

STUDY REPORT

SR 281 (2013)

Summary of the Implementation of a Fire Research Federated Search Element

A.P. Robbins



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Preface

This is the final summary report prepared during the development and implementation of a search element for a list of various fire research repositories internationally.

Acknowledgments

This work was funded by the Building Research Levy.

Note

This report is intended for fire researchers, and information managers.

Summary of the Implementation of a Fire Research Federated Search Element

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A. P. Robbins

Reference

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Abstract

This is a summary of the development and implementation of a fire research search element developed to facilitate the electronic search of international fire research literature in a single location.

The fire research community has large amounts of ever-growing research outputs and information in a vast array of formats located in discrete repositories around the world. This fragmented environment is collectively inefficient, resulting in a loss of unidentified opportunities to use research outputs, increasing duplication and limiting project sizes, scope and impact. There is an opportunity to more effectively utilise our fire information.

To improve the search process and access to relevant fire research and fire safety information, a collaborative effort was undertaken to develop and implement a federated search element for the international fire community. A federated search tool is located on a single website, through which a user can search a collection of online fire repositories, web-based information and databases to locate relevant papers from a wide range of sources.

This is an emerging and dynamic project, and this report is a summary of the underlying concept and its successful implementation, and provides details on how the search element can be incorporated into any existing HTML webpage to provide a localised portal to the international collection of repositories.

An example implementation of the federated fire research search element is located at: http://www.branz.co.nz/Fire_Information_Element_Google_Search as well as other remote locations across the Internet.

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1. INTRODUCTION

The fire research community has large amounts of ever-growing research outputs and information in a vast array of formats located in discrete repositories around the world. This fragmented environment is collectively inefficient, resulting in a loss of unidentified opportunities to use research outputs, increasing duplication and limiting project sizes, scope and impact. There is an opportunity to more effectively utilise our fire information.

To improve the search process and access to relevant fire research and fire safety information, a collaborative effort was undertaken to develop and implement a federated search element for the international fire community. A federated search tool is located on a single website, through which a user can search a collection of online fire repositories, web-based information and databases to locate relevant papers from a wide range of sources.

This is an emerging and dynamic project and this report is a summary of the underlying concept and its successful implementation. Details on how the search element can be incorporated into any existing HTML webpage to provide a localised portal to the collection of international fire research repositories are provided in Appendix A.

The current situation in many research fields is that projects are carried out by individuals, groups or organisations, where the communication with others in the research field relies heavily on written publications, including journal papers (which can take years to be published) or intermittent conference attendance. This fragmented community environment is collectively inefficient, resulting in increased duplication and the limiting of project sizes, scope and impact. There is a lack of collaboration, cooperation, as well as basic communication and a loss of unidentified opportunities to use research outputs and establish more robust research programmes through the communication of ideas. These inefficiencies are recognised problems across many research fields (Bos et al., 2007, Yu et al., 2008, Albors et al., 2008, Oxford, 2007, Hodgkinson-Williams et al., 2008, Fraser, 2005, Kiernan, 1997).

The situation is similar in our fire research fields and for non-researchers or researchers from other fields who wish to identify useful information within the fire fields. We currently have large amounts of information in a vast array of formats and continually produce new information at an increasing rate. We have the opportunity to more efficiently utilise this valuable resource.

Improved communication using virtual (web- or technology-based) communities has been identified as a fundamental characteristic for the future of efficient research in fields as diverse as humanities to hard sciences and interdisciplinary fields (Bos et al., 2007, Yu et al., 2008, Albors et al., 2008, Oxford, 2007, Hodgkinson-Williams et al., 2008, Robbins, 2009, Fraser, 2005, Kiernan, 1997). The unifying component of every community is to share information.

A preliminary survey was conducted within our fire research community as part of a broader scoping study (Robbins, 2009), providing useful insights into the processes that are currently employed by researchers or non-researchers investigating a particular fire-related problem or identifying other information as part of their work.

The results of this survey highlighted some of the current processes and tools that were being used for the initial scoping process of new ideas and concepts for research proposals and subsequent in-depth literature reviews. A marked difference in the extent and value of interpersonal networks was clear between early-career researchers and established experts. However, there was still an overall need and

desire identified for better communication, utilising all forms of media, within the field. The foremost self-identified need in the survey was information availability. Suggested aspects included (Robbins, 2009):

- Centralised repositories
- Access to large databases with powerful search engines
- A way of receiving briefs about ongoing research activities in relevant/selected areas
- Information on current research projects, and
- Information on what has been done or written versus anecdotal information, e.g. why researchers did not go down a certain track or what did not work

Some of these desirable aspects are not practical for the way in which our community currently works, because many groups have various information storage and distribution methods and policies. However, one key identified opportunity was to develop a single location or an element (i.e. a tool) that could be located on various websites and by accessing the same search engine and list of repositories, searches could be made through the array of fire-research-related repositories around the world (i.e. a federated search).

This report is a summary of the development and implementation of a collaborative project to design and implement a federated search element for the virtual collation of repositories of the international fire research community.

2. FEDERATED SEARCH ELEMENT PROJECT OBJECTIVE

The overall strategic objective of this collaborative project was to contribute to the international fire community by increasing the efficiency of research through succinct access to relevant and useful information and data.

The original objective of the collaborative project was to provide a successful tool at a centralised location that provides intuitive, concise and useful access to identifying and locating publications and other literature that are relevant to research within the international fire community.

During the course of the project it was identified that having access to the tool through a single portal meant that access was vulnerable to localised site outages (planned or unplanned). Therefore the project objective was modified to address this vulnerability. The updated working objective was:

- To develop a successful tool that can be embedded in various sites that provides intuitive, concise and useful access to identifying and locating publications and other literature that are relevant to research within the international fire community by the use of a centralised search engine and defined list of repository locations

3. FEDERATED SEARCH ELEMENT DESCRIPTION

A federated search element is a tool that provides a single access point for a user to search through a virtual collection of many repositories (e.g. **Error! Reference source not found.**, where the various repositories are represented by R1, R2, etc.). Each repository is owned and maintained by a partner organisation, institution or society

and, at the minimum, the abstracts of the contents of the repository are accessible by the users via the search element.

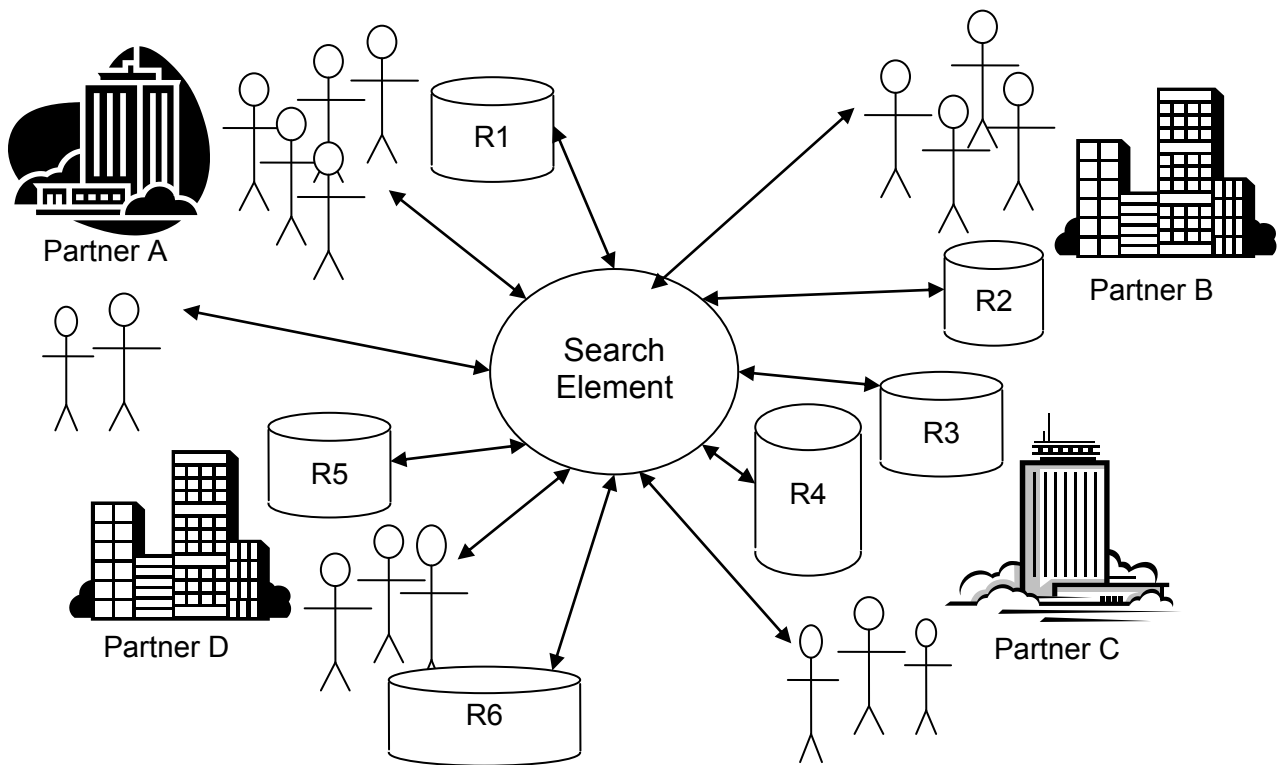


Figure 1. Schematic of an example of a federated search element, where repositories of information are represented as R1, R2, etc.

With the agreement of the owner of each repository, materials that are subject to copyright are included in the search functionality and a summary list returned (e.g. abstracts, etc.) to the user. Subsequent access to any copywrite-protected information is then dependent on the individual user's subscriptions.

The search element that was developed for the fire research community was targeted to fire researchers. The search functionality and presentation of the search results has been tailored and shaped by feedback and contributions from the community. This information was collected through feedback from the users throughout the initial testing and the alpha phase of the public release.

Examples of field-specific search elements developed for other fields of interest include sciotopia.org (Sciotopia, 2010) for science research, and the Sage Infobase Search (Sage, 2010) that was designed, implemented and targeted for mathematicians by mathematicians.

A schematic of the project outcomes, objectives, design and implementation elements and core design principles utilised in the development of the federated search element for the fire research field is shown in Figure 2.

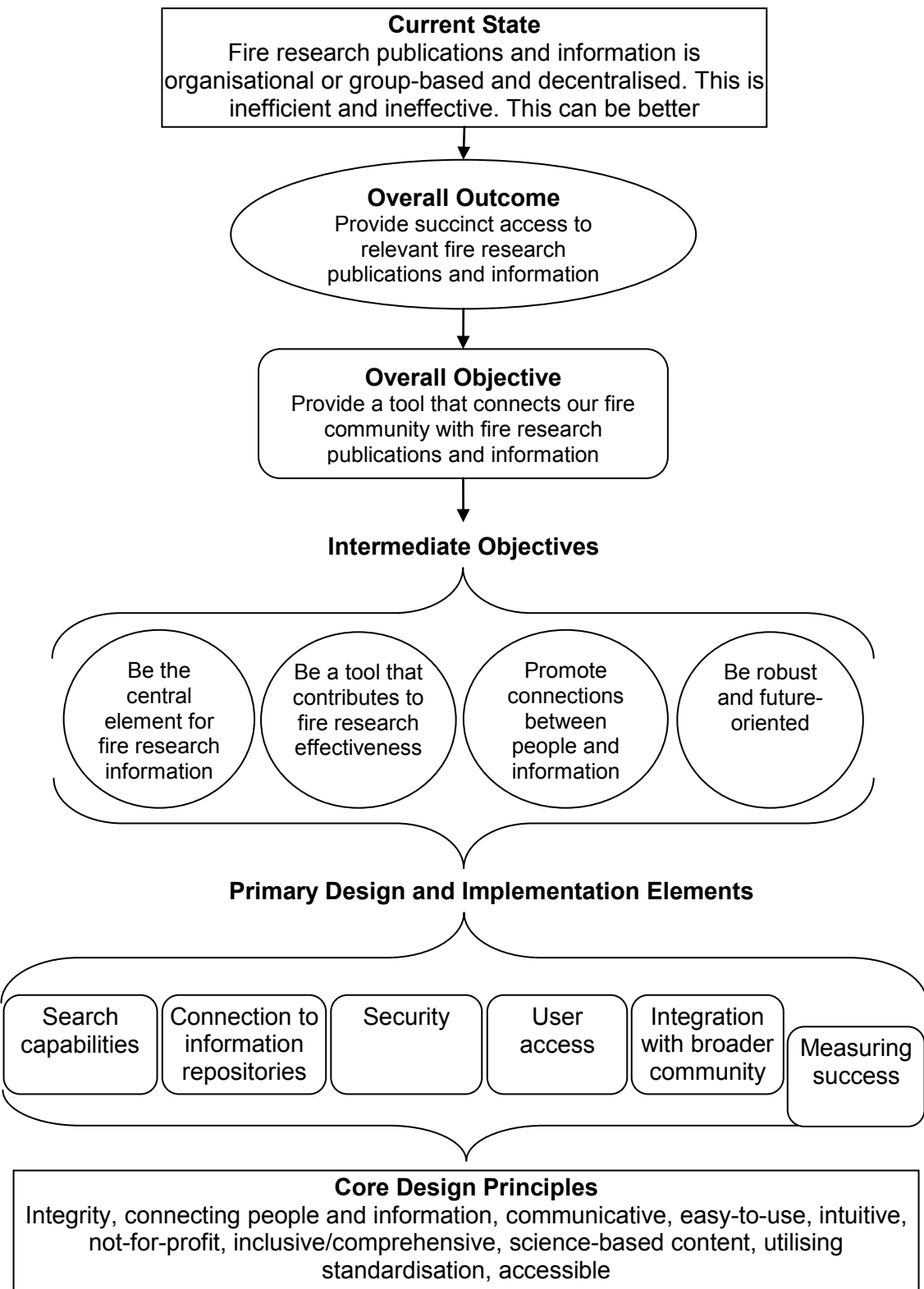


Figure 2. Schematic of the Federated Search Element project outcomes, objectives, design and implementation elements and core design principles

3.1 Core Design Principles

The core design principles that were chosen for the Federated Search Element project were:

- Integrity
- Connecting people and information
- Communicative
- Easy-to-use
- Intuitive
- Not-for-profit
- Inclusive/comprehensive
- Science-based content
- Utilising standardisation content tagging
- Accessible

These principles were selected to ensure that a useful tool was produced that covers the wide range of fire fields, identifies and locates useful science-based content of a minimal known level of detail and that use of the tool is accessible to everyone. In addition, the expected conduct of participants is transparent at all levels and users' expectations of the results from the tool are also clear.

3.2 Intended Users

Initially, the intended users of the federated search element were described as the international fire research community and this project was labelled International Fire Research Federated Search Element. The “research” part of the title had a tendency to inadvertently turn away non-researchers. Considering the concept that exposure to a wider audience results in unanticipated benefits and cross-fertilisation, it therefore follows that dissemination of the information produced by researchers is not intended to target researchers only and that it should be easily accessible to all who would be capable of utilising it, including but not limited to engineers, practitioners, researchers, model developers, regulators, etc.

Therefore the intended users include international fire researchers and researchers of directly and indirectly-related fields, fire safety/protection engineers, other building-related engineers, fire safety practitioners, fire model developers, building regulators, etc.

3.3 Timing

The design and implementation of this search element coincided with a number of other inter-related projects being undertaken by various organisations throughout the fire research community. These projects included developing and implementing strategies to ensure future access to digital repositories and other data currently available, as well as bringing older information online and ensuring the consistency and accessibility of future information. Where possible, this project was aligned with these other strategic projects to afford the most useful tool for the intended audience.

3.4 Future Opportunities

In addition to the value of having efficient, targeted search capabilities in a single location, the search element forms the initial building block around which other tools and functionality can potentially be built that will further aid in the efficiency of the dissemination and collation of information associated with the international fire community and the diversity of the intended users.

4. BREAKDOWN OF THE SEARCH ELEMENT

The design and implementation of the federated search element was divided into six major elements:

- Search capabilities
- Connection to information repositories
- Security
- User access
- Integration with the community
- Measuring success

A summary of each aspect of the search element development and implementation follows.

4.1 Search Capabilities

The objective of this aspect of the development of the search element was to define the functionality and features of the search element in terms of usability when initialising a search and presenting subsequent search results.

The initial part of this aspect was to identify the search-specific needs of the community from a series of short surveys and targeted interviews. This also formed the key stage of the entire project, since a general description was produced of what the search element would look like and how it was intended to work.

This aspect formed a snapshot overview of how intended users access information, what information they access and what functionality they would like to have access to. From this point, the description of the search element was formed in terms of the functionality and capabilities to be implemented. Once the search functionalities and form of presentation of the search results was fully described, then the best implementation tools were selected to meet these requirements.

4.1.1 Identified Search Element Capabilities

The top-four search capability priorities identified by potential users of a fire-research-focused search element were:

1. A single location with access to all the information
2. Access to full papers (however, the practicality is that this is dependent on individual subscriptions)
3. Range/types of repositories included in the search

4.2 Connection to Information Repositories

The objective of this second aspect was to first identify the current repositories that will be included in the initial list of searchable databases and repositories. All of the connection or permission aspects related to each repository were also identified.

Strategies for identifying linkage or data failures to current repositories were considered. However, direct feedback from users proved to be the most useful and efficient in this instance, since the context of the failure could be provided by the individual that expedited the identification of the specific problem and subsequent solution.

Strategies to identify new repositories for inclusion were developed and suggestions for future strategies for maintenance or standardisation of current repositories to maximise searchability were considered. Identification of those repositories via users' word of mouth proved to be the most effective method.

Similar to the approach in the first aspect, a snapshot of the current state and accessibility of repositories was initially compiled. The results of this snapshot were useful in determining the most efficient search strategies and resulted in potential search functionality and capabilities feeding back into the search capabilities.

As part of the completion of this aspect of the project, guidance was provided for repository custodians who wished to be included in the federated search element. This provided transparency for those repository owners who became involved after the initial launch and provided discussions with repository owners of potential future-proofing strategies to keep information available and useful.

4.2.1 Current State of Repositories

The current state of relevant fire research repositories varied in terms of details of storage format, indexing/taxonomy used, text searchability, levels of subscriber access and strategy development for future-proofing accessibility of information.

Producing a functional search element was the key priority. Therefore it was desirable that the search element had the widest functionality to incorporate as many repositories as possible in a useful manner.

A list of repositories included in the search element is presented in Appendix B.

4.3 Security

The level of required security for the search element was quantitatively estimated and avoidance or mitigation strategies were considered, where appropriate.

The level of security and how this would be implemented was estimated based upon the assessment of the types of information that will be available and estimates of the risk level associated with this. For instance, different levels of security may be appropriate for different aspects of the search element.

It was determined that the simplest approach would be to minimise all security risks by maintaining an independent search element from the ownerships of the repositories. Therefore only publicly-accessible information was targeted in the initial search functionality and "full-paper" access for commercial frameworks remained with the individual user.

4.4 User Access

An important aspect of this project was that access to the federated search element would be free to all users. This relates to the search element and the search information returned by the search element.

Some full-content papers are subject to an individual's subscriptions; however, the search element provides identification of the potentially-useful information and a link that the user can follow to either use their subscription, where appropriate, or purchase the particular paper.

An individual user gains access to the search element through a publicly-accessible website. No restrictions have been made as to who can use the search element.

Requiring a user to register and login to the element would have allowed a certain level of personalised filtering or other individually-tailored settings to be utilised. However, this type of functionality was not deemed to be of high importance when compared with immediacy of access to the functional search element.

4.5 Integration with the Community

The objective of this aspect was to identify potential features or functionality that may be utilised to keep users actively using the search element and attracting new users to the element.

Consideration was given to including the search element in a community-based website, such that there would be multiple fire-related aspects that would draw users back to the site. However, implementation within the website was found to be cumbersome in terms of approval processes within the framework of the community-based website committee. An alternative and functional approach was taken, to utilise multiple remote websites that the fire research and related areas already use for other reasons, in addition to the community-based website. This approach provides the added benefit of continuity of user access through the redundancy of local instances of the element. That is, if any one website that has the search element within it experiences a failure of service, then the search element can still be accessed from any of the other local instances.

4.6 Measuring Success

The objective of this aspect was to identify potential strategies for measuring and reporting the success of the search element in terms of usage and usefulness.

The information gathered in measuring the success of the federated search element was quantitative, in terms of the number of instances of usage over time (e.g. the number of distinct queries, which may have had several search iterations performed by the individual user as shown in Figure 3) and qualitative, in terms of individual user feedback of the usefulness of the element.

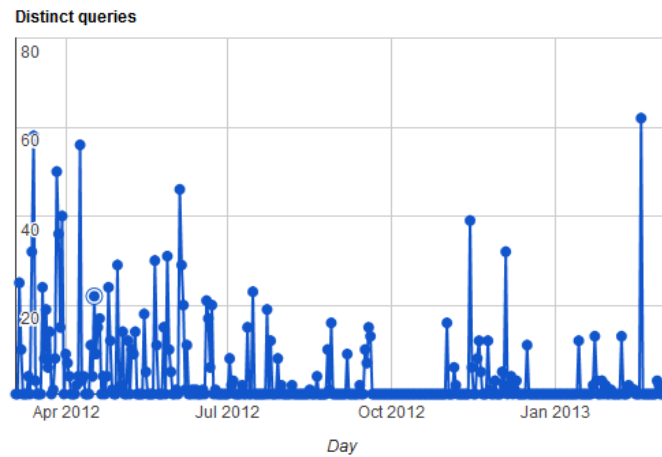


Figure 3: An example summary of the number of distinct queries per day for one year from March 2012 to March 2013

5. SUMMARY

In summary, the information available for the fire research field consists of a vast array of research outputs in various formats, natures of data and access, etc. that are located in discrete repositories around the world. It was hypothesised that access through a tool that is intuitive, easy-to-use and presents results in a useful and concise manner would improve the efficiency of researching and locating stored information and disseminating new information. A search element was designed and implemented to provide federated search capability of the information available to the international fire community via multiple remote websites.

6. ACKNOWLEDGEMENTS

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The author further acknowledge the support of the partner organisations, institutions and societies which supported their employees, students and members to participate in this collaborative project. The members of the group, who are responsible for designing and implementing the federated search element, were voluntary and were supported by their organisations. These members compose a dedicated and appreciated team. The initial design and implementation team members represent a range of fire community partners including (alphabetically):

- BRANZ (New Zealand)
- Canadian Nuclear Safety Commission (Canada)
- Fermi National Accelerator Laboratory(USA)
- Fire Resource (USA)
- Fire Science & Technology Inc.(USA)
- Ghent University (Belgium)
- Hughes Associates, Inc (UK)
- International Association for Fire Safety Science
- International Association of Wildland Fire
- National Aeronautics and Space Administration, Marshall Space Flight Center (USA)
- National Institute for Standards and Technology (USA)
- National Research Council Canada (Canada)
- New South Wales Rural Fire Service (Australia)
- New York State Office of Fire Prevention & Control (USA)
- New Zealand Fire Service (New Zealand)
- Polytechnic University of Bari (Italy)
- The University of Texas (USA)
- Thunderhead Engineering (USA)
- United States Fire Administration (USA)
- University of Edinburgh (UK)

7. REFERENCES

- ALBORS, J., RAMOS, J. C. & HERVASA, J. L. 2008. New Learning Network Paradigms: Communities of Objectives, Crowdsourcing, Wikis and Open Source. *International Journal of Information Management*, 28, 194-202.
- BOS, N., ZIMMERMAN, A., OLSON, J., YEW, J., YERKIE, J., DAHL, E. & OLSON, G. 2007. From Shared Databases to Communities of Practice: A Taxonomy of Collaboratories. *Journal of Computer-Mediated Communication*, 12, 652-672.
- FRASER, M. I. J. 2005. Virtual Research Environments: Overview and Activity. *ARIDENE* [Online]. Available: <http://www.ariadne.ac.uk/issue44/fraser/>.
- HODGKINSON-WILLIAMS, C., SLAY, H. & SIEBORGER, I. 2008. Developing Communities of Practice Within and Outside Higher Education Institutions. *British Journal of Educational Technology*, 39, 433-442.
- KIERNAN, V. 1997. All the World's a Lab – They Could Wake up Anywhere in the World – in Boston, Beijing or Berlin – But They Share the Same Workplace. *New Scientist* [Online], 2077. Available: <http://www.newscientist.com/article/mg15420774.200-all-the-worlds-a-lab--they-could-wake-up-anywhere-in-the-worldmdashin-boston-beijing-or-berlinmdashbut-they-share-the-same-workplace-itvincent-kiernanit-enters-the-virtual-lab.html>.
- OXFORD. 2007. Virtual Research Environment Projects at Oxford University.
- ROBBINS, A. P. 2009. *Frameworks for Virtual Research Communities – A Scoping Study*, BRANZ Study Report No. 207. Porirua, New Zealand: BRANZ.
- SAGE. 2010. *Sage Infobase Search*. Available: <http://sagemath.org/search.html>.
- SCIOTPIA. 2010. *Sciotpia.org, Integrating Trusted Science + Technology Research*. Available: <http://www.sciotpia.org/sciotpia/>.
- YU, E. T., HAWKINS, A., KUNTX, I. D., RAHN, L. A., ROTHFUSS, A., SALE, K., YOUNG, M. M., YANG, C. L., PANCERELLA, C. M. & FABRIS, D. 2008. The Collaboratory for Ms3d: A New Cyberinfrastructure for the Structural Elucidation of Biological Macromolecules and Their Assemblies Using Mass Spectrometry-Based Approaches. *Journal of Proteome Research*, 7, 4848-4857.

APPENDIX A SOURCE CODE FOR THE SEARCH ELEMENT

The HTML code below will work in any HTML webpage. It will allow a locally-run search within the page that will access the central search engine and list of international repositories.

Insert the following code where the search element is to be located:

```
<div id="cse-search-form" style="width: 100%;">Loading</div>
<script src="http://www.google.com/jsapi" type="text/javascript"></script>
<script type="text/javascript">
  google.load('search', '1', {language : 'en', style : google.loader.themes.MINIMALIST});
  google.setOnLoadCallback(function() {
    var customSearchOptions = {}; var customSearchControl = new
google.search.CustomSearchControl(
  '017497026900355310824:hrmhjhhud6i', customSearchOptions);

customSearchControl.setResultSetSize(google.search.Search.FILTERED_CSE_RESULTS
ET);
  var options = new google.search.DrawOptions();
  options.setSearchFormRoot('cse-search-form');
  options.setAutoComplete(true);
  customSearchControl.draw('cse', options);
}, true);
</script>
```

Then insert the following code where the search results will be shown (i.e. it can be directly below the above snippet of code or in another frame, etc.):

```
<div id="cse" style="width:100%;"></div>
```

APPENDIX B LIST OF SOURCES

The list of repository sources is included below in alphabetical order.

Original sources of papers are used, as it is the intention to limit the incidences of including databases containing other sources, since this may return several instances of the same document.

This is an ongoing collation process. Therefore the list included in this report was accurate at the time of publishing. However, to access the current list of repositories included in the implementation of the search element, consult the electronic version of the search element (e.g. http://www.branz.co.nz/Fire_Information_Element_Google_Search).

Additional repository locations can be added at any time. To do this please contact fire.information@gmail.com.

Specific Organisation, Company or Institution	URL for Searchable Database or Pattern for Paper Locations
BRANZ, New Zealand	http://www.branz.co.nz/cms_show_download.php?id=*
BRE, UK	www.bre.co.uk/filelibrary/pdf*
Centre Scientifique et Technique du Bâtiment (CSBT), France	www.cstb.fr/fileadmin/documents/theses/*.pdf
Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia	https://publications.csiro.au/rpr/pub?pid=csiro:*
Consumer Product Safety Commission (CPSC), USA	http://www.cpsc.gov/cpscpub/pubs/*.html http://www.cpsc.gov/cpscpub/pubs/*.pdf
Federal Aviation Administration (FAA), USA	http://www.fire.tc.faa.gov/pdf/*.pdf http://www.fire.tc.faa.gov/reports/listresults.asp?searchList=all&listSubmit=Submit*
Fire Protection Association (FPA), New Zealand	http://www.fireprotection.org.nz/publications.htm
International Association for Fire Safety Science (IAFSS): • Asia-Oceania Symposium on Fire Science & Technology (AOFST)	www.iafss.org/publications/frn/* www.iafss.org/publications/aofst/* www.iafss.org/publications/fss/*
GNS Science, New Zealand	www.gns.cri.nz/content/download/*
HERA, New Zealand	www.hera.org.nz/*
Laboratoire national de métrologie et d'essais (LNE), France	www.lne.eu/publications_en/thesis/*.pdf www.lne.fr/publications/theses/*.pdf www.lne.fr/publications/guides-documents-techniques/*.pdf
National Academies Press, USA	books.nap.edu/openbook.php?record_id=*
National Fire Protection Association (NFPA), USA Fire Protection Research Foundation (FPRF), USA	www.nfpa.org/assets/files/PDF/Research/*.pdf www.nfpa.org/assets/files/PDF/Research/*.pdf
National Institute of Standards and Technology (NIST), USA	www.nist.gov/manuscript-publication-search.cfm?pub_id=* fire.nist.gov/bfrlpubs/build/*.html fire.nist.gov/bfrlpubs/fire/*.html nvlpubs.nist.gov/nistpubs/* bfrlpubs.nist.gov/*
National Research Council Canada (NRCC-CNRC), Canada	irc.nrc-cnrc.gc.ca/pubs/* www.nrc-cnrc.gc.ca/obj/irc/doc/pubs/* nparc.cisti-icist.nrc-cnrc.gc.ca/npsi/*
Society of Fire Protection Engineers (SFPE)	www.sfpe.org/*
Technical Research Institute of Sweden (SP), Sweden	www-v2.sp.se/*
Treearch, US Forest Service	www.treearch.fs.fed.us/
United States Fire Administration (USFA)	www.usfa.fema.gov/downloads/*

	https://www.usfa.dhs.gov/applications/publications/
New Zealand Fire Service	www.fire.org.nz/Christchurch-Recovery/business-support/Documents/*.pdf
Technical Research Centre of Finland (VTT), Finland	www.vtt.fi/inf/pdf/*
UNIVERSITIES	
University of Auckland, New Zealand	www.cee.auckland.ac.nz/uoa/home/about/ourresearch/publications-5*
University of Canterbury, New Zealand	www.civil.canterbury.ac.nz/fire/pdfreports/*.pdf
University of Edinburgh, UK	www.era.lib.ed.ac.uk/handle/* www.era.lib.ed.ac.uk/handle/1842/* www.era.lib.ed.ac.uk/browse? www.era.lib.ed.ac.uk/*browse? www.ed.ac.uk/*
University of Lancashire, UK	clock.uclan.ac.uk/*
University of Maryland, USA	drum.lib.umd.edu/bitstream/*/*/*/*.pdf
Worcester Polytechnic Institute (WPI), USA	www.wpi.edu/Pubs/ETD/Available/*/unrestricted/*.pdf
Massachusetts Institute of Technology (MIT), USA	dspace.mit.edu/handle/*
DSpace	www.dspace.org/*
University of Greenwich, UK – Fire Safety Engineering Group	fseg.gre.ac.uk/fire/press.asp
University of Victoria, New Zealand	www.victoria.ac.nz/home/research/publications/*.pdf
University of Colorado – Hazlit Library	ibs.colorado.edu/hazards/library/hazlit/DisplaySingle.php?RecordID=*
JOURNALS	
Combustion Science and Technology	www.tandfonline.com/doi/abs/*
Fire Risk Management	www.frmjournal.com/Journal+Archive/*
Fire Science and Technology (FS&T), Japan	www.jstage.jst.go.jp/article/fst/*
Hemmingfire.com: • Industrial Fire Journal • Fire and Rescue	www.hemmingfire.com/news/fullstory.php/*
Industrial Fire World	www.fireworld.com/ifw_articles/*
Informaworld: • Combustion Theory and Modelling • Combustion Science and Technology	www.informaworld.com/smpp/content~db=all~content*
International Forest Fire News	www.fire.uni-freiburg.de/iffn/*
Journal of Applied Fire Science	baywood.metapress.com/app/home/contribution.asp?
MDM Publishing: • International Fire Protection • International Fire Fighter • Asia Pacific Fire	www.mdmpublishing.com/Archive/*
Sage: • Journal of Fire Protection Engineering • Journal of Fire Sciences	jfe.sagepub.com/cgi/* jfs.sagepub.com/cgi/*
ScienceDirect: • Fire Safety Journal • Building and Environment • Journal of Safety Research • Science of the Total Environment • Journal of Analytical and Applied Pyrolysis • Journal of Aerosol Science • Journal of Quantitative Spectroscopy and Radiative Transfer • Prehospital Emergency Care	linkingelement.elsevier.com/*

• Combustion and Flame • other journals	
Springer: • Fire Technology • Thermal Science	www.springerlink.com/index/* www.firesciencereviews.com/content/pdf/*.pdf
Wiley: • Fire and Materials	www3.interscience.wiley.com/journal/*/abstract

APPENDIX C OVERVIEW OF STRUCTURE, OUTCOMES AND OBJECTIVES

This section provides a summary as to the approach taken during the design and implementation of the search element.

C.1 Summary

C.1.1 Overall Outcome

Provide succinct access to relevant fire research materials.

C.1.2 Structure

Three levels, listed from top-down in terms of reporting:

- Governance
- Implementation Team

C.1.3 Participation and Membership Charter

Once Governance membership has been identified and formally implemented, a Charter shall be drawn up affirming that each of the membership of organisations will:

- Allow full search capabilities of a specified range or category of their publications
- Maintain online accessibility of their shared information/repository
- Specify the level of user accessibility

Organisations have already expressed interest in participation, membership and the value of a successful outcome. These organisations will be formally invited to join, once Governance and subsequently a Charter, is formally established.

C.1.4 Proof of Concept

A basic proof of concept to the proposed outcome was demonstrated utilising Google web-crawling technology.

The specific technology to be used in the final solution depends on the array of features and attributes of the final solution design.

(The current version is accessible at:

[http://www.branz.co.nz/Fire Information Element Google Search](http://www.branz.co.nz/Fire%20Information%20Element%20Google%20Search)).

C.1.5 Searchable Repositories and Material

Searchable materials will include both freely-accessible and publicly-available types. Subscription-access and user-pay systems will be honoured.

The Governance board will have final say on the specific repositories that are included in the search based on the appropriateness and applicability of the content of the repository.

C.2 Federated Fire Search Element

C.2.1 Overall Outcome

Provide succinct access to relevant fire research materials.

C.2.2 Overall Objective

To develop a successful tool at one location that provides succinct and useful access to identifying and locating publications and other literature that are relevant to research within the international fire research community, as represented by the Consortium.

C.2.3 Scope of the Federated Fire Search Element

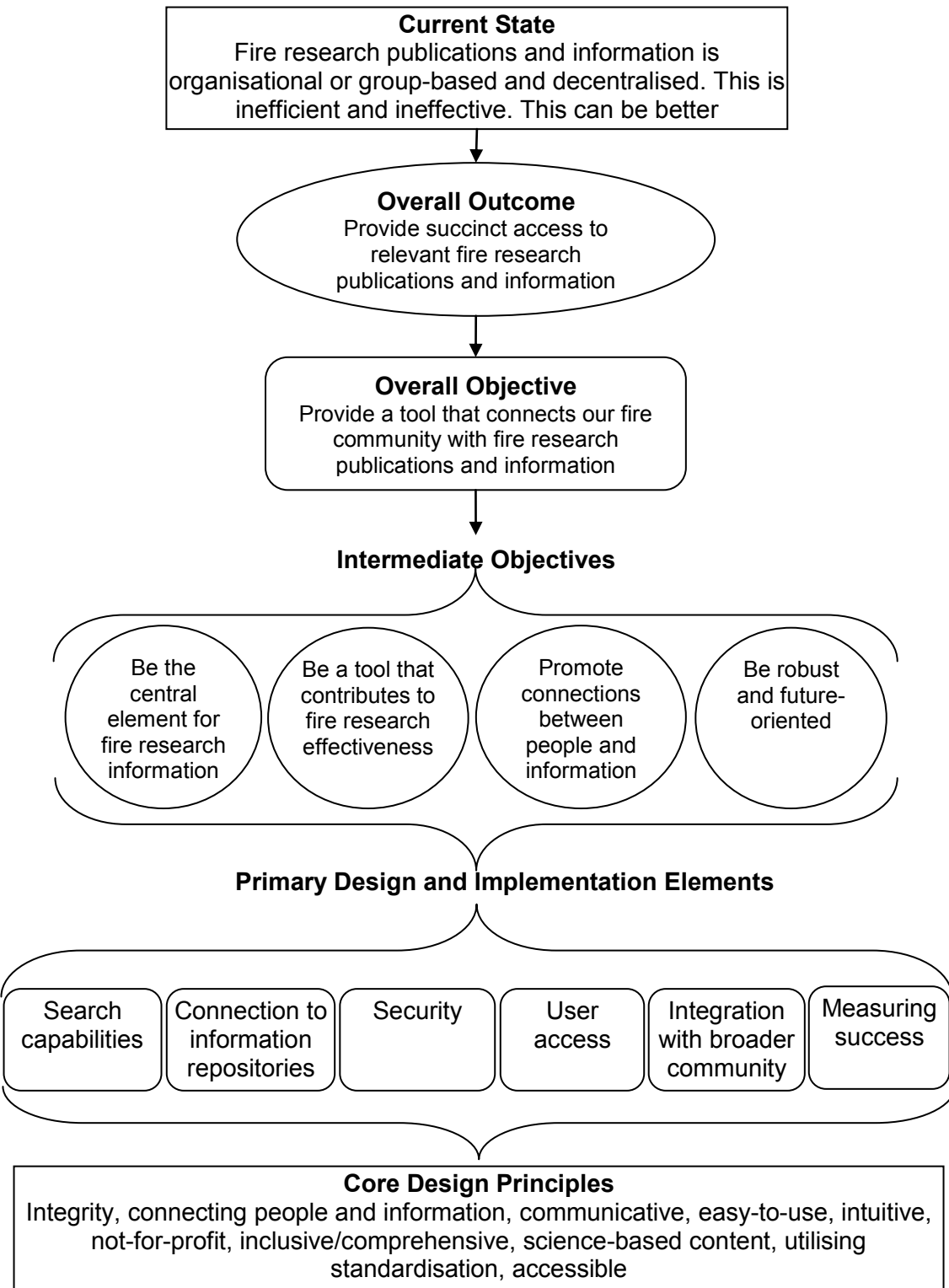
- A further-refined search tool (developed from the demonstration of concept example provided by the Federated Fire Research Search Tool) that forms an element of all relevant fire research publications, utilising relevant search engine technology and presenting search results in a succinct and useful manner.
- Development and implementation of other fire research community-related tools would be done separate to this. However, consideration of these developments and how to best utilise them within the scope of best implementation of the search element is recommended.
- Two-Year Objective: Fully-operational search element tool for fire research publications.
- Five-Year Objective: Search element tool with an expanded range of relevant searchable fire research information.

C.2.4 Intermediate Objectives of the Federated Fire Search Element

- Be a central element for fire research information from a wide range of repositories for research information – reports, papers, experimental data sets, etc.
- Be a tool that contributes to the international fire research community
- Promote efficient and relevant connections between people and information
- Be robust and future-orientated
- Assist international cooperation and communication
- Be a useful component/tool for the international fire research community that is aware and integrated, where appropriate, to other community tools in order to leverage access to and by the community

C.2.5 Implementation Objectives of the Federated Fire Search Element

- Be the primary place fire researchers use for locating relevant information
- Fire researchers use it and find it helpful
- Implementation and ongoing support of the search element is not-for-profit
- Be freely accessible
- Access to the search element is not restricted by provision of personal information of users or any other requirements of the user
- Utilise a distributed network, such that relevant information is accessible for a range of possible outcomes (e.g. change of an organisation's focus from research to other areas, etc.)
- Utilise appropriate and efficient technology
- Be a framework that interfaces with information in a large number of repositories
- Assist in the rapid and useful dissemination of recently-completed research project results/outputs
- Provide information on which search element metrics are collected and ensure the usage of results are transparent and publicised on the website in plain English



Schematic of the Federated Search Element project outcomes, objectives, design and implementation elements and core design principles

C.2.6 Stakeholders

Four Levels:

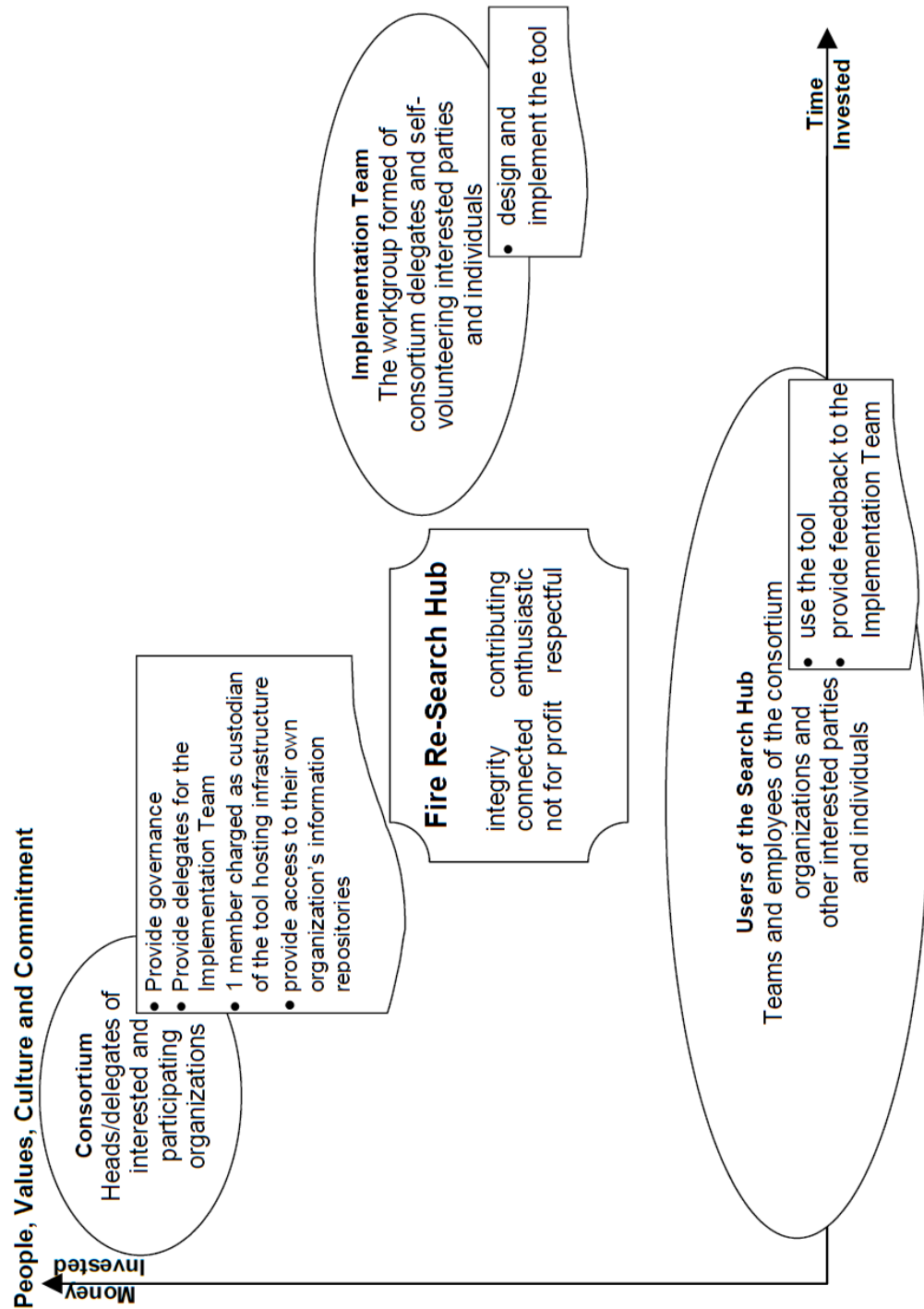
1. Governance
2. Consortium
3. Implementation Team – Ongoing Maintenance and Development Team
4. Users/members

C.2.7 Core Design Principles of the Federated Fire Search Element

- Integrity
- Connecting people and information
- Communicative
- Easy-to-use
- Intuitive
- Not-for-profit
- Neutral
- Accessible

C.2.8 Core Values of Federated Fire Search Element Community

- Integrity
- Contributing
- Connected
- Respectful
- Enthusiastic



Schematic of Investments of Resources and Time Expected for Various Involvement Levels in the Federated Search Element's Development, Implementation and Use

C.2.9 Appendix - Five-Year Plan

Date	Milestone	Brief Description
30 July 2010	0	Start date
31 August 2010	1	Scoping of Project Identify all groups to be involved at all levels.
30 September 2010	2	Participants Confirmed Recruit and confirm the Consortium members. Recruit and confirm the Implementation Team members.
31 January 2011	3	Guidance for Future Information Structure Provide guidance for the structure and formats of publications that will be searchable by the fire search element, and a description of the intended functionality and potential limitations of the tool.
31 July 2011	4	Working Demonstration of Tool The Fire Search Element is a working demonstration of the intended tool, providing a succinct, easy-to-use and useful way to search a range of publications from groups and other sources relevant to fire research performed by the member organisations of the Consortium.
31 July 2012	5	Fully-Operational Tool The Fire Search Element a fully-operational tool that provides a succinct, easy-to-use and useful way to search electronically-searchable publications and databases of other publications from all groups and other sources relevant to fire research performed by the member organisations of the Consortium.
31 July 2015	6	Expansion of Searchable Information The Fire Search Element provides a succinct, easy-to-use and useful way to search publications, <i>repositories of experimental data, researchers' biographies and current research project descriptions</i> from all groups and other sources relevant to fire research performed by the member organisations of the Consortium.

C.2.10 Appendix - List of Intended Users' Organisations

(this list is not exhaustive)

Organisation Name
BRANZ (New Zealand)
Canadian Nuclear Safety Commission (Canada)
Combustion Science Society
CSTB (France)
Fire Resource (USA)
Fire Science & Technology Inc (USA)
Ghent University (Belgium)
Hughes Associates (UK)
IAFSS
NASA Marshall Space Flight Center (USA)
National Research Council Canada (Canada)
NFPA (USA)
NIST (USA)
NSW Rural Fire Service (Australia)
NYS Office of Fire Prevention & Control (USA)
Polytechnic University of Bari (Italy)
SFPE
SP (Sweden)
The University of Texas, Austin (USA)
Thunderhead Engineering Consultants, Inc (USA)
U Canterbury (New Zealand)
U Illinois (USA)
U Maryland (USA)
University of Edinburgh (UK)
VTT (Finland)
WPI (USA)
www.Evacmod.net (USA)

C.2.11 Appendix - Elements of the Federated Fire Search Element for Consideration

- Search capabilities:
 - What search functionalities are best to utilise?
 - What search engines are relevant and available?
 - What is the best format for the presentation of results?
 - What is the best way to suggest other related search terms to the user?
 - What is the best way to personalised filtering/selection of areas of interest?
 - What are the best strategies to integrate a future focus into the design and implementation of the search element?
- Connection to information repositories:
 - What is currently available in terms of:
 - What structure is used?
 - What file formats are used?
 - What strategies are in place for future development of these?
 - How will these be integrated/linked?
 - What is the most appropriate way to connect to and handle free versus commercial information?
- Security:
 - What are the security risks and how is it best to remove or mitigate these?
- User access:
 - What is the best approach for users to have access to the tool? E.g. known membership base versus anonymity, versus a virtually-anonymous login and how these relate to aspects including:
 - Login access
 - Membership via invitation by other members
 - Personal portals
- Integration into the broader international fire research community:
 - What extent should the search element relate to and integrate with other fire research community tools/strategies?
- Measuring the success of the search element:
 - What metrics best estimate the success of the search element?
 - How is data on the usage of the search element collected?
 - How are these metrics implemented?
 - How is it communicated what metrics are being collected as well as how and what they are being used for?

C.3 GOVERNANCE

Overall Outcome

Provide succinct access to relevant fire research materials.

C.3.1 Overall Objective

To provide the point of ownership of the initial and ongoing development of a successful Federated Fire Search Element that represents the collection of organisations participating in development and usage of the search element.

C.3.2 Scope

The Governance is the body that provides the final point of authority for the project and the financial support for the infrastructure of the search element to the overall project.

C.3.3 Intermediate Objectives

- Spur the development of the Federated Fire Search Element

C.3.4 Implementation Objectives

- Provide funded support for the development of the Federated Fire Search Element by providing two (2) delegates from each organisation of the Implementation Team
- Charge one member organisation with ownership of the web-hosting infrastructure
- Ensure continuity of the project by:
 - Developing a handover procedure for the web-hosting infrastructure in the case where the custodian must change
 - Developing a handover procedure for each organisation's publication and information repositories in the case an organisation significantly changes focus and will no longer maintain its interest in fire research
- Have at least passive support from all FORUM member organisations
- Promote and champion the international Federated Fire Search Element
- Maintain responsibility for the timely implementation of the international Federated Fire Search Element by the Implementation Team
- Maintain a future focus on the usability and evolution of the International Federated Fire Search Element
- Maintain a future focus on the use of the International Federated Fire Search Element for the application of the framework to other fields/areas of research

C.4 IMPLEMENTATION TEAM

C.4.1 Overall Outcome

Provide succinct access to relevant fire research materials.

C.4.2 Overall Objective

Design and implement the successful Federated Fire Search Element. Handover the successful Federated Fire Search Element to the Ongoing Maintenance and Development Team.

C.4.3 Scope

The Implementation Team will take the Federated Fire Research Search Tool as a demonstration of concept and develop and implement a further-refined search that forms an element of all relevant fire research publications, utilises relevant search engine technology and presents search results in a succinct and useful manner.

The Implementation Team is formed of the delegates from each of the member organisations, institutions, etc. and other interested parties and individuals.

The implementation team is responsible for the design and implementation of the Federated Fire Search Element and communication of the current status, functionality and future of the Federated Fire Search Element to the Federated Fire Search Element users.

C.4.4 Intermediate Objectives

- Create a tool that is a central element for fire research information from a wide range of repositories for research information – reports, papers, experimental data sets, etc
- Design and implement a tool that contributes to the international fire research community
- Create a tool that promotes efficient and relevant connections between people and information
- Design the tool to be robust and future-orientated
- Assist international cooperation and communication
- Integrate the tool with other international fire research community tools, where appropriate, in order to leverage access to and by the community

C.4.5 Implementation Objectives

- Identify the intended-user base
- Identify the repositories desired for incorporation
 - Determine the current state of the contents of each repository and the intended direction of the owner organisation
 - Recruit the participation of the organisation
- Solicit, collect and collate intended-user data for use in designing the framework of the Federated Fire Search Element
- Formulate the scope and objectives of the Federated Fire Search Element
- Identify specialist input required for design or implementation, then identify potential sources of specialist knowledge and recruit
- Determine and implement the appropriate level of security (particularly pertaining to personal information [PI], if any, etc.)
- Develop and implement a strategy to check the status of the Federated Fire Search Element (e.g. the links to each of the federated banks of data, etc.)
- Identify metrics to assess the success of the Federated Fire Search Element
- Develop an implementation strategy
- Execute the implementation strategy
- Maintain contact with intended users during the design and implementation phase of the Federated Fire Search Element

- Maintain communication on progress with governance and users
- Develop the scope and objectives of the Ongoing Maintenance and Development Team in preparation for the handover of the Federated Fire Search Element at the two-year milestone

C.5 ONGOING MAINTENANCE AND DEVELOPMENT TEAM

C.5.1 Mission Statement

Provide succinct access to relevant fire research materials.

C.5.2 Scope

The Ongoing Maintenance and Development Team will assume responsibility for the Federated Fire Search Element from the Implementation Team at the two-year mark.

The Ongoing Maintenance and Development Team will be responsible for the continuance of the successful Federated Fire Search Element.

The structure and objectives of the Ongoing Maintenance and Development Team will be developed by the Implementation Team.

APPENDIX D FRAMEWORK FOR THE DEVELOPMENT AND IMPLEMENTATION OF THE FEDERATED FIRE RESEARCH HUB

Framework for the development and implementation of the Federated Fire Research Hub (FFReSH, also referred to as the “search element”):

- 1) Identify the intent of the FFReSH:
 - a) The objective or mission statement that provides a context for the framework of the FFReSH.
- 2) Identify stakeholders.
- 3) Identify the desired membership, including:
 - a) The intended size of the membership.
 - b) The type of membership that will be included, e.g. researchers (industrial or academic), students (undergraduate or postgraduate), users of research, funders of research, general public, and determine at what stages of development of the FFReSH these groups will be integrated.
 - c) This provides the context in which to start to determine the culture and policies of the FFReSH.
- 4) Identify champions of the FFReSH:
 - a) These people need to be self-selecting.
 - b) The champions need to be from a range of aspects of the desired membership.
 - c) The champions will form the heart of the core team for the development of the framework.
 - d) The champions provide a line of two-way communication to the desired membership during the development of the framework.
 - e) The champions provide a leadership within the implementation of the FFReSH.
- 5) Identify:
 - a) Developers of the FFReSH.
 - b) Initial test membership for the FFReSH prototype.
 - c) Maintainers of the FFReSH.
- 6) Select high-level champions:
 - a) The high-level champions do not need to be involved directly in the development of the framework or the day-to-day running of the search hub
 - b) The high-level champions perform the function of high-level advertisers and monitors, i.e. they may passively support the search hub and be asked to intervene from time to time when needed on difficult issues that may arise within the search element.
 - c) The people selected for these positions must be well known and highly respected within the membership intended for the search hub.
- 7) Reevaluate the intent and scope of the FFReSH:
 - a) As the potential membership is determined more accurately and feedback is obtained, the intent and scope of the FFReSH must be reassessed.
- 8) From the identified desired membership, identify the current:
 - a) General culture.
 - b) Policies.
 - c) Digital processes used.
 - d) Problems and items of concern or frustration in the current processes of research.
 - e) Expectations and desires of a FFReSH.
- 9) Based on the feedback of the intended membership:
 - a) Identify the appropriate culture and policies for the FFReSH.
 - b) Develop user scenarios.
 - c) Identify the functional requirements of the FFReSH and include a rating of the priority of each of these requirements.
 - d) Identify the non-functional requirements of the search hub (i.e. *how* the Search Hub and interface should function instead of what it should *do* or *include*).

- e) Identify the incomplete (or future) requirements and keep a record of items under development and ideas for future developments.
- 10) Form the architectural design of the FFReSH:
- a) Based on the assessment of feedback from the intended membership, identify the appropriate modes and types of communication styles that are in alignment with the intended membership and the intent, culture and policies of the FFReSH.
- 11) Design a prototype FFReSH:
- a) Collate a list of specific e-tools that can be used to achieve for the communication modes and styles identified in Point 10. Identify which e-tools are already used by the intended membership and the extent of use. Identify advantages and disadvantages of each in terms of the member useability, the FFReSH intent, and culture and policies.
 - b) Select the suite of e-tools appropriate for the FFReSH.
 - c) Identify the hardware, software, development and training required.
 - d) Assign leaders and development teams to each aspect of the FFReSH proposed.
 - e) Schedule a development timetable for the aspects of the proposed prototype.
- 12) Develop the prototype FFReSH.
- 13) Specify the testing plan for the beta FFReSH:
- a) Identify a testing strategy, listing tests (automated tests, functional tests, useability tests, compatibility tests, load tests, etc.) to be performed and evaluation to be completed and returned to developers.
 - b) Specify acceptance criteria.
 - c) Identify stages for implementation of aspects of the FFReSH beta. The implementation includes a prototype of each aspect and a series of cycles of changes based on interactions between users and developers.
 - d) Prioritise the implementation stages of the FFReSH.
 - e) Assign leaders to each of the implementation stages or aspects of each of these stages if appropriate.
 - f) Schedule the implementation stages.
- 14) Perform beta testing.
- 15) Evaluate beta testing feedback:
- a) Development team to assess required changes.
 - b) Implement changes to the beta search hub, returning to Point 13 if required.
- 16) Schedule a target deployment date for public release.
- 17) Specify a maintenance plan:
- a) Schedule a revision and adaptation assessment for the overall and aspect performance of the FFReSH as a formal evaluation of the progress, usefulness and effectiveness of the search hub. This forms an opportunity for the planning of required changes and future direction of the FFReSH based on practise. This is expected to be an ongoing periodic assessment that can be adapted according to the growth and performance of the FFReSH.