portals allow users to communicate with each other and share their experiences, special interests and services
- **Expertise Portals:** These portals allow users to communicate with each other and share their experiences, special interests and services

Shilakes and Tylman (1998) report that an enterprise (information) portal is considered as an application that primarily integrates the company's information and provides users with a single interface to this corporate information.

Murray (1999) states that the information portal is the one able just to organize large collections of content based on the subjects they contain, connecting people with information.

Reynolds and Koulopoulos (1999) viewed corporate portal as a user centric information system, able to integrate and deliver knowledge and experiences of individuals and teams, in order to achieve the "knowledge- centric" patterns of every day's work world.

White (1999) called the basic form of portal an "intranet portal", which included links to information and web sites within and outside the company.

According to Jacobson, (2000) ‘Personalization’ and “community” are two of these tailoring methods, and they are the backbone and nervous system of an institutional information portal.”

Looney and Lyman (2000) believed that the value of a portal to a campus is that it can be used to engage constituent groups, empower them with access to information resources and communication tools, and ultimately retain them by providing a more encompassing sense of membership in an academic community.

Eisler (2001) says “portal technology is driven by innovation in two primary functions: search, navigation and personalization. A portal can help to address fundamental challenges faced by the users today, the overabundance and discontinuity of information. He also notes that that portals offer the prospect of helping higher education find new ways to connect with students, faculty, alumni and the community. Many colleges strongly feel the need to create new avenues for building community among their people”.

Strauss (2002) reported that by developing a web portal, the explicit knowledge can be made shared between the staff members and the students of an institution. He also reported that companies are rushing to produce portal ware and portal-like Web pages without fully understanding the scope of a portal undertaking or even really understanding what a Web portal is or should do”. An institutional portal provides a personalised, single point of access to the online resources that support members of an institution in all aspects of their learning, teaching, research and other activities. The resources may be internal or external and include local and remote 'information resources' (books, journals, Web-sites, learning objects, images, etc.), 'transaction-based services' (room bookings, finance, registration, assignment submission, assessment, etc.) and 'collaborative tools' (calendars, email, chat, etc.).

Daigle and Cuocco (2002) stated that the first generation portals emphasise ‘content’; second-generation portals focus on institutional processes, services, technology applications and, process integrations; third-generation portals will likely strive to integrate data, voice, and video on a variety of platforms (such as handheld computers) perhaps over wireless networks.”

Katz (2002) noted that the 2002 edition of the *Winston Dictionary* defined a portal as a gate, door, or entrance; especially one that is stately and imposing, as of a cathedral.

Clarke and Flaherty(2003) explain that the word ‘portal’ is derived from the Latin *porta*, or gate, through which something will pass in an effort to get to another place.

Straub *et al.* (2002) described the importance of good metrics for NEOs to the researcher and the practitioner and stated that “the unique characteristics underlying the Web may in some cases require new metrics or at least the careful evaluation of existing ones, to facilitate the development of innovative solutions to emerging problems.”

Englert (2003) indicates that portal characteristics include a gateway that provides a single point of entry to information and tools, web-based aggregation point, targeted user groups, “My” home page , easy, accessible from anywhere, anytime.

Yang *et al.* (2005) said that an information presenting web portal is a site that provides users with online information and information related services, such as search function, community building features, commerce offerings, personal

productivity applications, and a channel of communications with the site owner and peer users.

Mansourvar and Yasin (2010) stated that the development of Web has affected different aspects of our lives, such as communication, sharing knowledge, searching for jobs, social activities, etc. The web portal as a gateway in the World Wide Web is a starting point for people who are connecting to the Internet. The web portal as the type of knowledge management system provides a rich space to share and search information as well as communication services like free email or content provision for the users.

Behera and Sethy (2012) said that web forms are programmable web pages that serve as the user interface for web application. A web forms page presents information to the user in any browser or client device and implements application logic using server- side code. Web forms page output may contain almost any HTTP- capable language, including html, xml etc.

2.4 Formats of presentation of website- preferences of users

Eastmond (1995) and Harasim (1993) suggested that it is effective for the trainers to post messages to the learner to stimulate discussion, and encourage interaction.

DeBra (1996) suggests that the designer use multiple columns on the screen, and/or break up the text with graphics to make the line length more manageable.

Cotrell and Eisenberg (1997) noted that developers are in agreement that graphics, and multimedia in general, should be used only when they directly support the materials.

Everhart (1997) suggests that the site should be “sensible, clear, and clutter free”.

Frick *et al.* (1997) identified that one of the fundamental advantages of hypertext is the potential for representing complex knowledge via multiple associative links.

Jones and Farquhar (1997) noted that the most consistent principal on web site instructional design, is that the text presented on a given page should be limited.

Nielson (1997) suggests that instructional text on the computer should be about 50 percent as long as would be the case if the same text was presented as hard copy.

Jonassen *et al.* (1997) noted that the use of external sites as support materials is not only important, because it is a unique advantage of the web, but it can serve as a powerful tool for providing a meaningful, “real world” context.

One of the most important design principles, which is supported both by web-designer published experiences, and by research on hypertext learning environments, is that the learner should be provided with guidance (Jacobson, Maouri, Mishra, Kolar, 1995; Smith, Newman and Parks, 1997).

2.5 End user assessment of websites/ e- material

Bailey and Pearson (1983) told that user satisfaction is measured by the weighted sum of user's positive and negative reactions to an information system, and the user's positive perception is the most important factor for consideration. Systems with a high score for this factor are considered to be high in user satisfaction.

Doll and Torkzadeh (1988) defined "end users" as the users that generally interact with applied software in order to approach information or prepare reports.

Galletta and Lederer (1989) defined user satisfaction as recognition and attitude.

Melone (1990) defined the user's attitude as a tendency reacting favorably or unfavorably on processes related to computer systems, applied systems, system administrators or applied system use.

Rainer and Harrison (1993) referred to end user satisfaction as the individual attitude toward the computer-related activities or computer use required to achieve work.

Chin and Lee (2000) defined end-user satisfaction with an information system as the overall affective evaluation and end-user has relating with his or her experience in the information system.

Rosenbaum and Chisnell (2000) recommended that an organization developing a software application, for example, use several methods of user involvement during the development life cycle to ensure a usable product.

Turban and Gehrke (2000) told that users no longer want glitter - they want content and service, and they need it fast. This demand will continue to drive Web site design toward speed, navigation efficiency, simplicity, and elegance with an emphasis on customer focus and security.

Mahmood *et al.* (2001) states that given the huge spending on IT (estimated at over one trillion dollars), one would hope that better IT usage results in improved organizational performance and productivity.

Kwon *et al.* (2002) pointed that the Web design factors influence a customer's motivation to purchase. To achieve success in e-commerce, website design must therefore be focused on the customer, and the current trend is towards simplicity.

Nah and Davis (2002) defined web-site usability in terms of several standard criteria: the ability to find one's way around the Web, to locate desired information, to know what to do next, and to do so with minimal effort. They also describe the usability challenges on the Web including typical user errors, the problem of disorientation, and the feeling of being "lost in space."

Burton-Taylor (2004) pointed that the good user experience is one where a user achieves their goals and is highly satisfied with the process; it will encourage reuse and recommendation of the site. If the organisation is not focused on providing a good user experience, then the web team will be unable to build an effective web site. Understanding the user experience, through research methods like usability testing, can be a powerful tool in driving the organisational change needed to develop an effective websites.

Nielsen (2004) identified that 'Animated gifs' (images that move) also lower the quality of a website by making it look amateurish. People have learned to ignore animations anyway because they often perceive them to be advertisements.

Outing and Ruel (2004) noted that 'Eye-tracking studies' have shown that the positioning of elements (where things such as the logo and the search box are placed on the web page) can affect the user experience.

Sing (2004) stated that the consumers face a proliferation of poorly designed electronic stores giving rise to poor usability and information overload.

Walker (2004) agreed that creating a usable Web site required real organisational commitment, commitment that could only come from senior management.

Wood (2004) stated that customers should be involved early in the process of designing a website. Usability should not be seen as something to test afterwards, a check you do near the end of a development project to prove how clever the team has been at guessing what customers want.

Dodd (2005) stated that good usability used to put a site above its competitors, but now that most designers understood usability, this was no longer the case. Sites needed to do more to distinguish themselves – they must create a good user experience. This would become the standard in future.

Nutley (2005) discussed how today's sites had become so easy to use that the customer can get through the transaction process too quickly and easily. This is good

for customer retention, but if the customer misses all the other messages on the site, then it is bad for increased sales. Paradoxically, usability may be counter-productive.

Zviran *et al.* (2006) and Lee (2008) reported that user-based designs affect user satisfaction in studies of user satisfaction for websites, in which the measure of end user computing satisfaction was utilized.

According to Stoimenova and Christozov (2013) the main aspects of usability in examining the websites are:

- effectiveness – the degree of correspondence between the website functionality and user's needs, goals and search and navigation skills;
- efficiency – a quantification of the amount of useful activities through users' interactive browsing behaviour;
- user satisfaction – subjective emotional and aesthetical user estimation about the interaction with the website.

2.5 Constraints in using websites/ e- materials

Patai (1991) identified that many people who participate in research do not have enough people in their lives who want to listen to what they have to say.

Sall (1994) urged that the main constraints to more effective forestry research in these countries is the lack of political and financial support and lack of adequate research management capacities.

That demographic and characteristic background such as age, gender, ethnicity, marital status, level of education, prior experiences with computers and the

Internet influence the ICT and or e-Learning adoption (Durndell and Thomson 1997; Whitely 1997; Teo and Lim 2000; Muilenberg and Berge 2005; Ong and Lay 2006).

Rogers (2002) observed that the teachers are reluctant to abandon their existing pedagogy was more of an obstacle to teacher development in classroom in the use of ICT than limited resources.

Mungania (2003) revealed that e-Learning barriers are heterogeneous, encompassing seven types of barriers, namely: (1) personal or dispositional, (2) learning style (3) instructional, (4) situational, (5) organisational, (6) content suitability, and (7) technological barriers.

Muilenburg and Berge (2005) determine eight barriers factors to online learning including administrative/instructor issues, social interactions, academic skills, technical skills, learner motivation, time and support for studies cost and access to the Internet and technical problems.

Swift *et al.* (2007) revealed based on a grounded theory analysis that the researchers may face a number of challenges while undertaking qualitative research which included issues relating to rapport development, use of researcher self-disclosure, listening to untold stories, feelings of guilt and vulnerability, leaving the research relationship and researcher exhaustion.

Ali and Magalhaes (2008) divided the barriers in the adoption of e-Learning into two factors: organisational and technical issues. Among the technical barriers, the most common ones are system crashes, bandwidth and infrastructure upgrading, accessibility, usability, technical support and perceived difficulties in using such a system. The organisational barriers include lack of time available for training; cost

versus value; lack of appropriate content related to specific needs; language barrier (as most of the content is delivered in English); difficulties in measuring e-Learning effectiveness; lack of strategic planning and direction, lack of e-Learning awareness; lack of incentives; and finally, lack of management support (Baldwin- Evans 2004).

Morell (2011) said that the establishment of trust and identification of actors through ICTs, a medium where the researcher usually remains distant and faceless as compared to face-to-face communication, and where most non-verbal communications is lost, constitutes a major challenge.

Purnomo and Lee (2010) reported that two factors, organisational culture and technological barriers were perceived as being relatively higher than individual and policy barriers. The organisational culture included lack of training availability to learn ICT, limitation of technical support from organisation, interpersonal barrier to share among employee, lack of awareness in availability of ICT and the technological barrier included poor infrastructure development in agricultural sector, the cost of broad band connection too high, less availability of ICT in agriculture, low computer literacy, restricted use of available ICT, poor interconnectivity in rural area.

Adeyinka *et al.* (2012) identified in a the study that a number of challenges faced by the students when using web-portal were loss/forgotten password, slow network/ server access problem, incessant power failure and swift and unannounced removal of important information and announcement.

Methodology

3. METHODOLOGY

This chapter deals with the description of the methods and procedures adopted in conducting the present research study. It is furnished in this chapter under the following subheadings.

3.1 Locale of the study

3.2 Selection of respondents

3.3 Design of the study

3.4 Operationalization and measurement of variables

3.5 Development of web interface

3.6 End user evaluation of the web interface

3.7 Tools and techniques for data collection

3.8 Statistical tools used for the study

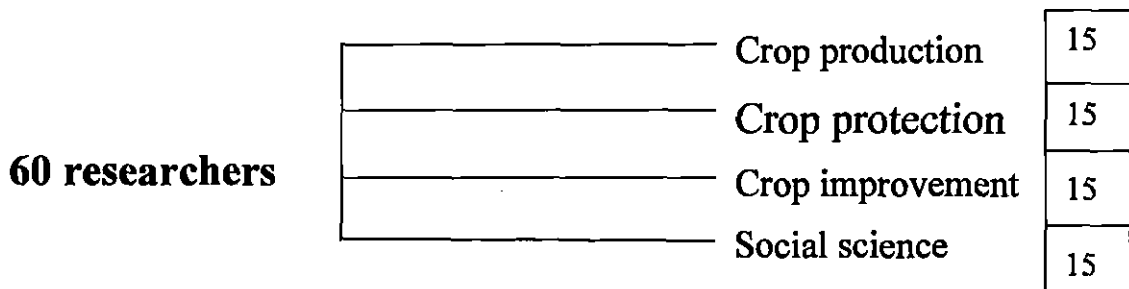
3.1 Locale of the study

Kerala Agricultural University (KAU) is the prime organization that is involved in research in the field of agriculture and allied areas. Kerala Agricultural University, all its research stations, project and scheme areas which come under the purview of Directorate of Research of KAU was selected as the locale of the study

3.2 Selection of respondents

There were two categories of respondents viz. researchers and research administrators. The researchers who had/are having research projects in KAU constitute the population in this category. They were divided into four divisions such as researchers in crop production, crop protection, crop improvement and social sciences. Fifteen researchers were selected randomly from each division constituting a total of 60 researchers for the study.

Figure 1. Pictorial representation of selection of respondents



30 administrators (research)

Director of Research	- 1
Professor (RC)	- 1
Associate Directors of Research-	ADR (M&E)- 1
	Other ADRs- 1
Head of Research stations excluding ADRs	- 10
Chairpersons of PC groups	- 10

Another group of 30 research administrators were selected randomly from a list of Director of Research, Professor (Research Co-ordination), Associate Directors of Research, Head of Research stations and Chairpersons of Project Co-ordination (PC) groups. Here also the population was divided into three groups, the first group consisting of Director of Research, Professor (Research Co-ordination) and Associate Directors of Research; the second group consisting of Head of various Research stations and the third group Chairpersons of PC groups. From each group, 10 research administrators were selected. Random selection was followed except in the first group, where the Director of Research, Professor (Research Co-ordination) and the Associate Directors of Research (Monitoring & Evaluation) were purposefully selected, and the rest seven from the group were selected randomly.

3.3 Design of the study

Majority of the variables were selected for the present study after careful examination of the available relevant literature and keeping the objectives in view,. The analysis of the information needs of the researchers and research administrators and the consequent designing of the web interface and its end user assessment of the web interface was exploratory in nature. Thus exploratory research was used for the present study.

3.4 Operationalization and measurement of variables

Based on the objectives, review of literature, desktop analysis of various websites of agricultural research organisation and discussions with researchers and research administrators, the following variables were selected for the study.

- 3.4. 1. *Information needs of researchers*
- 3.4. 2. Information needs of research administrators
- 3.4. 3. Basic details of individual research projects
- 3.4. 4. Progress of research projects

3.4. 5. Formats of presentation in the web interface

3.4. 6. Additional links/ labels

3.4. 7. Facilities and services for doing research in KAU

3.4. 8. Percentage of research projects to be monitored at different levels

3.4. 1. Information needs of researchers

Miranda and Tarapanoff (2004) defined Information needs as a state or process started when one perceives that there is a gap between the information and knowledge available to solve a problem and the actual solution of the problem. In this study information need of researchers means the information required by the researchers for undertaking a research project in KAU.

The information needs of researchers were identified by developing the research need domain under 13 captions namely ‘organizational set-up’, ‘thrust area and PC group’, ‘contact information’, ‘procedures/ formalities in KAU’, ‘funding agencies for research’, ‘services/ facilities in KAU’, ‘general information’, ‘capacity building’, ‘publishing of research works’, ‘research projects’, ‘research reports’, ‘research achievements/ technologies’, ‘honours/ recognitions’. Under each domain the information need items were categorized by collecting an exhaustive list from various sources like literature, personal discussion with researchers, experts and research administrators. Altogether 77 research items under 13 domains were identified and the same was given to the respondents which were rated in a 3 point continuum namely ‘essential’, ‘needed’, ‘not needed’ with a scoring of 3, 2, 1 respectively. Based on this, the information need index was computed by using the formula,

$$\text{Information need index} = \frac{\text{Total score obtained}}{\text{Maximum possible score}} \times 100$$

The score ranged from 60 to 180

3.4.2 Information needs of research administrators

Information needs of research administrators were operationally defined as the information that is required by the research administrators for monitoring and evaluating the research projects in KAU.

The same methodology adopted for researchers was used for research administrators too. The scores in this case ranged from 30 to 90.

3.4.3. Basic details of individual research projects

Basic details of individual projects refer to the items pertaining to a research project which are to be included in the research management information system (RMIS) for efficient monitoring and evaluation of the research projects in KAU. A list of 21 items was identified based on review of literature, desktop analysis of websites of research organisation and consultation with researchers and research administrators of KAU. Using this, the research administrators were asked to mention the essentiality of each item for research management in KAU on a dichotomous scale. The items which more than 50 per cent of research administrators perceived as essential under each domain was found out.

3.4. 4. Progress of research projects

In this study progress of research projects means the items to be fed in the RMIS by the investigators regarding the progress or otherwise of individual research projects.

The same methodology followed in the case of basic details of individual research projects was used here. But in this case, there were 24 items judged by the research administrators.

3.4. 5. Formats of presentation in the web interface

The formats of presentation were operationally defined as the style setting of web page contents with text elements by excluding or integrating images, animation and/ or the interactive components. The preferences of the researchers and research administrators towards various formats like text matter, text plus picture, text plus animations and clickable interactivity was assessed by asking them their preference. Later, percentage analysis was done to know the preferences of the respondents towards various format of presentation.

3.4.6. Additional links/ labels proposed

Other than the information contents that can be suggested based on the information need analysis, additional links/ labels which can be included for the website of Directorate of Research were identified by interaction with researchers and desktop analysis of websites of research organizations. Accordingly nine links/ labels were identified, viz. are location map, Frequently Asked Questions (FAQ), feedback forms, video gallery, photo gallery, researchers' forum, letters/ circulars, news and events, related links. The researchers and research administrators were asked to express their opinion regarding the necessity of these links/ labels as essential or not essential. Later the percentage of researchers and the research administrators who perceived the items as essential was found out. Those links/labels, which more than 50 percent of the respondents perceived as essential, were considered necessary for the website

3.4.7. Facilities and services for doing research in KAU

In addition, an exhaustive list of facilities and services for doing research in KAU was also attempted. This was collected by dividing it into two aspects viz. facilities and services inside KAU and those outside KAU. The facilities and services inside KAU means the conveniences/accessibilities available in KAU which

assists in doing research like different centres, analytical services, literature search facilities etc. The facilities and services outside KAU means the accessibilities outside KAU for doing research works in KAU like funding from various funding agencies.

3.4.8. Percentage of research projects to be monitored at different levels

It means the percentage of research projects proposed to be monitored at higher levels based on the data/ information fed by PIs in the research management information system and actual physical verification if required. For this purpose the five research administrator categories (monitoring officers) namely Head of the station, Project coordination group, Professor RC, Associate director of research-monitoring and evaluation (ADR (M & E), Director of Research (DR) were logically suggested a percentage for monitoring the research projects. Then the respondents were asked whether they agree to the suggested percentage or not with regard to each monitoring officer. Alternative suggestions and justifications were also elicited as follows:

Monitoring officer	Percentage suggested	Agree/disagree	Alternate suggestion (%)	Justification
Head of the station	100	A / D%	
Project coordination group	100	A / D%	
Professor RC	2	A / D%	
ADR (M & E)	5	A / D%	
DR	1	A / D%	

3.5 Development of web interface

A web interface was developed as a prototype of the website for Directorate of Research, based on the information needs of researchers and research administrators. The interface was developed using HTML. It was designed with a simple cascade style sheet. A total of 93 webpages were designed/ developed for the interface.

3.6 End user evaluation of the web interface

For fine tuning, the developed web interface was subjected to end user assessment. Two end user assessment forums were conducted one each for the research administrators and researchers. The research administrators' forum was organized at KAU headquarters where in nine research administrators participated. The researcher's forum was organized at the Center for E- learning, KAU where 24 researchers participated. Additionally one research administrator and six researchers were contacted in person to get the responses of a total of 30 researchers and 10 research administrators on the developed web interface

3.6.1 Design of the web interface

The developed web interface was demonstrated by the researcher before the participants/ respondents. Then the respondents were given a chance to use the interface. This was followed by distribution of a questionnaire to evaluate the design of the interface, for which the methodology suggested by Meyer (2007) was used with suitable modifications. Accordingly, the design of the interface was evaluated in terms of its homepage, navigation, site organisation, links and labels, and readability. Each of these items was evaluated based on some attributes. Thus 4,3,2,7 and 8 attributes were used for assessing homepage, navigation, site organisation, links and labels and readability respectively. The participants/ respondents were asked to rate the performance of the interface in each attribute on a five point continuum, the

points being very poor, poor, fair, good, outstanding, with a score of 1, 2, 3, 4 and 5 respectively. Ultimately the design was evaluated using mean score.

3.6.2 Constraints in using the web interface

After the assessment of the design of the web interface the respondents were asked to mention the constraints they faced while using the web interface. This was collected using an open- ended question.

3.6.3 Suggestions for improving the web interface

Suggestions for improving and scaling up of the interface were also elicited using an open- ended question during the end user assessment.

3.7 Tools and techniques for data collection

A pre tested structured questionnaire by including all the variables mentioned above was prepared for collecting data from the respondents. This was handed over in person or mailed by post. In the cases of responses, which were not clear, rechecking was done. For end user assessment of the web interface also, questionnaire was resorted to. This was handed over in person after demonstrating the web interface and giving chance to the respondents to use the interface.

3.8 Statistical tools used for the study

3.8.1. Kendall's coefficient of concordance

Kendall's coefficient of concordance was done to assess the consistency among the researchers and research administrators

3.8.2. Mann- Whitney U test

Mann- Whitney U test was done to assess the difference in preferential needs of research content between research administrators and researchers.

3.8.3. Mean

The mean scores were worked out for comparative analysis of attributes of evaluation of the web interface.

3.8.4 Percentage analysis

Percentage distribution of respondents on some of the variables was worked out to interpret the results

Results and discussion

4. RESULTS AND DISCUSSION

Keeping the objectives in view, the findings of the study are presented with appropriate discussions under the following headings:

4. 1. Information needs of researchers and research administrators
4. 2. Details on individual projects required for research management
4. 3. Additional links/labels to be set in the web interface
4. 4. Preferred format of presentation of the web interface
4. 5. Facilities and services for doing research in KAU
4. 6. Monitoring of projects at various levels
4. 7. Development of the web interface
4. 8. End user assessment of the web interface

4.1. Information needs of researchers and research administrators

This section reveals the information needs of researchers to carryout research in KAU and those of research administrators to monitor and evaluate research works in KAU. The information needs under various domains such as organisational set up, thrust area and PC group, contact information, procedures/ formalities in KAU, funding agencies for research, services/ facilities in KAU, general information, capacity building, publishing of research works, research projects, research reports, research achievements/ technologies and honours/ recognitions are presented in this section.

4.1.1. Agreement among the researchers and research administrators in rating information needs under different domains

The Kendal's coefficient of concordance of information needs in various domains for judgments made by the researchers (k=60) and research administrators (k=30) was found out. The results in this regard are presented in Table 1.

Table 1. Consistency among researchers and research administrators in rating information needs

Information need category	Kendall's W	
	Researchers (n= 60)	Research administrators (n=30)
Organisational set up (n=9)	0.254***	0.189***
Thrust area and PC Group (n= 4)	0.114***	0.193***
Contact information (n= 5)	0.103***	0.077*
Procedures/ Formalities in KAU (n= 3)	0.047 *	0.172***
Funding agencies for research (n= 7)	0.152***	0.119***
Services/ facilities in KAU (n= 5)	0.133***	0.074*
General information (n= 7)	0.336***	0.066*
Capacity building (n= 12)	0.096***	0.058 *
Publishing of research works (n=8)	0.130***	0.201***
Research projects (n=4)	0.045*	0.079*
Research reports (n=3)	0.090***	0.243***
Research achievements/ Technologies (n=7)	0.079***	0.130***
Honours/ Recognitions (n=3)	0.065**	0.084*
Overall (n=77)	0.129***	0.148***

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

Table 1, we can see that there was concordance in the rating/ranking of the information needs by researchers under all domains. Similarly there was concordance among the research administrators too in rating the information needs in all domains, either at 0.01, 0.05 or 0.10 percent level of significance.

4.1.2. Information needs related to 'organisational set up'

A research is not that easy to be carried out without relevant information. Information being the base for conducting a research, an attempt was made in the present study to find out the information needs of the researchers under various domains. The organizational set up is an important domain and the information needs of researcher and research administrators under this domain are presented in Table 2.

Table 2. Information needs of researchers and research administrators related to organizational set up

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researchers	Research administrators	
1	Information on different sections in the DR's office that deals different project categories	92	90	900.00
3	Area of specialization of scientists of KAU (staff profile)	91	96	780.00
2	Collaboration university has with other agencies	91	84	748.50
4	Mandate and mission of DoR	89	81	703.50**
5	Organizational structure	84	82	874.00
9	Research Stations/Centres in KAU	78	94	515.00***
7	History of Directorate of Research	74	74	884.00
6	Former Directors of Research	69	71	779.00
8	Cadre strength	67	83	567.50***

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

Table 2 shows that, among the information content items under 'organisational set up', the information on different sections in the office of

Directorate of Research that deals different project categories was perceived as the most important information need by the researchers with an index of 92. This may be because, this information was essential to follow up submission of project proposals, getting administrative and technical sanction, release of funds, reporting and the like. The second important information needs as perceived by the researchers were the information on KAU's collaboration with other agencies, and information on the areas of specialization of scientists of KAU with indices of 91 each.

The information on the area of specialization of scientists of KAU (staff profile) was perceived as the most important information need of research administrators with an index of 96, followed by the information on the research stations/centres in KAU with an index of 94. In this domain, these information are surely very important for allotting and administering research projects.

Table 2 further reveals that there was significant difference among researchers and research administrators with regard to the information needs on cadre strength, research stations/centres in KAU and mandate and mission of DoR, as evident from the Mann-Whitney U results. The information on mandate and mission of DoR is needed for researchers for undertaking research in accordance with it, while the other two items mentioned are needed for administrative purpose. That is why, the high index was registered for researchers for 'mandate and mission of DoR', while research administrators recorded higher indices for the other two items.

4.1. 3. Information needs related to ‘thrust area and PC group’

Table 3. Information needs of researchers and research administrators related to ‘thrust area and PC group’

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researcher	Research administrators	
1	Thrust areas of each PC group	87	92	789.50
2	Possible projects that can be taken up for research in KAU based on thrust area	84	79	806.50
3	Mandate of each PC group	83	83	871.50
4	Chairpersons and members of PC groups	74	94	426.00***

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

In thrust area and PC group’, the information on thrust area of each PC group was perceived as the most important information need by the researchers with an index of 87. While the information on chairpersons and members of PC groups was perceived as the most needed information by the researcher administrators with an index of 94, followed by thrust areas of each PC group (index of 92). Mandate of each PC group was perceived by both the categories as equally important. The researchers and research administrators significantly differed in the information on chairpersons and members of PC groups may be because this was essential for research administrators for administering and monitoring projects through the PC groups, while the information on the members of the group was not essential for the researchers to undertake research.

4.1. 4. Information needs related to ‘contact information’

Table 4. Information needs of researchers and research administrators related to contact information

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researcher	Research Administrators	
1	Contact details of scientists in related fields	89	80	694.00**
2	The contact details of various KAU stations and the heads of the station	85	89	818.50
3	Contact details of Directorate of Research	79	89	625.50***
4	Contact details of scientists of KAU	77	91	580.00***
5	The contact details of other research institutes	74	86	608.00***

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

‘Contact details of the scientists in related fields’ was perceived as the most needed information by the researchers with an index of 89. It may be needed for the researchers to contact other scientists working in related fields to consult as well as to collaborate for research purpose. The contact details of KAU stations and the heads of the stations was perceived as the next important information need of the researchers with an index of 85.

The research administrators perceived ‘contact details of the scientists of KAU’ as the most needed information in this information category with an index of 91. There is a definite need for the research administrators to contact the scientists

associated with different projects for administering and monitoring of the research works.

Table 4 further reveals that there was significant difference among the researchers and research administrators in the information needs under 'contact information', except for the contact details of various KAU stations and the heads of the station. Furthermore, the indices were comparatively higher for the research administrators in almost all cases, except one, showing that the contact information is more important for research administration than conduct of research work. At the same time, the 'contact details of scientists in related fields' is more important for the researchers for interaction and tie up with peers and seniors undertaking research in the same areas of specialization.

4.1. 5. Information needs related to 'procedures/formalities in KAU'

Table 5. Information needs of researchers and research administrators related to procedures/formalities in KAU

Sl. No	Information contents	Information Need Index		Mann-Whitney U
		Researchers	Research administrators	
1	Formalities to be followed for submitting project proposals to KAU	88	87	871.00
2	Formalities for getting/giving Administrative Sanction and Technical Sanction	88	93	801.00
3	Information on Patents, IPR & its procedures	83	80	827.50

In this information category, the formalities to be followed for submitting project proposals to KAU and the formalities for getting/giving administrative sanction and technical sanction were perceived as the most needed information by the researchers with indices of 88 each. Evidently these are the two important items for researchers for initiating a research project in KAU. Whereas the research administrators are concerned with sanctioning of research projects, and consequently perceived the information on formalities for getting/giving administrative sanction and technical sanction as the most important information need with an index of 93. Thus, this item (the formalities for getting/giving administrative sanction and technical sanction) was perceived as the most important information need by both the researchers and research administrators. Interestingly, there was no significant difference among the researchers and research administrators with regard to any of the information needs items in this category, which reveals that the their needs on procedures and formalities are almost similar.

4.1. 6. Information needs related to 'funding agencies for research'

Table 6. Information needs of researchers and research administrators related to funding agencies for research

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researchers	Research administrators	
1	Guidelines for submitting progress of projects to the funding agencies	97	94	835.50
2	Guidelines for submitting project proposals to funding agencies	90	83	810.00
3	The area of specialization of different funding agencies	89	91	864.00

4	Notification and financial support by research funding agencies time to time	89	84	840.00
5	The funding agencies available (that usually fund for projects in agriculture)	88	87	895.50
6	The agencies from whom funds are received in KAU	84	96	611.00***
7	Web URL of funding agencies	73	76	765.00

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

As shown in Table 6, guidelines for submitting progress of projects to the funding agencies was the most essential information of the researchers under this category with an index of 97, followed by the guidelines for submitting project proposals to funding agencies (index of 90). It may be because these information are crucial for the researchers to get continued financial support from external funding agencies.

Information on the agencies from whom funds are received in KAU was perceived by the research administrators as the most needed information in this information category with an index of 96. Information on funding agencies from whom funds are received in KAU is essential for research administrators for the follow up, monitoring and evaluation of research projects. Guidelines for submitting progress of projects to the funding agencies, and the areas of specialization of different funding agencies are necessary for continuous sanctioning of projects and release of funds, and hence are important in the administrators' perspective.

From Table 6, one can also see that there was significant difference between researchers and research administrators in the information need on 'the agencies from whom funds are received in KAU as apparent from the Mann - Whitney U test. The table exposes that the information on the agencies from whom funds are

received in KAU is more needed to research administrators than researchers. There are many funding agencies which fund projects in KAU, whose information is necessary for research administrative purpose; but the same is not that essential for researchers, as they need to know about the agency/agencies from whom funds are/were received for their projects.

4.1. 7. Information needs related to 'services/facilities in KAU'

Table 7. Information needs of researchers and research administrators related to services/facilities in KAU

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researchers	Research administrators	
1	Facilities available in university like soil testing, seed testing and water testing, and the formalities for availing these facilities	91	83	763.00
2	Rules and regulations for external agency/firm for consultancy/trials/product testing	77	86	708.00
3	Information on consultancy services for legal matters	76	84	692.00**
4	Equipment available in KAU	76	78	849.00
5	Germplasm collection of crops	72	81	709.50

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

The facilities available in the university like soil testing, seed testing and water testing, and the formalities for availing these facilities was perceived as the most needed information by the researchers (index of 91), because these facilities may be required for research projects. The most important information need of the

research administrators was the information on rules and regulations for external agency/firm for consultancy/trials/product testing (index of 86). While providing facilities of KAU for external agencies, the rules have to be strictly adhered to, and it may be the reason why this information was perceived as important.

Table 7 also divulges that there was significant difference on the information needs of researchers and research administrators with regard to the information on consultancy services for legal matters. This is definitely more applicable at the top level and hence more needed for research administrators.

4.1. 8. Information needs related to 'general information'

Table 8. Information needs of researchers and research administrators related to general information

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researchers	Research administrators	
1	Updated statistics of Indian agriculture	96	88	758.50
2	Updated statistics of Kerala agriculture	92	92	842.50
3	Updated statistics of Kerala	87	79	764.00
4	Updated statistics of India	74	78	800.00
5	Basic information of National Agricultural Research System (NARS) in India	74	82	691.50
6	Updated statistics of world agriculture	72	82	662.50**
7	Agricultural research systems in other countries	66	80	599.50***

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

Table 8 shows that in the category of general information', the updated statistics of Indian agriculture was perceived as the most essential information by the researchers with an index of 96, followed by updated statistics of Kerala agriculture with an index of 92. Though in reverse order, these two items were the important information needs of research administrators too with indices of 92 and 88 respectively. The latest statistics of Indian and Kerala agriculture are necessary for researchers for framing research plans and justifying research proposals. While, for recommending, approving or sanctioning of projects, the research administrators require these information.

From Table 8, it is seen that there was significant difference in the information needs of researchers and research administrators with regard to updated statistics of world agriculture and agricultural research systems in other countries. This information was comparatively more needed by the research administrators. Though the researchers, in general undertook research in the context of either Kerala or Indian agriculture, the research administrators were watchful of the changes and trends in the world agriculture, may be for adopting positive features in world agriculture and agricultural research systems.

4.1. 9. Information needs related to 'capacity building'

Table 9. Information needs of researchers and research administrators related to capacity building

Sl. No.	Information contents	Information index		Mann-Whitney U
		Researchers	Research administrators	
1	Sources of getting research materials like inputs/equipment for doing research	90	80	636.00***
2	Publishing possibilities	88	80	781.00

3	Poster/paper writing tips	87	73	536.50***
4	Design/layout of experiments	87	80	869.00
5	Statistical tools/analysis	83	80	822.00
6	Information on research forums	82	76	708.00
7	Information on trainings programme	81	61	687.00***
8	Protocols for different types of research	80	83	792.00
9	Research ethics	77	81	767.50
10	Contemporary stake holders' innovation	77	78	831.00
11	ITK in related fields of agriculture (useful for validation)	79	76	754.50
12	Information on types of researches	69	79	692.50**

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

Table 9 indicates that the researchers perceived 'sources of getting research materials like inputs/equipment for doing research as the most needed information in this category with an index of 90. Needless to explain, the information on sources of materials for doing research is vital in procuring good quality materials for research purpose without much delay. The information on publishing possibilities, poster/paper writing tips, design/layout of experiments were also perceived important for capacity building of researchers with indices 88, 87 and 87 respectively. Information on these are practically important for doing research works and for publishing papers which plays a key role in the career advancement of researchers.

It can be noted that, in the category of capacity building, none of the information needs registered a need index of above 83 for the research

administrators. This shows that, the research administrators are more concerned with administration, and are either burdened with the administrative work or are setting less priority for capacity building.

Table 9 further clarifies that there was significant difference between researchers and research administrators regarding four information needs viz. information on sources of getting research materials like inputs/equipment for doing research, poster/paper writing tips, information on trainings programs, and information on types of researches. In this, the first three sets of information items, for which the researchers registered higher indices, are obviously concerned with capacity building of the researchers for the conduct of research/implementation of research projects, and publication of research. It may be the reason for the significant difference.

4.1. 10. Information needs related to ‘publishing of research works’

Table 10. Information needs of researchers and research administrators related to publishing of research works

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researcher	Research administrator	
1	Information on online journals	96	69	837.00
2	Web URL of journals	89	72	362.00***
3	Popular journals in agriculture	88	92	795.50
4	Reference style format of KAU	87	82	795.00
5	Guidelines for publishing research papers	85	82	640.00**
6	Standard global format /style of reference	79	64	611.00***
7	Research publications of KAU	78	74	537.50***
8	NAAS rating of journals	77	63	771.00

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

In the information needs on publishing of research works, the information on online journals was perceived as the most essential information by the researchers with an index of 96, followed by the web URL of journals (index of 89), popular journals in agriculture (index of 88), and the reference style format of KAU (index of 87), whereas the most important information need perceived by the research administrators was the information on popular journals in agriculture with an index of 92.

Significant difference in the information needs of researchers and research administrators was found for four items viz. web URL of journals, guidelines for publishing research papers, standard global format/style of reference, research publications of KAU. It could be further noticed from Table 10 that the researchers' indices for almost all the information items (except one) were higher than those of research administrators. This may be because, this information need category, 'publishing of research works' is of utmost importance to researchers for their career building.

4.1. 11. Information needs related to 'research projects'

Table 11. Information needs of researchers and research administrators related research projects

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researcher	Research administrator	
1	Status of project proposals submitted	90	93	810.00
2	Ongoing research works in KAU	88	97	687.00**
3	Research projects completed	87	89	846.50
4	PG and Ph.D. research works	87	94	690.00**

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

In the category of information needs on research projects, the status of project proposal submitted was perceived as the most important information need by the researchers with an index of 90. It is essential for a researcher to get the proposals processed in time, forwarded to funding agencies, get sanction of the funding agencies, and get the administrative and technical sanction from the University for starting a project work. Naturally the researchers would be curious to know the status of their submission.

The research administrators perceived 'ongoing research works in KAU' as the most needed information (index of 97) in this category, because it is essential to know about the current research works for its administration, monitoring and evaluation. This information need was followed by information on PG and Ph.D. research works, and status of project proposals submitted with indices 94 and 93 respectively.

From Table 11, it was also found that there was significant difference between researchers and research administrators on the need of information on PG and Ph.D. research works and the ongoing research works in KAU. Further, the indices were found to be high for research administrators, as compared to researchers. Thus this category of information needs is more important for research administrators than researchers, as the information items are related to research projects in KAU and its administration.

4.1. 12. Information needs related to 'research reports'

Table 12. Information needs of researchers and research administrators related research reports

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researcher	Research administrator	
1	Abstract reports of completed projects	85	92	764.00
2	Detailed report of projects	81	94	800.00
3	Interim reports on progress of project	72	77	438.50***

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

As seen from Table 12, the information on abstract reports of completed projects was perceived as the most important information need by the researchers in this category with an index of 85. This is in order to get a brief idea of the research works that was done in KAU. Among the research administrators, the detailed report of projects was the most needed information (index of 94), followed by the abstract reports (index of 92), because it was important for them to know almost all the information regarding the research works done in the University for administrative purpose.

From Table 12, one can also see that there was significant difference between researchers and research administrators on the need of information on interim reports of project progress. Furthermore, the research administrators recorded higher indices for all the information needs in this category, because of the necessity of information in this category for research administrators for administration of research works in KAU.

4.1. 13. Information needs related to 'research achievements/technologies'

Table 13. Information needs of researchers and research administrators related to research achievements/ technologies

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researcher	Research administrator	
1	Abstract of research results	92	88	766.50
2	Details of research results	88	98	659.00***
3	Technologies commercialized	87	96	688.00**
4	Technologies for commercialization	87	96	686.00**
5	Information on all the technologies developed	81	86	766.50
6	Technologies recently developed	82	96	577.00***
7	Success stories of technology utilization	78	87	659.00***

***Significant at 1% level ** Significant at 5% level *Significant at 10 % level

Table 13 depicts that the researchers perceived 'abstract of research results' as their most needed information which registered an index of 92. This information is important for the researchers for updating the research findings in agriculture and related areas, which would act as a strong background for academic and research excellence. Whereas, the details of research results was perceived by the research administrators as their most needed information with a very high index of 98 followed by technologies recently developed, technologies commercialized and technologies for commercialization with indices of 96 each. These information are needed for the research administrators for administering research works in KAU, propagating the research results and technologies having practical utility, and upholding the name and fame of the University.

Table 13 further illustrates that there was significant difference between the researchers and research administrators with regard to five information needs viz. details of research results, technologies commercialized, technologies for commercialization, technologies recently developed and success stories of technology utilization. In all these cases, the research administrators registered higher indices, which show that administrators are more concerned with the information in the category of research achievements/technologies.

4.1. 14. Information needs related to honours/ recognitions

Table 14. Information needs of researchers and research administrators related to honours/ recognitions

Sl. No.	Information contents	Information Need Index		Mann-Whitney U
		Researcher	Research administrators	
1	Awards bagged by KAU	83	89	806.00
2	Patents obtained	82	83	810.00
3	Honours/recognition for researchers	73	78	869.00

As evidenced by Table 14, the information on awards bagged by KAU was the most needed information by both the researchers and research administrators in the category, 'honours/recognitions' with indices 83 and 89 respectively. There was no significant difference between the two groups of respondents with regard to any of the information needs in this category, which means that their information needs related to honours and recognition are almost similar.

4.2. Details on individual research projects required for research management

The details required on individual research projects for research management in KAU is classified into two: the basic details of individual research projects and the

details on the progress of research projects.

4.2.1. Necessity of items pertaining to basic details of individual projects

The necessity of items pertaining to basic details of individual projects that are important for research administration, as perceived by the research administrators are given in Table 15.

Table 15. Items pertaining to basic details of individual projects perceived as essential by the research administrators

Basic details	Percentage of respondents
Project title	86.67
Name of Principal Investigator and address	86.67
Code (Project ID) with year status	83.33
Objective of project	80.00
Faculty in which the project is undertaken	70.00
Project Co-ordination group	70.00
Location	70.00
Duration	70.00
Total outlay	66.67
Thrust area	63.33
Activities to be undertaken	60.00
Co- Principal Investigator/s with address	60.00
Budget details	60.00
Key words	60.00
Annual cost (year wise)	56.67
Name and address of Drawing and Disbursing Officer	53.33
Sanctioning year	53.33
Commencement year and date	53.33

Regarding the basic details on individual projects that are required for administration of research projects, as shown in Table 15, more than 50 percentage of research administrators were of the view that items such as project title, name of Principal Investigator and address, code (Project ID) with year status, objective of project, faculty in which the project is undertaken, Project Co-ordination group, location, duration, total outlay, thrust area, activities to be undertaken, Co- Principal Investigator/s with address, budget details, key words, annual cost (year wise), name and address of Drawing and Disbursing Officer, sanctioning year, commencement year and date were essential. These are the items that are required for getting preliminary information and basic idea about all the projects that are being undertaken in the University. Hence these items may be included in the research management information system (to be developed by KAU), before sanctioning each and every project. This may be done at the Directorate of Research.

4.2. 2. Necessity of items pertaining to progress of research projects

The necessity of items pertaining to progress of research projects that are required for research administration in KAU, as perceived by the research administrators is given in Table 16.

Table 16. Details on the progress of research projects perceived as essential by the research administrators

Details on the progress of projects	Percentage of respondents
Research results –highlights	76.67
Deliverables/ technology generated	76.67
Status of projects (Ongoing/completed/Abandoned/not yet implemented)	73.33
Outcome of project	73.33
Expense incurred	70.00

Date of completion	66.67
Actual output of project (quantifiable)	66.67
Patents obtained	66.67
Deviation if any from the objectives set	63.33
Impact	63.33
Difficulties faced by the researcher	60.00
Publications from the project	60.00
Justification for the deviation if any	56.67
Knowledge support in the project	56.67
Practical utility	53.33
Details of Utilization Certificate (UC)	53.33
Success stories	53.33
Case studies	53.33

Among the items pertaining to progress of research projects required for research administration, more than 50 percent of research administrators rated the items such as research results –highlights, deliverables/ technology generated, status of projects (Ongoing/completed/abandoned/not yet implemented), outcome of project, expense incurred, date of completion, actual output of project (quantifiable), patents obtained, deviation if any from the objectives set, impact, difficulties faced by the researcher, publications from the project, justification for the deviation if any, knowledge support in the project, practical utility, details of Utilization Certificate (UC), success stories, case studies as essential. These items would clearly depict the status/progress of research projects in KAU, which in turn would enable easy and efficient administration of research projects including proper supervision, monitoring, and evaluation.

4. 3. Additional links/labels to be set in the web interface

The analysis of information needs of researchers and research administrators was done to identify the navigation bars to be included in the web interface of the Directorate of Research. Other than the information contained in various information need categories used for the analysis, additional links/labels proposed by the respondents were also identified and are presented in Table 17.

Table 17. Links/ labels perceived as essential by the respondents

Links/labels	Percentage of respondents	
	Researchers	Researchers administrators
Feedback forms	68.33	70.00
Location map	60.00	56.67
Photo gallery	55.00	56.67
Search	53.33	76.67
News and events	53.33	53.33
Researcher's forum	51.67	53.33
Letters/ circulars	38.33	53.33

From Table 17, one can see that majority of the researchers and research administrators considered feedback forms, location map, photo gallery, search, news and events, researcher's forum as essential links/labels in the website of Directorate of Research. In case of letters/ circulars, though only 38.33% of researchers perceived it as essential, 53.33% research administrators opined it as essential. Thus these seven links/labels are suggested to be included in the website of Directorate of Research, which would enrich the website in terms of its usefulness. Some respondents demanded for Frequently Asked Questions (FAQ), video gallery, and related links, but majority opined these items as 'not essential'.

4. 4. Format of presentation of the web interface

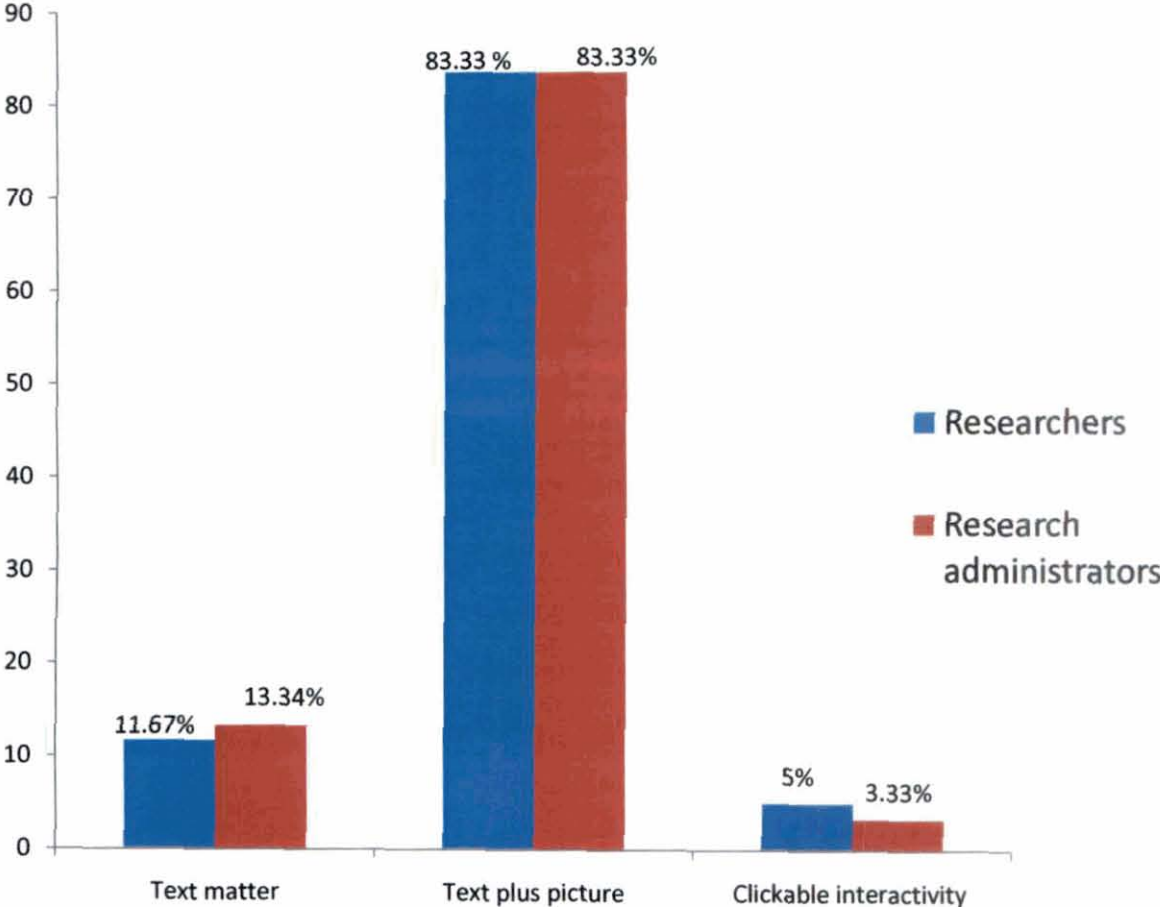
The preferences of the researchers and research administrators towards various formats like text matter, text plus picture, text plus animation and clickable interactivity for the web interface were assessed and the results obtained are presented below:

Table 18. Preference towards various formats of presentation

Preference	Researchers (60)		Research administrators(30)	
	Frequency	Percentage	Frequency	Percentage
Text matter	7	11.67	4	13.34
Text plus picture	50	83.33	25	83.33
Text plus animation	0	0.00	0	0.00
Clickable interactivity	3	5.00	1	3.33

Table 18 and Figure 2 illustrate the preferences of the researchers and research administrators to selected formats of presentation. We can see that 83.33% of both researchers and research administrators preferred text plus picture format of presentation for the website. It may be because, text plus picture makes it easy to comprehend things with clarity and without ambiguity and distraction. Few researchers (11.67%) and research administrators (13.34%) preferred text only. This may be because these researchers and research administrators wanted only scientific data without any pictures. However, none of the respondents preferred the format, text plus animation, as they might have considered this format unsuitable for providing research information. Thus, it can be inferred that the preferred format of presentation of website by the researchers and research administrators is text plus picture.

Figure 2. The preferences of researchers and research administrators towards selected formats of presentation



4.5. Facilities and services for doing research

Facilities and services for doing research in KAU were categorized in to two viz. those available with KAU and those accessible outside KAU. The list of facilities were attempted to be elicited from the respondents.

4.5.1. Facilities and services available with KAU

The facilities and services that were available with KAU to be included in the web interface as suggested by the researchers and research administrators are pesticide residue analysis, soil analysis, microbial analysis, lab/equipment, bio technology centre, bioinformatics centre, libraries, wood quality analysis, timber identification, wild life forensic, statistical packages, plant analysis, extension services, molecular analysis, seed testing/genetic fidelity, disaster management cell, planting materials, consultancy services, instrumentation facilities, computer facilities, product testing facilities, information kiosk, and plant tissue culture.

4.5.2. Facilities and services available outside KAU

The major facility/service accessible outside KAU, as suggested by the respondents was the funding by external agencies. The funding agencies in agriculture that are suggested by the researchers and research administrators to be included in the web interface include Indian Council of Agricultural Research (ICAR), State Horticulture Mission (SHM), Department of Bio-technology (DBT), Indian Council of Forestry Research (ICFR), Department of Science and Technology (DST), Kerala State Council for Science, Technology and Environment (KSCSTE), Kerala State Planning Board, Government of India (GoI), Ministry of Agriculture and Co-operation, National Bank for Agriculture and Rural Development (NABARD), Rashtriya Krishi Vikas Yojana (RKVY), Ministry of Environment & Forests (MoEF), International Foundation of Science, Council of Scientific and Industrial Research (CSIR), Bhabha Atomic Research Centre (BARC),

Defense Research Development Organisation (DRDO), Western Ghat Cell, Kerala Biodiversity Board, Kerala State Pollution Board, Vocational Higher Secondary Education (VHSE), Ministry of Food Processing, Department of Planning and Economic Affairs, Food and Agriculture Organization (FAO), and Sakshat (NME ICT). This is only a suggestive list to which more agencies funding for research in agriculture can be included.

4.6. Monitoring of projects at various levels

4.6.1. Hierarchy of user rights

For effective monitoring, the organisational hierarchy should function properly. Following are the hierarchy of officers presently functioning as the monitoring officers at different levels.

Principal Investigators
Drawing and Disbursement Officers
Heads of the Stations
Project Coordination Groups,
Zonal Directors
Professor (Research Co-ordination)
Associate Director of Research (Monitoring & Evaluation)
Director of Research

The users having user rights can log on to the Online Research Management Information System using the user id and password given to them from the Directorate of Research. Later on they can change the password. Depending on the functions at each level, the user rights in the proposed Online Research Management Information System is specified as hereunder:

The principal investigator can view, make modifications and update information on those research projects/development projects in which he is the principal investigator. The DDO can monitor and make suggestions only on those research projects for which he/she is the drawing and disbursement officer. The Heads of the Stations can see and monitor all the projects that come under their respective station. The PC Groups are authorized to view and monitor all the research projects that come under the purview of the PC Group. Other projects which are not coming under the purview of the above officers cannot be viewed by them. While, Professor (RC), ADR (M&E), and Director of Research can view the details and progress of all the projects and thus can monitor and evaluate all the projects that are being undertaken by the university.

4.6.2. The minimum number of projects to be monitored at different levels

Proper monitoring of research projects is instrumental in creating a good research climate and bringing out good research works and authentic research results. So it should be viewed as an important agenda of the Directorate of Research. The minimum number of projects to be monitored by different monitoring officers as perceived by the researchers and research administrators is presented in Table 19.

Table 19. The minimum number of projects to be monitored by different monitoring officers expressed in percentage.

Monitoring officer	Percentage suggested	Percentage of researchers	Percentage of research administrators
Heads of the stations	100	75.00	93.10
Project coordination group	100	72.22	82.14
Professor (RC)	2	58.82	53.84
ADR (M & E)	5	60.78	50.00
DR	1	60.00	53.57

As seen from Table 19, majority of the researchers and research administrators suggested that the heads of stations and the Project coordination group should monitor 100% of the research projects under their jurisdiction. There was consensus among a large majority of the respondents in this regard. Whereas the minimum percentage of projects suggested to be monitored by Professor (Research Co-ordination) was two percent, Associate Director of Research (Monitoring &Evaluation) was five percent and the Director of Research was one percent. There were some strong dissents among the respondents regarding the minimum percent of projects to be monitored by ADR (M&E) and Professor (RC). They suggested that more percentage of projects should be monitored by them. According to them, ADR (M&E) should monitor at least 50% of the projects, because this ADR is specifically meant for monitoring and evaluation of the research projects. Some even suggested 100 % monitoring by ADR (M&E). Similarly, Professor (RC), who is in charge of research co-ordination in KAU should monitor at least 25% of the projects, while the Director of Research should monitor at least 5% for ensuring efficient and effective functioning of research works in KAU.

4.7. Development of the web interface

Based on the analysis of information needs of researchers and research administrators, several navigation bars were identified for the web interface of the Directorate of Research. Accordingly, a web interface was laid out, designed and developed as a prototype of the website for Directorate of Research. A total of 103 webpages were developed/designed for the interface. Plate 1 shows the home page of the developed web interface.

The Home page has 18 navigation bars/links/labels. Many of the navigation bars has got sub links. The major links/labels identified and included in the interface were: 'About DoR', 'Technologies', 'Research projects', 'Services and facilities',

Plate 1. Home page of the web interface of Directorate of Research developed as part of the study

Home | News & Events | Contact Us | Search

 **Directorate of Research**
Kerala Agricultural University

[About DoR](#) [Technologies](#) [Research Projects](#) [Services & Facilities](#) [Publications](#) [Achievements](#) [Funding Agencies](#)

Welcome...

Welcome to the ICT enabled platform for Research Information, Research Administration and Project Management in Kerala Agricultural University.

The Directorate of Research, Kerala Agricultural University undertakes research and development activities in Agriculture and allied areas, for the benefit of farming community. The research and development activities in the field of Agriculture, Horticulture, Agri. Engineering, Forestry, Co-operation & Banking are implemented through a network of six colleges, six Regional Agricultural Research Stations and 26 research stations along with three instructional farms and seven Krishi Vigyan Kendras spread across the state. In addition to the long-term major research projects namely, All India Co-ordinated Research Projects (AICRP) and All India Network Projects (AINP), a good number of short-term and medium term research and development projects are funded by various agencies such as NHM, SHM, RKVY, KSCSTE, DBT, NABARD, Ministry of Agriculture, Govt. of India, State Planning Board etc. Nearly 1000 research programmes are now being implemented in KAU.

- Reports
- Capacity Building
- Letters/Circulars
- Success Stories
- Researchers Forum
- Feedback

RESEARCH MANAGEMENT INFORMATION SYSTEM
ORMIS



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Plate2. Links and sub links in the homepage of the developed web interface



'Publications', 'Achievements', 'Funding agencies', 'Research reports', 'Capacity building', 'Letters/circulars', 'Success stories', Researchers' forum, 'Feedback', 'Online Research Management Information System', 'Home', 'News and events', 'Contact us' and 'Search'. Plate 2 shows the sub links in each navigation bar/link. The details of the navigation bars/links/labels in the web interface are presented below:

About DoR: The link, About DoR is meant for providing information on the the history, structure, staff details, objectives, functions etc. of the organization. There are seven sub- links. The sub links, 'mandate and mission' would tell about the mandates and mission of DoR, 'thrust area and PC group' give information on the thrust area of each Project Co-ordination group, the mandate of each PC group and the Chairpersons and members of PC group. The sub link, 'Procedures/Formalities in KAU' would provide information on formalities to be followed for submitting project proposals to KAU which provides information on what are the formalities for submitting project proposals to KAU, formalities for getting/giving administrative sanction and technical sanction, information on Patents, IPR and it procedures which provides information on the Patents and IPR as well as the procedures for patenting and claiming intellectual property rights. The next sub-link is the organisational setup which provides the organogram of the Directorate of Research, KAU, information on the contact details of the Associate Directors Research in KAU Head Quarters and other research stations, the contact details of various KAU research stations and the heads of stations. The contact details of scientists of KAU, contact details of other research institutes and contact details of scientists in related fields are also proposed as information for the researchers and research administrators. Though the researchers had a felt need for information on the scientists working in related field it would be difficult to provide this information impartially and exhaustively. The link, 'Research stations/centres' is laid out to

provides information on the various research stations/centres in KAU as well as the links to the websites of these research stations. The sub link, awards/recognitions would tell about the awards that are bagged by the researchers or the Directorate of research. The sub link, Former directors is meant for giving information on former directors in the Directorate of research, with their tenure as Director.

Technologies: The next link in the Home page is the link to technologies. There are 6 sub links in the link technologies. The first sub link 'crop improvement' intends to provide information on the varieties released as well as the crop improvement done in different crops. It is given crop wise. The next sub link is 'crop production' which is followed by 'crop protection'. In these sub links the technologies developed by KAU related to crop production and crop protection aspects of crops are proposed crop wise. The next sub link that follows is the 'post-harvest technology and value addition', which would provide the post- harvest aspects of various crops. The sub- link 'outreach and development' which follows post- harvest technology intends to provide technologies in social sciences including Extension, Economic and Statistics. The last sub link 'others' aims to provide technologies in agricultural meteorology, biotechnology, weed management, apiculture, mushroom, forestry, *integrated farming system*, *agricultural engineering* and food science.

Research projects: Another link in the Home page is the link to 'research projects'. This link is divided into three sub links: Year wise list of projects, PC group wise list of projects and PG and PhD projects. The year wise list of projects would be given under different years. In each year, information on research projects would be given funding agency wise. AICRP projects which cannot be placed under a particular year are given separately. The details of projects proposed to be given includes name of the project, total out lay, duration, date of commencement, target

date of completion and the date of completion. Similarly, PC group wise list of projects in each year and information on plan projects, PG and PhD projects are proposed to be given.

Services and facilities: The next link in the Home page is the link to 'services and facilities. It is categorized into two: Services and Facilities. Under the heading 'services' the sub links provided are agro- advisory services, seeds and planting materials, soil analysis, plant analysis, pesticide residue analysis, microbial analysis and water analysis services in KAU. Under the heading facilities the sub links provided are bioinformatics, biotechnology centre, library and lab equipment in KAU.

Publications: In the link 'publications' the sub links identified are the list of research publications from DoR, annual reports, books/manuals from DoR, bulletins/ leaflets and publication for sales.

Achievements: In the link achievements, the sub links included are 'showcase of technologies' which shows the technologies recently developed, 'technologies commercialized' which gives information on the already commercialized technologies, and 'technologies for commercialization' which provides information on the technologies that are suitable for commercialization.

Funding agencies: The link, 'funding agencies' has been categorized in to sub links viz. local, state, national and international, and in each sub link the areas of specialization of each funding agencies, guidelines for submitting project proposals to the concerned agencies, information on how the progress of project has to be submitted to the funding agencies, and the web URL of funding agencies are provided.

Research reports: The link 'reports' is meant for providing information on the abstract reports of research projects. The sub links included are year wise reports, PC group wise reports, discipline wise reports and station wise reports.

Capacity building: The link is meant for the capacity building of researchers. The items proposed in this link are sources of getting research materials like inputs/ equipment for doing research, Publishing of research works (guidelines for publishing research papers, popular journals in agriculture, web URL of different journals, information on-online journals, Poster/paper writing tips, format of the reference style to be followed in KAU, Standard global formats/styles of reference and NAAS rating of different journals.), Protocols for different types of research, Design/ layout of experiments, Statistical tools/analysis, Information on research forums, Information on trainings programs, workshops, seminars etc., Research ethics, Basic statistics of Kerala, Kerala agriculture, India and Indian agriculture.

Success stories: The link 'success stories' is intended to provide information on the success stories that resulted by the utilization of the technologies developed by KAU.

Online Research Management Information System: The Online Research Management Information System (ORMIS) is a data base platform which would enable efficient monitoring of research projects in KAU. As mentioned earlier, user rights have been restricted to the Principal Investigators, Drawing and Disbursing Officers, Head of the stations, Project Coordination Group, Zonal directors, Professor (Research Co-ordination), Associate Director of Research (Monitoring &Evaluation) and the Director of Research. They can login to the data base using the

given user id and the password (allotted by the Directorate of Research), and can make modifications/update information depending on their user rights. While sanctioning a new research project, the basic details of the project should be entered in ORMIS by the Directorate of Research, whereas the progress of research projects should be updated by the Principal Investigators periodically. The information updated can be viewed by others not having user rights only through the link reports, where only the abstract of reports are provided. Depending on the user rights, researchers/ research administrators will have access in ORMIS. For example, a Principal Investigator will have access, can view and edit data on his research projects only, while the Director of Research will have access and can view all the research projects in KAU, but cannot make editions in the data, instead can give instructions.

Other links/labels: The other links/labels provided in the web interface are: home, news and events, contact us, location map, letters/circulars, researchers forum, feedback and the search link. The news and events link is meant for uploading latest news and events related to Directorate of Research. Similar is the case of letters/circulars. The contact us link provides information on the contact details of the DoR. The Researchers' forum is a platform for the researchers to interact and deliberate on.

4.8. End user assessment of the web interface

As mentioned, the links and proposed contents of the web interface were identified based on the needs of researchers and research administrators, and accordingly the interface was developed. The design of the developed interface was assessed with the help of end users which consisted of both researchers and research administrators. The results of the assessment are presented below:

Plate 3. Interaction with Research Administrators during end user assessment of the web interface

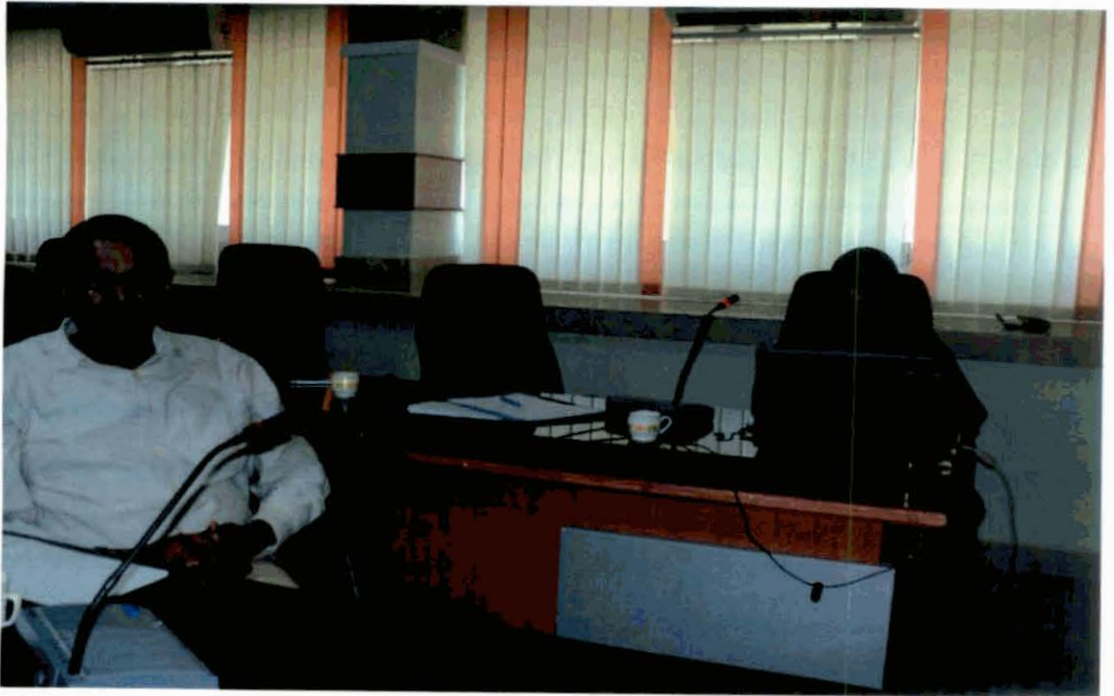


Plate 4. Interaction with Researchers during end user assessment of the web interface



4.3.1. Design of the web interface

Table 20. The quality of various design elements of the web interface as assessed by the end- users

Design elements	Mean score
Organization	3.90
Links and labels	3.89
Navigation	3.87
Home page	3.67
Readability	3.47

A glance of Table 20 reveals that the 'organisation of the web interface; registered the highest mean score of 3.90. This may be because the links and the draft contents of the web interface were arranged in a logical manner. The 'links and labels' and the 'navigation' also registered high mean scores of 3.89 and 3.87 respectively, may be because the end users might have felt that the major links/labels and navigation were appropriate for their use. While, the mean score obtained for readability of the web interface was 3.47, which shows that it requires improvement. Thus it can be inferred that the organization of the interface, the links and labels, the navigation and the home page are of good quality, while the readability needs to be improved.

To have a detailed picture in this regard, the perceived quality of attributes of each design element is presented in Table 21.

Table 21. Quality of attributes of each design element of the web interface, as perceived by the end users

Attributes	Mean score
HOME PAGE	
1. Content of the website (How informative is the home page leading to the inner contents?)	3.89
2. Quick loading of home page (How fast does it load?)	3.78
3. Arrangement of contents (Is the home page properly laid out?)	3.74
4. Appeal (not annoying) (Is the home page pleasant and appealing?)	3.30
NAVIGATION	
1. Quick Navigation (Is it quick to navigate from page to page? (forward and backward))	3.96
2. Easy identification of clickable items (Do clickable items stylistically indicate that they are clickable?)	3.89
3. Enough local navigation (Do major sections have forward and backward local navigations in them?)	3.78
SITE ORGANISATION	
1. Easiness to comprehend (Is the site organization easy to understand?)	3.93
2. Comfort to use (Is the site organization comfortable to work with?)	3.89
LINKS AND LABELS	
1. Distinguishable links (Are links easy to differentiate one another?)	4.00
2. Understandable links (Are content grouping (categorization) easy to understand?)	3.97
3. Identifiable links (In general do the names of the link indicate the purpose for which they are meant?)	3.89

4. Matching to the Organization (Do the links seem to match the mission and activities of the Directorate of Research, KAU?)	3.89
5. Useful to Research Administrators (Do the links seem to cater to the needs of the research administrators?)	3.89
6. Lay out of links (Are the links laid out (set) conveniently in sidebars and other groupings?)	3.84
7. Useful to Researchers (Do the links seem to cater to the needs of the researchers?)	3.76
READABILITY	
1. Line length (Are the line lengths acceptable?)	3.91
2. Fonts (Are the fonts easy to read?)	3.80
3. Design (Is the design appropriate to the intended users i.e. Researchers and Research administrators?)	3.71
4. Content sub-grouping (Is the site easy to scan with your eyes, with chunked (break apart) information?)	3.55
5. Font size (Are the font sizes appropriate?)	3.38
6. Font Colour (Are the font colours appropriate?)	3.37
7. Background colour (Is the background colour appropriate?)	3.11
8. Contrast (Is the contrast between text and its background colour sufficient to make reading easy to the eyes?)	3.06

In the design element, homepage, the attribute ‘content of the home page’ had the highest mean score. This may be because the end users might have found the contents in the home page as informative. Over all, the attributes of the homepage were of good quality. However, the appeal of the home page was having a mean score of 3.30 only, which needed improvement.

In navigation, quickness of navigation was having the highest mean score (3.96), which means that the interface navigates fast. This coupled with easy

identification of clickable items and enough local navigation made the design element, navigation of good quality.

In the design element, site organization, high mean score was registered by the attribute, easiness to comprehend (3.93) followed by the comfort to use (3.89). Thus both the attributes of the site organization was found good.

The quality of all the attributes in 'links and labels' were found good. The distinguishability of links was having the highest mean score (4.00). The links were found distinguishable from one another, with understandable content grouping, identifiable with purpose, conveniently laid out, matching to the organization and useful to both researchers and research administrators.

With regard to the attributes affecting readability, line length, fonts used, appropriateness of the design for intended users, and breaking apart of contents were found good with mean scores of 3.91, 3.80, 3.71, and 3.55 respectively. Notably, the attributes which needed improvement included font size, font colour, back ground colour and contrast. This was mainly because of the less contrast between the font colour and back ground colour.

In short, the web interface developed was of good quality in terms majority of the attributes of the design elements of organization of the interface, links and labels, navigation and the home page, where as it needed improvement in readability by enhancing the contrast between the back ground colour and font colour. The appeal of the home page also needed improvement.

4.8.2. Constraints in using the web interface

For the end- user assessment of the web interface, the sub sample of researchers and research administrators were given chance to use the interface. Subsequently constraints felt by them in using the web interface were elicited. The results in this regard are presented in Table 22.

Table 22. Constraints in using the interface as perceived by the end users

Constraints	Rank
Less contrast due to inappropriate font/ background colour	1
Less font size and inappropriate font - for names of the links	2
Inadequacy of illustrations and graphics	3
The draft contents are too lengthy with complex sentences	4

From Table 22, we can see that ‘Less contrast due to inappropriate font/ background colour’ was the major constraint in using the interface. This coupled with less font size for names of the links (the second ranked constraint) might have made it difficult in reading the contents. Inadequacy of illustrations and graphics and complex sentences in the draft contents were some other constraints faced by the end- users. But development of contents did not come under the purview of this study, still recorded here so as to take care of it while developing the final contents of the website of Directorate of Research.

4.3.3. Suggestions for improving and scaling up of the web interface

The suggestions for improvement of the web interface were also elicited from the end users and are given in Table 23.

Table 23. Suggestions for improving and scaling up of the web interface

Suggestions	Rank
Use contrasting colours to the background for enhanced readability	1
Use san-serif fonts for links and sub-links	2
Better to include success stories in website of Directorate of Extension	3
Include awards and recognition for research only	4
Provide a sub link to Package of Practices of KAU - in link ‘technologies’	5
Provide a link to the reports of completed projects from the link, ‘research projects’	6

Provide a link to Journal of Tropical Agriculture – in link ‘publications’	7
Include Radio Tracer Lab and Bio-control Lab- in link ‘facilities’	8
Include abstract bio-data and photos of the former Directors with their tenure as Director of Research	9
Give ‘Mandate’ and ‘Mission’ statements separately	10

As shown in Table 23, the end users suggested to use more contrasting colours to the font and background for enhanced readability. This is in tune with the results of the evaluation of the design of interface by the users, and the constraints they faced in using the interface. They also suggested to change the serif fonts given for links and sub-links to san-serif. They also demanded for giving the ‘Mandate’ and ‘Mission’ statements separately. Many other suggestions as given in Table 23 were also put forth by the end users, for improving and scaling up of the interface.

Summary and Conclusion

5. SUMMARY AND CONCLUSION

Information and Communication Technologies (ICTs) has now been globally accepted as an important tool for development. The acceptance of ICTs is such that it has made tremendous improvements in the life-styles & efficiency levels of all sectors in the economy. It can very well be utilized for agricultural research management.

The Kerala Agricultural University (KAU) is the prime organization in Kerala involved in agricultural research. The Directorate of Research (DoR) of KAU processes, sanctions, monitor and evaluate all the research works undertaken in the University. It also acts as a knowledge centre of the University in providing information to the policy makers of the State & Central Govt. Hence there should be a system that helps in easy management and monitoring of all the research activities that are being undertaken in KAU. A web portal integrated with a database on research projects would help the DoR in easy administration and management of research projects in KAU. In this backdrop, the present study entitled “Development and validation of a web interface for research management in Kerala Agricultural University” was framed with the following objectives:

1. To analyse the needs of researchers with regard to research management in Kerala Agricultural University
2. To analyse the needs of research administrators with regard to research management in Kerala Agricultural University
3. To lay out a web interface for research management
4. To conduct an end- user assessment of the developed interface so as to suggest appropriate modifications

The study was conducted at Kerala Agricultural University. There were two categories of respondents: 60 researchers who had or were having research projects and 30 research administrators who monitor and evaluate projects. Review of

literature, desktop analysis of the web- sites of research organizations and discussion with non-sample respondents were done. Later, questionnaires were used to collect data on the information needs of researchers and research administrators. In addition, the information contents to be included in the Research Management Information System pertaining to the basic details of individual research projects as well as progress of research projects were identified. The preferences of researchers and research administrators towards various formats of presentation of the web interface, additional links/ labels, and the facilities and services to be included in the web interface were analyzed. Based on the study, a web interface was laid out, designed and developed. Later an end user assessment of the web interface was done in order to assess the quality of the developed web interface. This was done by organizing two end user fora. In the fora, the web interface was demonstrated, and later the participants were given opportunity to use the interface. Questionnaires were used to assess the design elements of the web interface as well as to elicit constrains and suggestions. Frequency, mean, percentage analysis, Kendall's coefficient of concordance and Mann - Whitney U test were used to analyse the data.

The salient findings are summarized below:

1. There was concordance in the rating/ranking of the information needs by researchers under all domains. Similarly there was concordance among the research administrators too in rating the information needs in all domains, either at 1%,5% or 10% level.
2. Among the information content items under 'organisational set up', the information on different sections in the office of Directorate of Research that deals different project categories was perceived as the most important information need by the researchers with an index of 92. The information on the area of specialization of scientists of KAU (staff profile) was perceived as the most important information need of research administrators with an index of 96,

followed by the information on the research stations/centres in KAU with an index of 94

3. There was significant difference among researchers and research administrators with regard to the information needs on cadre strength, research stations/centres in KAU and mandate and mission of DoR,
4. In thrust area and PC group', the information on thrust area of each PC group was perceived as the most important information need by the researchers with an index of 87. While the information on chairpersons and members of PC groups was perceived as the most needed information by the researcher administrators with an index of 94, followed by thrust areas of each PC group (index of 92). Mandate of each PC group was perceived by both the categories as equally important.
5. The researchers and research administrators significantly differed in the information on chairpersons and members of PC groups.
6. In Contact information, 'contact details of the scientists in related fields' was perceived as the most needed information by the researchers with an index of 89. The research administrators perceived 'contact details of the scientists of KAU' as the most needed information in this information category with an index of 91.
7. There was significant difference among the researchers and research administrators in the information needs under 'contact information', except for the contact details of various KAU stations and the heads of the station. Furthermore, the indices were comparatively higher for the research administrators in almost all cases, except one showing that the contact information is more important for research administration than conduct of research work.
8. In the information category, procedures and formalities, the formalities to be followed for submitting project proposals to KAU and the formalities for getting/giving administrative sanction and technical sanction were perceived as the most needed information by the researchers with indices of 88 each. The item

- (the formalities for getting/giving administrative sanction and technical sanction) was perceived as the most important information need by both the researchers and research administrators.
9. In the category 'funding agencies for research', guidelines for submitting progress of projects to the funding agencies was the most essential information of the researchers under this category with an index of 97, followed by the guidelines for submitting project proposals to funding agencies (index of 90). Information on the agencies from whom funds are received in KAU was perceived by the research administrators as the most needed information in this information category with an index of 96.
 10. There was significant difference between researchers and research administrators in the information need on 'the agencies from whom funds are received in KAU'.
 11. The facilities available in the university like soil testing, seed testing and water testing, and the formalities for availing these facilities was perceived as the most needed information by the researchers (index of 91) in the category, facilities and services. The most important information need of the research administrators in this category was the information on rules and regulations for external agency/firm for consultancy/trials/product testing (index of 86).
 12. There was significant difference on the information needs of researchers and research administrators with regard to the information on consultancy services for legal matters.
 13. In the category of 'general information', the updated statistics of Indian agriculture was perceived as the most essential information by the researchers with an index of 96, followed by updated statistics of Kerala agriculture with an index of 92. Though in reverse order, these two items were the important information needs of research administrators too with indices of 92 and 88 respectively.

14. There was significant difference in the information needs of researchers and research administrators with regard to updated statistics of world agriculture and agricultural research systems in other countries. These information were comparatively more needed by the research administrators.
15. The researchers perceived 'sources of getting research materials like inputs/equipment for doing research' as the most needed information in the category of capacity building with an index of 90. The information on publishing possibilities, poster/paper writing tips, design/layout of experiments were also perceived important for capacity building of researchers with indices 88, 87 and 87 respectively. In this category, none of the information needs registered a need index of above 83 for the research administrators.
16. There was significant difference between researchers and research administrators regarding four information needs viz. information on sources of getting research materials like inputs/equipment for doing research, poster/paper writing tips, information on trainings programs, and information on types of researches. In this, for the first three sets of information items, the researchers registered higher indices.
17. In the information needs on publishing of research works, the information on online journals was perceived as the most essential information by the researchers with an index of 96, followed by the web URL of journals (index of 89), popular journals in agriculture (index of 88), and the reference style format of KAU (index of 87), whereas the most important information need perceived by the research administrators was the information on popular journals in agriculture with an index of 92.
18. In the category of publishing of research works, significant difference in the information needs of researchers and research administrators was found for four items viz. web URL of journals, guidelines for publishing research papers, standard global format/style of reference, and research publications of KAU. The

researchers' indices for almost all the information items (except one) were higher than those of research administrators.

19. In the category of information needs on research projects, the status of project proposal submitted was perceived as the most important information need by the researchers with an index of 90. The research administrators perceived 'ongoing research works in KAU' as the most needed information (index of 97) in this category. This was followed by information on PG and Ph.D. research works, and status of project proposals submitted with indices 94 and 93 respectively.
20. There was significant difference between researchers and research administrators on the need of information on PG and Ph.D. research works and the ongoing research works in KAU. The indices were found to be high for research administrators, as compared to researchers.
21. The information on abstract reports of completed projects was perceived as the *most important information need* by the researchers in the category, research reports with an index of 85. Among the research administrators, the detailed report of projects was the most needed information (index of 94), followed by the abstract reports (index of 92).
22. There was significant difference between researchers and research administrators on the need of information on interim reports of project progress. Furthermore, the research administrators recorded higher indices for all the information needs in the category, research reports.
23. Researchers perceived 'abstract of research results' as their most needed information in 'research achievements/technologies', which registered an index of 92. Whereas, the details of research results was perceived by the research administrators as their most needed information with a very high index of 98 followed by technologies recently developed, technologies commercialized and technologies for commercialization with indices of 96 each.

24. There was significant difference between the researchers and research administrators with regard to five information needs viz. details of research results, technologies commercialized, technologies for commercialization, technologies recently developed and success stories of technology utilization. In all these cases, the research administrators registered higher indices.
25. The information on awards bagged by KAU was the most needed information by both the researchers and research administrators in the category, 'honours/recognitions' with indices 83 and 89 respectively. There was no significant difference between the two groups of respondents with regard any of the information needs in this category.
26. Regarding the basic details on individual projects that are required for administration of research projects, more than 50% of research administrators perceived 18 items as essential. Among the items pertaining to progress of research projects required for research administration, more than 50% of research administrators rated 18 items as essential.
27. Majority of the researchers and research administrators considered feedback forms, location map, photo gallery, search, news and events, researcher's forum as essential links/labels in the website of Directorate of Research. In case of letters/circulars, though only 38.33% of researchers perceived it as essential, 53.33% research administrators opined it as essential.
28. It is seen that 83.33% of both researchers and research administrators preferred text plus picture format of presentation for the website of DoR.
29. Facilities and services for doing research in KAU were also elicited from respondents. Twenty one facilities/services inside KAU and 24 funding agencies that fund projects in agriculture were catalogued.
30. The hierarchy of user rights was identified with eight levels. Depending on the functions at each level, the user rights in the proposed Online Research Management Information System was specified.

31. Majority of the researchers and research administrators suggested that the heads of stations and the Project coordination group should monitor 100% of the research projects under their jurisdiction. Whereas the minimum percentage of projects suggested to be monitored by Professor (Research Co-ordination) was two percent, Associate Director of Research (Monitoring & Evaluation) was five percent and the Director of Research was one percent.
32. Based on the analysis of information needs of researchers and research administrators, several navigation bars were identified for the web interface of the Directorate of Research. Accordingly, a prototype web interface was laid out, designed and developed as a platform for the website for Directorate of Research. A total of 103 webpages were developed/designed for the interface.
33. The home page of the web interface has 18 navigation bars/links/labels. Many of the navigation bars has got sub links. The major links/labels identified and included in the interface were: 'About DoR', 'Technologies', 'Research projects', 'Services and facilities', 'Publications', 'Achievements', 'Funding agencies', 'Research reports', 'Capacity building', 'Letters/circulars', 'Success stories', Researchers' forum, 'Feedback', 'Online Research Management Information System', 'Home', 'News and events', 'Contact us' and 'Search'.
34. Regarding the end user assessment of the web interface, it was found that the 'organisation of the web interface registered a high mean score of 3.90. The 'links and labels', and the 'navigation' also registered high mean scores of 3.89 and 3.87 respectively, which shows that , overall, the design of the interface was good.
35. The mean score obtained for readability of the web interface was 3.47, showing that the interface requires improvement in its readability
36. The web interface developed was of good quality in terms majority of the attributes of the design elements of organization of the interface, links and labels, navigation and the home page, where as it needed improvement in readability by

enhancing the contrast between the back ground colour and font colour. The appeal of the home page also needed improvement.

37. 'Less contrast due to inappropriate font/background colour' was the major constraint in using the interface, followed by less font size for names of the links.
38. The end users suggested using more contrasting colours to the font and background for enhanced readability. They also suggested to change the serif fonts given for links and sub-links to san-serif.

Conclusion

There are a number of research works that are being undertaken in KAU by the Directorate of Research. Hence it would be very difficult for the Directorate of Research to manage and monitor all the projects without web support. A web portal integrated with a data base would help to solve this problem to a certain extent. The web interface developed as part of the study is based on the needs of researchers and research administrators in KAU. Since it is stakeholder's need based and demand driven, it would expected to be highly useful to both researchers and research administrators in KAU. With the help of this, information can be stored, modified, and extracted based on the needs of the researchers and research administrators making the research management comfortable. Thus the prototype web interface developed would act as a good platform for developing the web portal for research management in KAU. This web portal was expected to cater to all the information needs of the researchers and research administrator for conducting a research as well as to monitor and evaluate research works. Further, items to be included in the online research management information system were also suggested by the study. If a database/Management Information System is developed and integrated with the web portal, it would definitely act as strong tool for efficient research management in KAU. Hence, the Directorate of Research may take up further value addition, up gradation and updating of the prototype developed.

Suggested areas for future research

1. Further refinement of the prototype, based on the end user assessment, and content enrichment can be carried out so as to develop the final product for research management in KAU
2. An end user assessment of the final version of the website can be taken up
3. Periodic refinement, up gradation, updating and assessment of the final version of the website can be done
4. The final online research management information system can be developed using the results emerged from the present study
5. Similar study can be taken up for developing a web interface for the Directorate of Extension, Kerala Agricultural University.
6. An end user assessment of the online research management information system can also be taken up.

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Appendices

APPENDIX- I

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE
DEPARTMENT OF AGRICULTURAL EXTENSION

Dr. A. Sakeer Hussain

Assistant Professor

Dear Sir/ Madam

Ms. Shely Mary Koshy (2011-11-168) is undertaking a study titled "Development and Validation of Web Interface for Research Management in Kerala Agricultural University" as part fulfillment of her PG programme under my guidance.

This study aims to analyze the needs of researchers and research administrators with regard to research management in Kerala Agricultural University. It is also envisaged to lay out a web interface for research management, and to conduct an end- user assessment of the developed interface so as to suggest appropriate modifications.

As a result the study intends for developing a need based web interface for research management in KAU, providing necessary information to researchers for research purpose and providing data/ information to research administrators for project monitoring and management.

Sparing your valuable time in responding this questionnaire will be helpful in developing a web interface for the Directorate of Research.

Thanking you

Vellanikkara
07.08.2012

Yours faithfully
(Dr. A. Sakeer Hussain)

APPENDIX- I

KERALA AGRICULTURAL UNIVERSITY
Department of Agri. Extension, College of Horticulture
Vellanikkara, Thrissur

Development and validation of a web interface for research management in
KAU

QUESTIONNAIRE

(For Academic purpose only)

Name of the PG Scholar: Shely Mary Koshy

Major Advisor : Dr. A. Sakeer Husain

Kindly note: This is a need-oriented study demanded by the Directorate of Research, KAU. The study is for 1) analyzing the needs of researchers with regard to research management in KAU 2) laying out the needs-based web interface for research management in KAU and 3) to conduct an end user assessment of the developed web interface. Therefore, in addition to giving responses to the questions below, please give your suggestions in each area.

I. As a Researcher, Kindly state what are your information needs, that can be provided through a website, for conducting research works in KAU.

Please rate the necessity of following items, based on the needs you feel for conducting research works in KAU and for getting relevant information. Please put a tick mark against the item which you feel is necessary to know by a researcher in KAU. Put a tick (✓) mark in the appropriate column

1. Organizational set- up	Essential	Needed	Not needed
History of Directorate of Research			
Mandate and mission of DoR			
Information on different sections in the DR's office that deals different project categories			
Collaboration university has with other agencies			
Former Directors of Research			

Organizational structure (organogram)			
Research Stations/Centres in KAU			
Area of specialization of scientists of KAU (staff profile)			
Cadre strength			
2. Thrust area and PC Group	Essential	Needed	Not needed
Chairman and members of PC group			
Mandate of each PC group			
Thrust area of each PC group			
Possible projects that can be taken up for research in KAU based on thrust area			
3. Contact information	Essential	Needed	Not needed
Contact details of Directorate of Research			
The contact details of various KAU stations and the heads of the station			
The contact details of other research institutes			
Contact details of scientists of KAU			
Contact details of scientists in related fields			
4. Procedures/ Formalities in KAU	Essential	Needed	Not needed
Formalities to be followed for submitting project proposals to KAU			
Formalities for getting Administrative Sanction and Technical Sanction			
Information on patents, IPR & its procedures			
5. Funding agencies for research	Essential	Needed	Not needed
The funding agencies available (that usually fund for projects in agriculture)			
Guidelines for submitting project proposals to funding agencies			
The area of specialization of different funding agencies			
The agencies from which funds are received in KAU			
How the progress of project has to be			

submitted to the funding agency			
Web URL of funding agencies			
Notification and financial support by research funding agencies time to time			
6. Services/ Facilities in KAU	Essential	Needed	Not needed
Rules and regulations for external agency/firm for consultancy/trials/product testing			
Information on consultancy services for legal matters			
The equipment available in university			
Various facilities available in university i.e. soil testing, seed testing, water testing etc. and the formalities to be undergone to avail these facilities			
Availability of plant germplasm collection of different crops			
7. General information	Essential	Needed	Not needed
Updated statistics of Kerala			
Updated statistics of Kerala agriculture			
Updated statistics of India			
Updated statistics of Indian agriculture			
Basic information of National Agricultural Research System (NARS) in India			
Updated statistics of world agriculture			
Agricultural Research Systems in other countries			
8. Capacity building	Essential	Needed	Not needed
Information on research ethics			
Information on types of researches			
Protocols for different types of research			
Design/ layout of experiments			
Statistical tools/analysis			
Publishing possibilities			
Poster/ paper writing tips			
ITK in related fields of agriculture (useful for validation)			
Contemporary stake holder's innovation			

Information on workshops, seminars etc.			
Information on trainings applicable to researchers			
Sources of getting research materials like inputs/ equipment for doing research			
9. Publishing of research works	Essential	Needed	Not needed
Popular journals in agriculture			
Research publications of KAU			
Guidelines for publishing research papers			
Web URL of different journals			
Format of the reference style to be followed in KAU (Journal of Tropical Agriculture)			
Different standard global formats of reference styles			
Information on online journals			
NAAS rating of different journals			
10. Research projects	Essential	Needed	Not needed
The research works completed in KAU			
The research works presently undergoing in KAU			
Status of project proposals submitted			
Information on PG and PhD research works			
11. Research reports	Essential	Needed	Not needed
Abstract of the findings of research work completed			
Interim reports of project progress			
Detailed report of projects			
12. Research achievements/ Technologies	Essential	Needed	Not needed
Abstract of research results			
Details of research results			
Technologies commercialized			
Technologies for commercialization			
Technologies recently developed			
Information on all the technologies developed			
Success stories of technology utilization			

13. Honours/ Recognitions	Essential	Needed	Not needed
Information on the awards that are bagged by KAU and the item for which it was awarded			
Patents obtained			
Recognition for researchers and the work that was honoured			

II. 1) What format of presentation do you prefer in the web interface?

Text matter/ text plus picture/ clickable interactivity

2) Other than the information contained above, what are the items you propose to be included in the website of DoR

Other information	Essential	Needed	Not needed
Location map			
FAQ (Frequently Asked Questions)			
Feedback forms			
Video gallery			
Photo gallery			
Researchers' forum			
Letters/Circulars			
News and events			
Related links			
Others, if any (Please mention)			

3. Following are some publications that can be included in the website: **Research highlights, Annual Report, Bulletins/leaflets, Online newsletter, Books/Manuals, Vision Document (Vision2030)**

Please mention other Publications that can be included in the website

4. Some of the funding agencies in agriculture include Indian Council of Agricultural Research (ICAR), State Horticulture Mission (SHM), Department of Bio-technology (DBT), Indian Council of Forestry Research (ICFR), Department of Science and Technology (DST), Kerala State Council for Science, Technology and Environment

(KSCSTE) and Kerala State Planning Board. Mention other funding agencies about which information is to be provided through the website-

.....

5. In your opinion how frequently should the research/project reports be submitted? Please give your justification along with your opinion

Fortnightly/Monthly/ Quarterly /Biannually /Annually (Others, specify)

Justification:

6. What is your preference for categorizing information on Research projects/ results

	Please put a tick mark
PC group wise	
Station wise	
Discipline wise	
Scientist wise	
Year wise	

Suggestions,if any:.....

7. The facilities and services in KAU that can be included in the website covers Pesticide residue analysis, Soil analysis, Microbial analysis, Lab/ equipment, Bio technology centre, Bioinformatics Centre, and Libraries

a) Please mention other facilities and services that can be added

.....

b) Suggestions, if any:

8. Based on the information/data (report) fed by the Principle investigator on KAU Research Management Information System, Supervision, Monitoring and Evaluation of the project is to be done by the higher ups.

a) Is functioning of the project to be graded (like excellent-good-average-poor-very poor): (Please give your response by putting a tick mark (✓))

Needed /not needed

b) **If needed**, please give your justification and comments :

.....

c) **If not needed**, alternate suggestions:.....

d) What are the items to be included in the report of the supervising/monitoring/evaluating officer?

Specify:

9. a) The projects are to be monitored at various levels. In your opinion how much percentage of projects should be monitored at each level, based on the data/information fed by the PIs in the MIS?

Monitoring officer	Percentage suggested	Agree/disagree	Alternate suggestion (%)	Justification
Head of the station	100	A / D%	
Project coordination group	100	A / D%	
Professor RC	2	A / D%	
ADR (M & E)	5	A / D%	
DR	1	A / D%	

b) Your suggestions (specify):-

.....

If you have any other suggestions, please write:-

.....

Your Name:

Address :

Thank you sir/madam.

APPENDIX- II

Questionnaire for the Evaluation of Web Interface

Dear Sir/ Madam

You are participating in the End-User Assessment Workshop of the web interface for Directorate of Research, Kerala Agricultural University. Please express your opinion about the effectiveness of the web interface. Please put tick (✓) marks in appropriate columns given based on your opinion or preference on the following statements.

	1 (Very poor)	2 (Poor)	3 (Fair)	4 (Good)	5 (Outstanding)
1. HOME PAGE					
1. Content of the website (How informative is the home page leading to the inner contents?)					
2. Arrangement of contents (Is the home page properly laid out?)					
3. Appeal (not annoying) (Is the home page pleasant and appealing?)					
4. Quick loading of home page (How fast does it load?)					
2. NAVIGATION					
1. Quick Navigation (Is it quick to navigate from page to page? (forward and backward))					
2. Enough local navigation (Do major sections have forward and backward local navigations in them?)					
3. Easy identification of clickable items (Do clickable items stylistically indicate that they are clickable?)					

3. SITE ORGANIZATION					
1. Comfort to use (Is the site organization comfortable to work with?)					
2. Easiness to comprehend (Is the site organization easy to understand?)					
4. LINKS AND LABELS					
1. Understandable links (Are content grouping (categorization) easy to understand?)					
2. Distinguishable links (Are links easy to differentiate one another?)					
3. Identifiable links (In general do the names of the link indicate the purpose for which they are meant?)					
4. Lay out of links (Are the links laid out (set) conveniently in sidebars and other groupings?)					
5. Content appropriateness (Do the provided links cater to the expected contents?)					
6. Matching to the Organization (Do the links seem to match the mission and activities of the Directorate of Research, KAU?)					
7. Useful to Researchers (Do the links seem to cater to the needs of the researchers?)					
8. Useful to Research Administrators (Do the links seem to cater to the needs of the research administrators?)					

5. READABILITY					
1. Fonts (Are the used fonts easy to read?)					
2. Line length (Are the line lengths acceptable?)					
3. Content sub-grouping (Is the site easy to scan with your eyes, with chunked (break apart) information?)					
4. Background colour (Is the background colour appropriate?)					
5. Font Colour (Are the font colours appropriate?)					
6. Font size (Are the font sizes appropriate?)					
7. Design (Is the design appropriate to the intended users i.e. Researchers and Research administrators?)					
8. Contrast (Is the contrast between text and its background colour sufficient to make reading easy to the eyes?)					

Constraints in using the web interface

- 1.
- 2.
- 3.
- 4.
- 5.

Suggestions for modification of the web interface

- 1.
- 2.
- 3.
- 4.
- 5.

Thank you Sir/Madam

Abstract

**DEVELOPMENT AND VALIDATION OF A WEB INTERFACE
FOR RESEARCH MANAGEMENT IN KERALA
AGRICULTURAL UNIVERSITY**

by

SHELY MARY KOSHY

(2011- 11- 168)

Abstract of the thesis

**Submitted in partial fulfillment of the
requirement for the degree of**

MASTER OF SCIENCE IN AGRICULTURE

(Agricultural Extension)

Faculty of Agriculture

Kerala Agricultural University

2013

DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF HORTICULTURE

VELLANIKKARA, THRISSUR- 680656

8. ABSTRACT

Kerala Agricultural University (KAU) is the prime organisation in Kerala involved in agricultural research. Research activities in KAU are organised and conducted at six Regional Research Stations, 16 Research Stations, some specialised centres of research and studies, Instructional Farms, and in the laboratories of various departments of the colleges. It is very difficult to manage and monitor all these research projects by the research administration in KAU without a Management Information System (MIS). A web interface which can be integrated with a data base will solve this problem to a large extent.

The present study entitled "Development and validation of web interface for research management in Kerala Agricultural University" was taken up in this background to identify the information needs of researchers and research administrators, to develop a web interface for research management and to conduct an end user assessment of the developed web interface. Sixty researchers and 30 research administrators were selected for the study. Thirteen research need domains were identified and there were 77 information need items under 13 domains.

The study showed that there was significant concordance in the rating/ranking of the information needs by researchers under all domains. The information needs mostly needed by the researchers included information on different sections in the DR's office that deals with different project categories, collaboration the university has with other agencies, areas of specialization of scientists of KAU, guidelines for submission of progress of project to the funding agencies, guidelines for submitting project proposals to funding agencies, various facilities available in the university for research, formalities to be undergone to avail these facilities, updated statistics of Indian agriculture, updated statistics of Kerala agriculture, sources of getting research materials like inputs/ equipment for doing research,

information on online journals, status of project proposals submitted, and abstracts of research results.

The research administrators' major information needs included information on area of specialization of scientists of KAU, research stations/centres in KAU, information on different sections in the DR's office that deals different project categories, chairpersons and members of PC groups, thrust area of each PC group, contact details of scientists of KAU, formalities for getting/giving administrative sanction and technical sanction, agencies from whom funds are received in KAU, guidelines for submission of progress of project to the funding agencies, areas of specialization of different funding agencies, updated statistics of Kerala agriculture, popular journals in agriculture, research works presently undergoing in KAU, information on PG and Ph.D. research works, status of project proposals submitted, detailed report of projects, abstract reports of the research work completed, details of research results, technologies commercialized, technologies for commercialization, and technologies recently developed. The significant difference, if any, among researchers and research administrators on each of the information needs were also assessed using Mann-Whitney U test.

In addition, the details on individual projects to be included in the Management Information System (MIS) required for research management, additional links/labels in the web interface, the preferred format of presentation of the website, the facilities and services for doing research in KAU that are to be included in the web interface were also identified.

Based on the above analysis, a web interface was developed as a prototype of the website for Directorate of Research. The interface was developed using HTML and designed with a simple cascade style sheet. There are 18 links in the homepage with a total of 103 web pages. The end user assessment of the web interface revealed that among the six design elements such as 'home page', 'navigation', 'organization', 'links and labels' and 'readability' that were used to assess the web

interface, the readability of the web interface needed more improvement. The constraints in using the web interface as well as suggestions for improvement and scaling up of the interface were also elicited. The prototype developed as part of the study will be handed over to the Directorate of Research, KAU for content enrichment as per the suggestions of the study.