A Survey of RISA Teams

Exploring knowledge management practices to enhance the use of science in decision making: A case study of NOAA RISA's

Knowledge management examines the roles people take within organizations to generate, synthesize, archive, and disseminate information to stakeholders. Dr. Aimee Franklin and Ms. Jennifer Le at the University of Oklahoma applied this concept to the RISA network via a survey administered in Spring 2018. The project sought to document knowledge management practices among the RISA teams for acquiring and synthesizing information, disseminating research deliverables, and evaluating RISA impacts. Survey responses suggest that creating and disseminating project results in communication formats suitable for a range of stakeholders is hampered by the lack of slack resources for someone to function as the communication specialist. Participants identified potential advantages, as well as concerns, related to the introduction of the RISA evaluation templates and comparable outcome measures to enhance professional and scientific knowledge utilization. These results inform suggestions for future knowledge management practices.

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University of Oklahoma, 2018

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RISA's as Boundary Organizations

NOAA's Regional Integrated Sciences and Assessments (RISA) program supports nationwide research teams tasked with expanding and building the nation's capacity to prepare for and adapt to climate variability and change. Central to the RISA approach are commitments to process, partnership, and trust building. RISA teams work with public and private user communities to:

- advance understanding of context and risk;
- support knowledge to action networks;
- innovate services, products and tools to enhance the use of science in decision making; and
- advance science policy.

RISA's demonstrate all the qualities of a boundary organization, which are tasked with the facilitation of voluntary, fluid and informal partnerships with scientific and non-scientific stakeholders to address complex physical and social science phenomenon that overlaps disciplines and crosses organization sectors[1]. An analysis of RISA's as boundary organizations conducted by University of Oklahoma researchers found that RISA's demonstrated a steady and improving alignment between strategic plan emphases and more frequent production of research deliverables that are user-friendly and contribute to the desired link between knowledge producers and knowledge users. This is the result of synergistic knowledge networks formed by boundary organizations such as RISA's.

RISA's

Supports research teams that conduct innovative, interdisciplinary, user-inspired and regionally relevant research that informs resource management, planning, and public policy.

About the Research

Taking this idea one step further, this research examined how boundary organizations manage the knowledge they acquire, create and disseminate. Table 1 displays the roles of knowledge management collaborators as defined in the existing knowledge management literature.

[1] Franklin, A.L., Le, J. Grossman, A., Shafer, M. (2018) "Creating Broader Impacts Through Boundary Organizations." *Public Administration Review*. https://doi.org/10.1111/puar.12985

This mixed method research project reviewed content on RISA websites, interviewed key informants familiar with RISAs and conducted an online survey of RISA members. The survey asked about RISA knowledge management practices, stakeholders, communication tools and impacts measurement.

Table 1: Knowledge Management Roles

Knowledge Management Roles	Role Responsibilities
Knowledge Management Leaders/Champions	Responsible for promoting knowledge management practices within the organization
Knowledge Managers	Accountable for the acquisition and management of internal and external knowledge
Knowledge Navigators/Brokers	Tasked with knowing where knowledge is located
Knowledge Synthesizers/Stewards	Accountable for providing the recording of significant knowledge to organizational memory
Content Editors/Managers	Responsible for codifying and structuring content and identifying and documenting knowledge researchers, writers and editors

Researchers collaborating with SCIPP[2] have advanced the idea of a multi-year research knowledge production cycle that connects strategic plans with the tactical implementation of goals and objectives in routine program operations. The research results are evaluated to identify research gaps and future research trajectories. This information is fed forward into the discussion for the next strategic plan.

Organization value can be enhanced by aligning the stages in research knowledge production cycle with the different knowledge management roles. For example, the Knowledge Management Leader/Champion promotes the importance and value of strategic planning, while the Program Manager is uniquely situated to facilitate the planning process. Knowledge synthesizers play an important role in providing feedback necessary for next generation planning activities. Table 2 shows how those knowledge management roles contribute to that stages in the research knowledge production cycle, and then translated into human infrastructure within RISA organizations.

Table 2: Linking Knowledge Production & Knowledge Management

Research Knowledge Production Cycle	KM Collaborator Role	RISA Human Infrastructure
Strategic Planning	Knowledge Leader	PI's & Program Managers
Objective-driven Research Activities	Knowledge Manager	Researchers
Documenting Research Partners and Results	Content Editor	Various Personnel
Systematic Evaluation of Research Portfolio	Knowledge Synthesizer	Program Managers & Researchers
Linking Research Results to Planning	Knowledge Manager	PI's & Program Managers

[2] Franklin, A.L., Le, J. Grossman, A., Shafer, M. (2017). Efficiently Translating research into practice: Oklahoma's contribution through the Southern Climate Impacts Planning Program. *Oklahoma Politics*. 27: December, 103-138.

Survey Results

Knowledge Management

To get the first-person perspective on the extent to which knowledge management practices occur, we surveyed the RISA's. The link to the survey website was distributed via RISA listserv and all members of RISA teams were invited to participate. We received eighteen responses representing ten of the eleven current RISA teams. Of these responses, ten were completed by program managers and eight by principal investigators or co-principal investigators (PI's). Program managers were asked to complete the entire survey. The PI's did not answer the knowledge management questions, focusing instead on the questions related to stakeholders, communication modalities and impact measurement.

> "We produce and acquire so many different kinds of information, across multiple platforms, produced by multiple researchers at several universities.
>
> It's really difficult to get all relevant parties to communicate important details on a regular basis because of limitations of their time (e.g. It's not necessarily fair to expect a PI to communicate all relevant details when they spend more time on RISA work than they're getting paid for)."

The responses reveal that RISA program managers are responsible for most knowledge management roles, although PI's and others are tasked with some of the roles as well. The exception was the role of content editing, which varied based on the type of the deliverable being created. Since different deliverables are prepared for different stakeholders; the person responsible for preparing and editing this content varies. One person explained: "If the information is requested by a partner, the RISA person contacted by that partner creates and disseminates the information". Another notes that the person editing the content is "various between peer reviewed publications (PI) or one-pager newsletter, web content or a presentation (PM [program manager])."

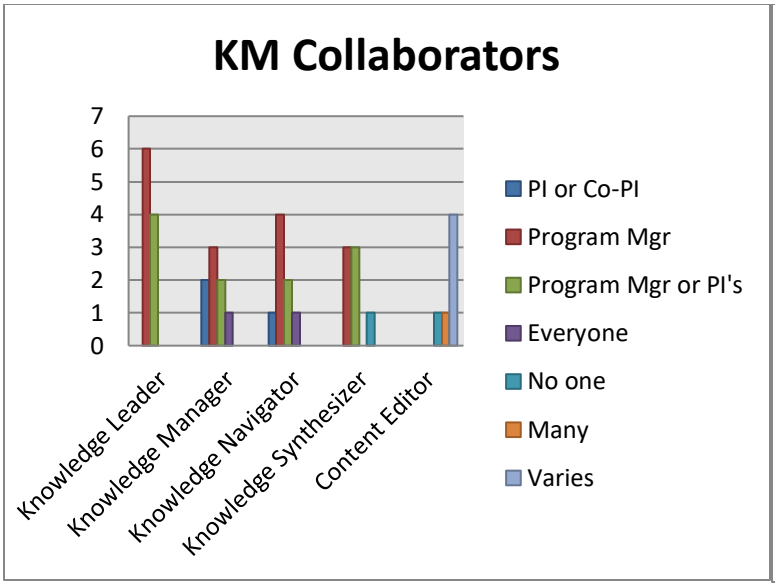
> *"The team shares many communication responsibilities, depending on the project and deliverable."*

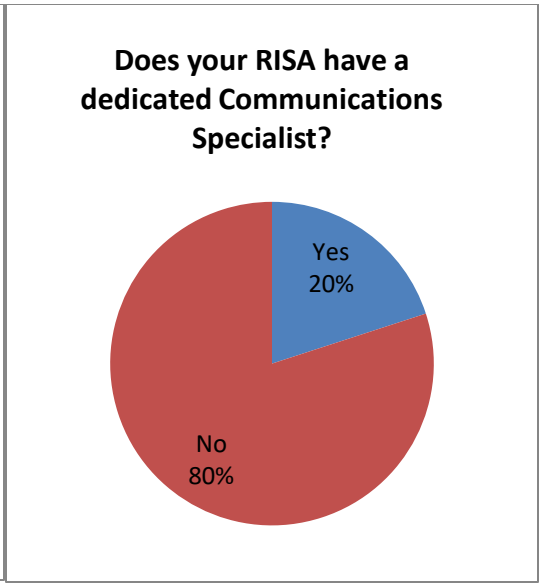
Open-ended responses to a question asking what knowledge management roles are not used and what could help to better manage knowledge, suggested that the knowledge synthesizer role is under-utilized. The responses also suggest it would be difficult for a new person to step in and know where things are located. Knowledge synthesizers are the main contributors to organizational memory since they purposefully record what the organization has learned. This shortcoming in institutional memory expressed by multiple respondents suggests a potential area for improvement, although the consensus seems to be that resource limitations may make this a challenge.

Another gap in knowledge management revealed by the survey responses is that only two of the ten RISA's had a dedicated communications specialist (or an outreach specialist), although the person in this position often has additional duties. The dissemination of knowledge and information is typically tasked to the program managers, whose responses expressed that dedicated communications personnel could greatly benefit the organization. A communications specialist could improve the efficiency of translating expert knowledge to the language/format best suited to the external stakeholder.

> *"The program manager(s) fulfills a lot of the roles, but only partially. There are some gaps because they a) have enough on their plate already and/or b) do not have the skillset for certain roles."*

Knowledge Management Roles in 10 RISA's





Stakeholders and Communication Tools

RISA teams produce information for a wide variety of stakeholders. Stakeholders are those who partner with the RISA to produce and disseminate information and/or use the information produced by RISA teams. Research deliverables communicate knowledge, through many forms of communication such as academic and non-academic research publications, annual reports, newsletters, workshop materials, public presentations, and social media posts. Table 3 displays different types of stakeholders and the extent to which they partner to create information and/or actively disseminate information contained in research deliverables.

Table 3: Stakeholder Partners and Information Dissemination (n=24)

Stakeholder Partner Roles	Partner to create information	#	Disseminate information	#	Total
Scientists	60.87%	14	39.13%	9	23
The academic community	60.87%	14	39.13%	9	23
Policy decision makers	50.00%	8	50.00%	8	16
Industry professionals	66.67%	6	33.33%	3	9
Federal agency partners	54.17%	13	45.83%	11	24
State or local planners	60.87%	14	39.13%	9	23
State or local emergency managers	57.14%	8	42.86%	6	14
External partners	57.14%	8	42.86%	6	14
Interested private citizens	36.36%	4	63.64%	7	11
Schools	0.00%	0	100.00%	5	5
Community members	46.15%	6	53.85%	7	13
Other stakeholders*	50.00%	2	50.00%	2	4

*Other stakeholders mentioned: Tribes, State agencies, State Climate Offices

The presentation of the information in a format that is understood by and usable for stakeholders is critical to enhancing information use. Survey results suggest that there is great variety in the way RISA research results are delivered. Survey respondents noted that RISA deliverables are often formatted in different ways in order to reach specific stakeholders and the strive to develop formats that offer value to them. The only consistently used template among the RISA's seems to be the annual report, which is a NOAA Climate Program Office reporting document. Other common templates are newsletters and research results for a non-academic audience.

Table 4: Intended Audience for Research Deliverables (n=19)

How useful are these research deliverables for ….?	Useful for a specific type of Stakeholder	#	Useful for any Stakeholder	#	Total
Research publications in academic journals	85.71%	12	14.29%	2	14
Research publications for a non-academic audience	57.89%	11	42.11%	8	19
Annual reports	37.50%	6	62.50%	10	16
Newsletters	21.43%	3	78.57%	11	14
Workshop Materials	57.89%	11	42.11%	8	19
Public Presentations	47.37%	9	52.63%	10	19
Social Media posts	18.75%	3	81.25%	13	16

When asked if templates would be of use to stakeholders, a majority of respondents said they would be helpful for all stakeholders. The results were mixed concerning template usefulness for scientists.

Table 5: Usefulness of Templates by Type of Stakeholder (n=14)

Would you use templates for…?	Likely to use	#	Not likely to use	#	Total
Community members	63.64%	7	36.36%	4	11
Schools	75.00%	6	25.00%	2	8
Interested private citizens	66.67%	8	33.33%	4	12
External partners	69.23%	9	30.77%	4	13
State or local emergency managers	92.31%	12	7.69%	1	13
State or local planners	92.31%	12	7.69%	1	13
Federal agency partners	92.31%	12	7.69%	1	13
Industry professionals	76.92%	10	23.08%	3	13
Policy decision makers	92.86%	13	7.14%	1	14
The academic community	66.67%	8	33.33%	4	12
Scientists	53.85%	7	46.15%	6	13

However, when asked if templates would be helpful for the RISA teams, there was a common concern that templates would be difficult to follow because the teams all produce such different information that is relevant to their own regions and stakeholders. Some did suggest that templates could be useful, but only for certain types of deliverables and that the benefits of templates would be for branding and consistency to help users better understand the information.

> *"We have an historical [analysis] tool for looking at [environmental] change, several ongoing webinar series, a weather and climate highlights tool that maps notable weather events [in our region] under different weather type categories and different time frames (daily, weekly, monthly, seasonal)"*

Information is disseminated in a variety of ways. All survey respondents identified multiple communications tools that have been effective for them. This was confirmed in our review of the RISA webpages. We found that front-page website items tend to focus on general stakeholders, upcoming events and current activities, although each RISA determines what they wish to highlight. However, in the survey, 43% report that they do not have all the information they have produced available on their website. This may be due to the deliverable being prepared for a specific partner or fair use restrictions for academic journal articles. There is some indication that this delivering research results in multiple formats for use by different stakeholders can be difficult to prioritize and keep up to date. In fact, only two RISA's have a dedicated communications specialist that fill this role. The importance of a communications specialist is an area for future consideration.

Comments on value of templates.

> *"From a marketing perspective, consistency in format across the RISAs may contribute to brand recognition as we continue to try to document the value of the program and the need for a national network of RISAs."*

> *"Creating templates would hopefully speed up the formatting process of future communication tools and save time by removing some of the brain power required to create the tools."*

There is great variety in the communications tools that RISA's have created to meet stakeholder needs and increase the likelihood that research results will be used. These include online tools like dashboards, webinars, and other interactive web-based tools such as maps and climate highlights. Newsletters and social media seem to be consistently popular ways to communicate RISA activities. We found some noteworthy examples of novel formats. Under the SCIPP Data Tools tab, there are a variety of tools; several have YouTube tutorials for use. The Pacific RISA's "Documoments" videos are short stories that link people in specific sectors with climate information and decisions. These kinds of communication tools enhance the likelihood of building connections with new stakeholder partners.

Impacts Measurement

The last portion of the survey focused on impacts measurement and evaluation activities. How do RISA's measure the impacts of their work and who is using their information? One asked "Does your RISA use outside experts to monitor who is accessing your website?" Only two of the RISA's surveyed use external experts to monitor activity on their websites. The other RISA's indicated that internal staff monitors web activity (such as downloads and page counts, but on a limited basis because of time constraints and lack of expertise). It is unclear whether or not the external experts that monitor web activity also maintain the RISA websites. One of the RISA's with an internal outreach specialist indicated that this person does monitor the website and also designed a database of their work.

Eleven respondents reported using data analytics to monitor levels of activity to their websites and two respondents answered that they do not. All of those who reported using data analytics accessed basic Google analytics; however, some also use the analytics provided by social media sites such as Facebook and Twitter. Mailchimp was also suggested as a resource for monitoring levels of use and interest as well as to push messages about recent RISA deliverables and new data products. All respondents expressed that the use of data analytics was a useful way to gauge interest in projects. They also noted that it would be more efficient and valuable if they had a qualified person, whether internal or external, who had sufficient time and working knowledge to know what to do with that information.

Several questions were asked to assess how and to whom RISA generated information was actively disseminated. The most common responses were listserv, social media, newsletters, email, and flyers. When asked to offer specific examples of how stakeholders have used RISA generated information, respondents offered many examples. For instance, one city's office of sustainability used CLIMAS climate change impact data in a funding proposal. This RISA also designed a graphic in their outlook about reservoir levels, which was used by New Mexico officials in their presentations. In North Carolina, materials developed and available through the Convergence website (convergence.unc.edu) have been used by public health departments to raise awareness about heat health vulnerabilities. U.S. Drought Monitor map authors regularly access condition monitoring reports submitted by citizen science volunteers through an online web map (https://www.cocorahs.org/Maps/conditionmonitoring/). This program began as a pilot project in the Carolinas and is now a national program. The City of Ann Arbor used historical precipitation data generated by GLISA to justify proposing and passing an increase in storm water management fees.

New York City released climate resiliency design guidelines grounded in CCRUN science. Work in the Delaware Valley on surge-inland flooding is being guided by CCRUN research. In another city, a local emergency manager used climate tools to gather data for their hazard mitigation plan based on a RISA workshop. These are only a few of the many examples of RISA-generated information being directly used by stakeholders.

Impacts measurement is an important aspect for identifying how RISA activities are creating public value. Nine respondents indicated that they currently gather data that measures the impacts of their activities, while four reported that they do not measure impacts. Webinar attendance, direct contact with stakeholders, and publication downloads were mentioned as ways of measuring impact. Of the organizations that do gather impact measurement data, some have specific people dedicated to evaluating impacts by the type of data they gather. While each RISA currently has different ways of evaluating their impacts, all provided several examples of how stakeholders have used the information that they have produced and how it has impacted and benefitted their region. Despite the abundance of examples, how they identify use and impact varies. It seems that direct feedback with stakeholders is the most common way that RISA's learn that their information is being used and making an impact. Other ways RISA's know that their information is being used is through surveys, web activity (data analytics), call-backs, and citations in other research, or citations in local policy or community documents. The majority of respondents believe that standardized metrics of impact might be useful, but it may be difficult to define meaningful metrics on a broader scale since each RISA caters to different regions and different stakeholders.

Challenges and Future Suggestions

These RISA teams have all demonstrated how they create public value and broader impacts by acting as boundary organizations. The biggest impact is that RISAs engage in boundary work and foster interactions necessary for forming and maintaining dedicated user networks and facilitating information uptake and dissemination[3]. "The RISA model has become an enduring network of people focused on providing usable science to the public. The model has value internally as well. Staff and researchers often stay with the teams for years[4]." Lemos and Morehouse[5] found that RISAs foster higher levels of innovation and produce research that has direct social impacts.

[3] Kirchhoff, C. J., Carmen Lemos, M., & Dessai, S. (2013). Actionable Knowledge for Environmental Decision Making: Broadening the Usability of Climate Science. *Annual Review of Environment and Resources*, *38*(1), 393–414.

[4] Meadow, A. M. (2017). *An ethnohistory of the NOAA RISA program*. Retrieved from http://cpo.noaa.gov/Portals/0/Docs/RISA/Meadow_2017_RISA_History.pdf?ver=2017-07-05-142106-183

[5] Lemos, M. C., & Morehouse, B. J. (2005). The co-production of science and policy in integrated climate assessments. *Global Environmental Change*, *15*(1), 57–68. doi.org/10.1016/j.gloenvcha.2004.09.004

Although each of the RISA's have different organizational structures, there are some best practices that were shared by the teams. Each team has found effective ways for their organizations to acquire knowledge and disseminate this information to their stakeholders, as well as using some kind of evaluation metric to gauge if and how their information is being used. Program managers play a large role in managing knowledge within the organizations.

To further the accomplishment of planning objectives and to increase the efficacy of RISA teams, it is incumbent on leaders to explore ways to better support RISA activities. In the knowledge management arena, RISA's are effectively making use of their human infrastructure to fill the roles previously discussed, but gaps exist. The knowledge synthesizer role that is dedicated to committing RISA knowledge to institutional memory is one that is potentially underutilized, although some RISAs do have personnel that maintain databases of RISA information. Most RISA's document knowledge in a limited capacity (mostly by program managers as time allows), but some do not have the resources to make it a consistent priority. Having a person to document RISA information in a database (perhaps an intern or student on a semi-annual basis), would greatly contribute to this aspect of knowledge management within RISA's. As one respondent notes: "Someone who has the time and experience to drill down into how our website is used and accessed would be incredibly helpful. I don't have the knowledge nor the time to dig deeper than very simple google analytics."

The RISA teams tailor information to reach their desired stakeholders. Anecdotal evidence suggests high levels of use of RISA produced knowledge by these stakeholders. The ways in which RISA's communicate knowledge and disseminate information vary by team and desired audience. Allocating resources for dedicated communications specialists to RISA teams could offer more robust and meaningful ways of reaching the desired audiences. While RISA's are currently able to perform these communication and dissemination activities at some modest level, those who are currently doing these activities are often responsible for multiple other tasks and may not have sufficient time to dedicate to communication outreach activities. For instance, periodically updating websites to include current research, upcoming events, or other areas of interest may be difficult to maintain if done by someone with various other duties. If resources could be dedicated to this knowledge management role, there could be a parallel advance in the use of RISA produced knowledge.

"[Templates] would facilitate quicker dissemination of information. We spend a lot of time on the formatting and preparing the information and with time, the effectiveness of communicating the science is lost as it's further away from an event."

Offering information in consistent formats could help users to better understand information and offers cues on where to find information.

Templates and standardized formats for certain types of deliverables may be useful in order to save time and create brand recognition. Annual report templates make information reporting consistent, allowing comparisons. However, templates may be useful only for certain types of research deliverables since projects and use of research results vary across regions.

> "There are some things that slip through the cracks due to lack of time and capacity. For example, we could have a better curated and utilized a Vimeo channel or Flickr feed that was integrated into our website if we had more capacity."

Measuring the impacts of RISA activities is reported to be difficult and often under-prioritized. Those responsible for evaluating RISA activities vary by team. RISA's with limited staff capacity are unable to dedicate a person to conducting evaluation activities. Establishing a standard set of metrics with which to evaluate RISA impacts would be extremely difficult since each RISA serves a wide variety of stakeholders. There may also be temporal challenges in attempting to measure impacts, as long-term follow up of RISA collaborations or RISA produced information may not be reported or even sought out by RISA evaluators due to limited capacity. Some RISA's have seen benefits from hiring external firms to conduct analyses of their activities. When RISA information is used for decision-making or other purposes by various stakeholders, the economic impacts are often unknown. There seems to be a desire for evaluation metrics that measure economic impacts of RISA activities. Knowledge of how RISA's make an economic impact would be a valuable tool in promoting the efficacy of the organizations.

The use of data analytics is a helpful tool to assist in evaluation, although the staff examining the results of the analytics may have limited knowledge concerning what to do with the information. The use of outside experts, or equipping internal personnel with additional training, may be a consideration that could better serve the needs of the organization.

Measuring the impacts RISA's have on the climate sciences in an empirical way would be almost impossible. Their activities, whether acquiring knowledge, disseminating information, or creating networks to advance the sciences and create public value, could not be measured in a way that meaningfully addresses the totality of what they do. This document explores possible methods to enhance their contributions given the dynamic nature of their work. With similar goals, but differing structures, all RISA's have developed their own ways of making their organizations effective and impactful to their stakeholders. This information obtained by surveying each RISA suggests a commonality in the areas with high potential improvement. We thank SCIPP for partnering with us to conduct this project and all the RISA survey participants who contributed valuable insights.