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This paper examines issues in promoting explicit and tacit knowledge management practices, particularly within the use of intranets. Specifically, this paper presents an information audit of the Frank Hawkins Kenan Institute of Private Enterprise's Business Intelligence Portal. The purpose of this audit is to identify the information environment of the Institute as well as its knowledge management practices. Overall, the findings of this audit indicate problems in finding, retrieving, organizing, and sharing needed information as well as a lack of collaboration and communication amongst centers. Recommendations for new technology and practices to remedy existing information and knowledge management problems are offered. This paper also acts as a roadmap for other information professionals interested in conducting information audits for their organizations.

Headings:

Knowledge Management

Information Services – Evaluation

Intranets

Use Studies – Information Services

AN INFORMATION AUDIT OF A BUSINESS INTELLIGENCE PORTAL

by
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Introduction

Knowledge management is the discipline that encourages organizations to identify, create, distribute, and share information. It uses practices to meet organizational objectives like improved performance, competitive advantage, developmental processes, innovation, teaching lessons learned, and the development of collaborative practices. It promotes continual learning, organization wide collaboration, and information sharing. Knowledge management consists of the promotion of two types of knowledge: explicit and tacit. Explicit knowledge is knowledge retrieved from information, resources, and technology, whereas tacit knowledge is knowledge acquired from lessons learned and personal experiences. Knowledge management is critical to the success of an organization because it assures appropriate informational resources, guidance for employees, communication, collaboration, and overall organizational efficiency.

Knowledge management practices can be implemented into an organization by using specific technology like an intranet. The use of intranets as knowledge management tools has become popular because they can store explicit information like databases, electronic journals, publications, and other electronic resources and promote tacit information through discussion boards, blogs, wikis, and shared folders. Ideally, they act as technological tools that help employees communicate, collaborate, share resources, find information, and overall access needed knowledge and information.

Knowledge and information resources are critical to an organization's success. The ability of employees to locate, use, archive, and share information helps in conducting research, developing new products, collaboration and organization efficiency. However, organizations face continuous battles of gaining access to relevant resources, having too much information or "information overload," time and money wasted on searching for needed information, and a lack of collaboration. In addition, due to downsizing and budgetary cutbacks many organizations have lost information professionals who aided in information acquisition and management. In many cases, employees must rely on themselves to acquire and maintain their own informational resources; they must operate as individual business units with minimal direction and collaboration. This oversight presents problems in retrieving appropriate information needed to meet organization objectives. Duplication of employee efforts, gaps in information, and time and money wasted on unsuccessful searches also manifests a lack of information management and creates a lack of knowledge management where employees fail to learn from each other, share resources, and collaborate on projects.

Although many organizations rely on intranets to archive and keep useful, important, and resourceful information, in many instances needed information cannot be accessed, found, or retrieved from the intranet. Many employees keep their information in multiple places, such as desktop folders, emails, personal files, and in print. In some cases, employees do not index materials in their databases and other resources on the intranet making it impossible for others to find needed information. Also, intranets require regular maintenance to manage databases, resources, calendars, folders, and information. However, many organizations do not take the time to maintain their

intranets or do not have the resources, such as information professionals who can regularly assess and update them.

Although some organizations lack needed information or fail to make information available, other organizations inundate their employees with too much information. Organizations that lack information professionals do not have intermediaries to help employees select, acquire, and maintain useful and needed information. Often vendors will overload employees with products and resources resulting in “information overload.” In addition to having too much information, employees do not have time to navigate resources to select and de-select appropriate information.

In addition to having too little or too much information, many intranets lack effective searching mechanisms. In fact, most intranets can only provide basic results and cannot deliver specific information. Also, not all employees know how to execute effective searches for needed information. As a result, employees waste time on useless searches and navigating through results to find relevant and specific information.

Along with wasting time searching for appropriate information, employees also waste time duplicating their efforts, working independently from each other with minimal collaboration, and miss opportunities for mentorship and guidance. Departments working on similar projects and using related resources should share information and experiences. By sharing experiences and knowledge of previous projects, employees help each other learn from project failures and successes as well as provide guidance. Intranets should provide both explicit knowledge that is knowledge found in informational resources, as well as tacit knowledge, which is knowledge found from personal experiences. By promoting both explicit and tacit knowledge, organizations implement effective

knowledge management practices that reduce time spent looking for information and duplicating efforts while increasing productivity and success.

Overall, organizations are finding that they are wasting too much time, money, and effort on information acquisitions, management, and failing to promote effective knowledge management practices. Intranets have the potential to make accessing information easier, faster, organize resources, and promote both explicit and tacit knowledge. However, organizations must identify the inefficiencies and problems with their intranet before they can re-model it to better meet employees' informational needs.

Although organizations face continual battles with information management, a lack of knowledge management, and intranets that fail to fulfill both of these duties, an information audit offers opportunities to evaluate an organization's information retrieval practices, identify information needed to achieve organizational objectives, map the flows of information within an organization, and identify opportunities for collaboration and resource sharing. The information audit is a process that identifies an organization's information environment. Specifically, it identifies information needed to meet organizational objectives, reveals currently existing information and identifies gaps, inconsistencies, and duplications. Overall, it identifies inefficiencies and problems that can improve information and knowledge management practices, particularly within an organization's intranet.

Purpose of the study

The purpose of this study is to conduct an information audit to examine the existing information environment of an organization and to identify information gaps, duplications, resource needs, and opportunities for collaboration and information sharing. The study also describes the information audit process and how it can be used to identify opportunities for improving or implementing more effective information and knowledge management practices as well as recommendations. The audit maps the flow of information in an organization, identifies employee resource needs, and acts as the first step toward new organizational practices, improving existing information tools like intranets, and implementing effective knowledge management practices that promote both explicit and tacit knowledge. This paper does not describe how to re-design intranets, install software, or conduct usability testing for a new intranet. Instead, it describes the process of an information audit and how the findings of this audit identify the information and knowledge management needs within an organization. The process can serve as a guide for other information professionals who want to identify and improve information and knowledge needs of their organizations.

Supporting Literature

The need for effective approaches for information and knowledge management are strongly emphasized in the professional literature. The article “Effects of Knowledge Management Strategy on Organizational Performance: A Complementary Theory-Base Approach,” by Byounggu Choi, Simon Poon, and Joesph Davis (2008) investigates the use of knowledge management strategies and their effect on organizational performance. The study examines both explicit and tacit knowledge practices and whether they improve organizational performance. The study was carried out in two stages with the first classifying the organizations’ knowledge management strategies and then assessing the success of these strategies. Some organizations used only explicit or tacit knowledge strategies while others used both. The results indicate that the implementation of both explicit and tacit knowledge practices did improve performance, but that the strategies used must be specific to the needs of the organization. The study also revealed that strategies consisting of only one type of knowledge were not as successful as using both. The study concluded that explicit and tacit knowledge practices result in increased efficiency and productivity as long as organizations implement both types and tailor them to their specific needs.

Implementing both explicit and tacit knowledge practices into an organization can be difficult, but with the right technology it can be done. The article “Don’t Say Web 2.0, Say Intranet 2.0,” by Boué Goetz (2008) explores how intranets can assist

organizations in reaching their knowledge management objectives. Specifically, Goetz argues that organizations should implement intranets that include social networking tools that create “a real community bulletin board and meeting place.” He also argues that intranets should contain appropriate informational resources along with groupware to fully utilize resources, share information, communicate, and collaborate. Overall, he emphasizes that organizations need to take advantage of blogs, wikis, RSS feeds, and social networking tools to make their intranets a better communication tool and to further promote explicit and tacit knowledge.

Although intranets can implement effective explicit and tacit knowledge practices, if not carefully constructed they can also inhibit employees from finding needed information. The article “The High Cost of Not Finding Information” by Susan Feldman and Chris Sherman (2004), discusses the problems of having too much and too little information available to employees. Specifically, Feldman and Sherman estimate that Fortune 1000 companies lose at least \$2.5 billion each year due to inability to find and access information. They argue that most companies do not know how to effectively store, organize, and locate needed materials. In addition many employees lack the appropriate resources or are overwhelmed with too much information.

Although the advent of the Internet has enabled people to actively search and retrieve relevant and needed information, employees must realize that intranets do not work in the same way as the Internet. According to Feldman and Sherman, there are a lot of limitations to what an information system like an intranet can do for an organization. For example, information within an organization may reside in several different places all of which may lack accessibility via the intranet. Many employees store information on

desktops, personal computer folders, and in print. Unfortunately, these places do not allow universal accessibility and employees cannot always find needed resources with an intranet search.

In addition, many intranets do not index all available databases and resources. According to Feldman and Sherman, “Intranets rely on search technology that utilizes ‘crawlers’ to find, fetch, and index material residing on the intranet. When users search, they are searching this centralized index, not the actual intranet” (p. 12). As a result, information that is not centrally indexed cannot be retrieved or accessed. Typically, organizations have information databases and content repositories that are not centrally indexed on the intranet and the only way to retrieve information from these sources is to query the specific database or repository. Overall, crawlers used by intranets only extract information from one specific area and cannot retrieve information from each database or repository.

Feldman and Sherman emphasize that companies waste time and money searching for information. The lack of needed information results in poor decisions based on faulty or poor information, duplicated efforts, and lost productivity due to time spent asking others or conducting unsuccessful searches. According to Feldman and Sherman, companies are wasting “at least \$2.5 to \$3.5 million per year searching for nonexistent information, failing to find existing information, or recreating information that cannot be found” (p.17). Organizations need to evaluate where employees store resources, index databases and repositories, and overall reduce the number of searchable places for information.

Like Feldman and Sherman, Li et al (2005) also examine problems accessing needed information from intranets. In their article, “A New Approach to Intranet Search Based on Information Extraction,” they argue that the problem with most intranet systems exists in how they conduct searches. They claim that the problem is not that employees do not know how to conduct appropriate searches, but that intranet searching does not have the capabilities to retrieve specific information. The authors propose that intranets implement new searching mechanisms that query both by categorizing search needs and by conducting searches in a question and answer format to better recognize needed information. Overall, the article emphasizes that employees face uphill battles when retrieving specific information and that the problem resides in the searching abilities of the intranet and not in the users.

In addition to having intranets inappropriately designed for conducting appropriate searches, organizations also face the challenge that not all employees have the same level of information literacy. In the article “Constructing and Using a Company Intranet: ‘It’s a very Cultural Thing,’” Ken Clarke and David Preece (2005) examine problems with constructing an intranet that all employees can easily use and understand. Often, when a company implements an intranet or remodels an old one, it relies on the information technology department to do the job without employee input. In fact, Clarke and Preece argue that upper management and IT departments make most decisions concerning new technology and fail to test usability with all employees. As a result, employees experience difficulties in using new technology, particularly in finding information and learning how to conduct effective searches.

Although organizations may rely heavily on upper management and IT personnel for constructing and implementing technology, Clarke and Preece offer a better approach. They suggest that IT departments meet with all employees and conduct interviews to assess information literacy and understand the informational needs of their users. Clarke and Preece conducted a study where an IT department and a quality manager interviewed employees from all levels of an organization as well as conducted usability tests on potential intranet technology. In conclusion, their study received positive feedback from employees and the organization implemented a more usable and effective intranet. Unlike the typical method of implementing an intranet approved only by the IT department, their study suggests that employees need to consider their users, their levels of information literacy, and informational needs. Overall, the authors found by taking these initial steps there were fewer problems with usability and significant increases in productivity.

Clarke and Preece's article reveals the overwhelming problem of ineffective knowledge management practices. Many organizations rely on technology like intranets to provide information, resources, and communication to their employees. Intranets can increase communication; however, many organizations fail to make them usable for all employees. Perhaps companies assume that intranets offer quick solutions to their information and knowledge management needs. However, organizations need to take the time to understand their users, assess information needs, evaluate the level of collaboration among employees and departments, and implement usable and effective technology to promote effective knowledge management practices.

Along with taking the time and steps to implement effective knowledge management practices, organizations also need to be more practical about knowledge management. In the article “Putting Ideas to Work: Knowledge Management Can Make A Difference—But It Needs to Be More Pragmatic,” Thomas Davenport, Laurence Prusak, and Bruce Strong (2008), emphasize the importance of knowledge management, especially in becoming “more productive and competitive” (p. 2). However, they also argue that most organizations have embraced the idea of knowledge management but have yet to take it from idea to practice. In fact, Davenport, Prusak and Strong argue that most organizations focus on technology to fulfill their knowledge management needs without assessing whether this technology is actually meeting those needs.

In conclusion, the authors suggest that instead of focusing on technology to provide knowledge management that organizations map their knowledge creation, knowledge dissemination, and knowledge application. If employers better understand the organization’s flow of knowledge and information, particularly its creation, how it’s shared throughout the organization, and how it’s used in daily work practices, then the organization can take steps to improve its flow and increase efficiency.

Davenport, Prusak, and Strong’s proposal of mapping knowledge and information flows can be accomplished by conducting an information audit. Susan Henczel (2000) in her article “The Information Audit as a First Step Towards Effective Knowledge Management: An Opportunity for the Special Librarian” defines an information audit as “a process that will effectively determine the current information environment by identifying what information is required to meet the needs of the organization” (p. 211). Henczel argues that information audits reveal what information exists at an organization

and determine gaps, duplications, and areas lacking information. Overall, the information audit can begin to identify an organization's information environment and its flow.

In addition, information audits also identify strategically significant information resources. When an organization wants to evaluate resources for retention, such as databases, electronic, and paper publications, an information audit helps determine useful resources that should be kept and ones that should be removed. The audit helps employees determine what information and resources support productivity and those they do not. By understanding efficient and inefficient resources, organizations can make better collection development decisions and save money by not spending it on useless technology and resources.

Although information audits help identify useful information resources, they also reveal workplace tasks and activities that create knowledge. Knowledge plays an important role in fulfilling job duties and can help employees work more efficiently. However, like identifying useful and useless information, an information audit can uncover workplace practices that create knowledge, if and how they disseminate knowledge, and how they apply knowledge. By understanding the flow of an organization's knowledge, management can assess whether it effectively promotes and manages it.

Henzel also argues that information audits promote knowledge management practices. Like Davenport, Prusak, and Strong, she criticizes organizations for depending on technology to satisfy knowledge management needs. Henzcel states:

Good information management is seen as the essential prerequisite to

knowledge management yet many organizations are developing knowledge management strategies based on technical systems that disregard information resources and the people who create the knowledge (p. 211).

In addition, Henzcel also believes that by understanding the use and flow of information, one can better understand the use and flow of knowledge within an organization.

Therefore, by conducting an information audit an organization can better assess and implement more effective knowledge and information management.

Like Henzcel, Kim Guenther (2004) the Director of the University of Virginia Health System Web Center, also advocates conducting information audits, particularly on organization intranets. Guenther argues that organizations should conduct audits before implementing new technology, which would help better tailor technology to meet organizational objectives. In her article “Conducting an Information Audit on your Intranet” she states, “An intranet’s effectiveness and value to the organization is tied directly to how well underlying needs are assessed, making a systemic information audit prior to development vital” (p. 46). She stresses that by doing an audit before the implementation of an intranet, the organization better plans and prepares for the installation of this new technology. Also, employees will be more willing to use new technology if its design and implementation included their input.

In addition to appropriate planning of an intranet, Guenther also argues that conducting an audit before installing an intranet assures companies that their intranets will have value. Unlike organizations that hastily implement an intranet, by doing an audit the organization will incorporate resources shown to be useful and avoid useless ones. Employees will have more input and participate in the development of the intranet. Also, an initial audit will avoid counterproductive technology and resources. Guenther

claims that most corporations when creating their intranet design it to match the corporate structure of the organization without considering its usability. She also argues that these types of intranets are “organization-centric rather than user-centric, mirroring information behaviors even if those behaviors are counterproductive” (p. 48). Therefore, by doing an initial audit companies can avoid creating unhelpful and useless technology that fails to increase productivity and efficiency.

Like Guenther, Rebecca Jones and Bonnie Burwell (2004) in their article “Information Audits: Building A Critical Process” promote the use of information audits. Jones and Burwell surveyed public, academic, and special libraries to see how many information professionals have conducted information audits and to learn about their experiences. Unfortunately, Jones and Burwell discovered that only a small group of information professionals had conducted them and that there were very few steps and processes built to guide information professionals who want to conduct information audits.

Although Jones and Burwell found very few individuals who had conducted information audits, they did construct a list of guidelines for performing successful audits, which includes useful information like “Establish specific, realistic objectives for your audit. Be able to answer the key question: What will we need to know at the end of this audit that we don’t know now?” (p. 53). In addition, they also urge information professionals to take a realistic approach when conducting an audit and not to expect immediate results. In conclusion, they articulate the need for information audits and provide a pragmatic approach to conducting one.

Overall, the literature suggests that organizations can improve performance by implementing explicit and tacit knowledge practices. Intranets using groupware, social networking tools, and informational resources can provide both types of knowledge. However, many intranets lack these tools requiring organizations to re-evaluate their intranets. The literature also suggests that companies waste time and money on unhelpful information sources, intranets that fail to retrieve needed information and that do not initiate employee communication and collaboration. However, the literature also suggests that an information audit can help organizations better understand their information environment as well as help make changes to bring effective information and knowledge management practices.

The Information Audit

Section A: About the Institute

For this study, a small-scale information audit of the Business Intelligence Portal of the Frank Hawkins Kenan Institute of Private Enterprise was conducted. The intent was to reveal the processes involved in conducting an information audit and discover unmet information and knowledge management needs of this particular organization.

The Frank Hawkins Kenan Institute of Private Enterprise (Kenan Institute), established in 1995 at the University of North Carolina at Chapel Hill's Kenan-Flagler Business School, "provides companies, communities, and countries with research, information, knowledge, and solutions to help them develop strategies to compete and prosper in today's business world" (Kenan Institute, 2008). The institute consists of eight centers: Air Commerce, Competitive Economies, Entrepreneurial Studies, International Business Education and Research, Logistics and Digital Strategy, Real Estate Development, Sustainable Enterprise, and Urban Investment Strategies. The Institute is known for its research, publications, and expertise in the business world.

Section B: About the Business Intelligence Portal

The Kenan Institute's Business Intelligence Portal database (BI Portal) has received few entries since 2006 and is accessed via the Kenan-Flagler Business School intranet. The portal is currently a SQL-based database with a web interface for adding information as well as search and retrieval capabilities. Center directors and staff can

search for information by browsing the Business Intelligence Search, which allows multiple search options:

- Search by center, index, full text, and files. This search also allows users to select how far back in time they wish to search.
- Search through center files for articles and research information.
- Search through files and centers to locate newly added articles.
- Search for articles under the employee name that posted them.
- Search for articles by center indexes and general indexes.

In the past a staff member selected articles relevant to director and centers' needs and regularly updated the portal. Selection was made through Internet and vendor-database alerts, weekly searches, and other environmental scanning search techniques—a time-consuming process that required much selection and de-selection of information. Typically, the employee posted 2 to 15 articles for a specific project or research need. Some of the directors and staff preferred this system because it pushed articles and information to them and did not require lengthy searches. However, the institute no longer has a designated employee to search and post articles for projects and since 2006 the portal has had little use. New Senior Research Associate Cindy Reifsnider plans to re-design the portal to satisfy knowledge management and research needs of these centers.

Section C: Why this Audit is needed

Since the Kenan Institute's Research Services department plans to re-design its BI Portal, staff will directly benefit from this study. The purpose of the information audit was to identify knowledge management needs, to assess current information resources

and to processes, to map information flows within and amongst the centers, and to examine the activities and tasks within the centers and the research that are supported. Suggestions for new resources and removal of no longer useful resources were the point of this study.

Section D: Methodology

The first phase of an information audit requires planning to identify the departments or centers needed to understand the information environment of the organization. The planning phase of this study include these four steps:

1. Gaining organizational support
2. Selecting a scope for the audit
3. Understanding/Learning about the centers
4. Creating and developing interview questions

Step 1: Gaining Organizational Support

Before identifying centers and selecting the scope of this information audit, the appropriate organizational support was needed before further proceeding. Senior Research Associate, Cindy Reifsnider, who works in the Research Services department of the Kenan Institute, helped identify appropriate centers and helped in setting up interviews with the designated centers' directors and staff.

Step 2: Identifying the centers

When planning to conduct the information audit specific centers were selected to participate due to their higher informational needs. In particular, these centers were chosen because they conduct the most research and would benefit the most from the re-design of the new BI portal. In particular, this audit focuses on five centers: Logistics

and Digital Strategy, Competitive Economies, Entrepreneurial Studies, and Urban Investment Strategies and Sustainable Enterprise.

Step 3: Understanding/Learning about the centers

Prior to interviewing directors and staff from each center, research was conducted to understand each center's purpose, their clients, and their organizational objects. By better understanding each selected center, interviews could be tailored to specific needs (see Appendix A for interview questions).

Section E: Data Collection and Analysis

Step 1: Interviews

After researching each of the five centers, appointments were set up via email to meet with a center director and/or staff member. Interviews lasted 60 minutes each and were conducted at the Kenan Institute. Each interview provided important data for the information audit and helped to assess informational needs, needed resources, useless resources, and everyday tasks and activities. The questions for the interviews fell into three categories:

1. Questions relating to knowledge management/research required to perform tasks, projects, and research:
2. Questions about the level of criticality of information resources used to complete tasks and projects
3. Questions regarding the transfer and sharing of information resources within, across, and beyond centers.

All of the questions asked in the interviews related to the BI Portal and the center affiliated with the interviewee.

Step 2: Organizing the data

When conducting an information audit the interviewer must diligently track and record interviewee responses. Interview responses contain valuable information that will identify useful and useless information sources, business practices, and will provide recommendations for improving technology. After each interview, the interviewee's answers were recorded and maintained in a Microsoft word document. Initially, interviewees' responses were to be recorded in an MS Excel spreadsheet, however, due to the length of the responses the spreadsheet could not provide adequate space.

Records for each interview included the following information: the center affiliated with the interviewee, the center's objectives, routine research projects (number and scope per year), critical success factors, tasks/activities/projects, projects that include collaboration with other centers, desired information resources, and other additional notes.

Results of Interviews

The first center interviewed for this information audit was the Center for Logistics and Digital Strategy (CLDS). The interview consisted of responses from Director Noel Greis and Senior Research Associate Monica Nogueira. The CLDS, established in 1997, helps organizations find new technologies to develop new innovative ideas. The center “helps our clients face challenges such as end-to-end integration of the supply chain, total asset visibility, and real-time control to respond to customer demands and market shifts” (Kenan Institute, 2008). In addition, its areas of expertise include: global enterprise coordination, emerging logistics technologies (intelligent software, Wireless GPS/GIS), intelligent decision support, dynamic asset management, event-driven planning and scheduling, adaptive business processes and workflows, and multi-agent development and design. Overall, CLDS collaborates with a global network of partners from academia, business and government to take ideas from concept to marketplace.

Annually the CLDS works on several projects with government, academic, and corporate clients. Specifically, their current projects include: Pattern Recognition for Real-Time Performance Tracking and Failure Prediction in Complex Systems, Battlefield Situational Awareness and Logistics Command and Control, Multi-Agent System for Supply Cross-Leveling in Future Combat System, Dynamic Resource Management for Aviation Spare/Repair Parts, Performance Monitoring and Alarm Management for FAA Power Systems, and a NASA Shuttle Orbiter Data Mining.

Since CLDS takes on several projects per year, they have large and diverse information needs. Particularly, the CLDS needs current articles relating to research and updated information for projects. In the past, Noel Greis relied heavily on the BI Portal to provide her with weekly emails that contained 10 to 15 articles related to her research. She liked that the portal pushed information to her via email and that she did not have to conduct regular searches for needed information. In addition, Director Greis also passed along the weekly articles she received from the portal to clients as a marketing tool to show that the CLDS conducts the most current research.

Unfortunately, the BI Portal has not been updated since 2006 and as a result the CLDS no longer receives weekly email updates. Currently, Greis and Noguiera search independently for their own information and use resources like Google, Google Alerts, and Lexis Nexis for retrieving articles. Due to time constraints, they have little opportunity to regularly search for information and cannot easily share resources. The CLDS would like a digital space where they could share articles and pass along information.

Although the CLDS does not collaborate with other centers or know about resources used in them, it seems the CLDS could benefit from sharing databases and articles, particularly with the center of Air Commerce. Unfortunately, due to the lack of communication between centers CLDS does not know about similar projects or resources used by other centers. In addition, since the CLDS takes on a lot of projects its employees do not have a lot of free time to connect with other centers, learn about their resources, and discuss similar research.

When questioned about their ideal intranet, Greis and Noguiera responded that they want a system that “pushed” information rather than having to “pull” it. Specifically, they liked the old weekly email system that regularly sent them current articles. They also liked that the old system worked on a schedule and sent updates to all center employees. In addition, they liked the personalization of the old system and wanted articles specifically related to their projects and research. They also wanted the ability to share these articles with other center employees and clients. Along with the weekly email updates, they also want access to scholarly databases as well as Google when they need to conduct additional research.

Unlike the CLDS, the Center for Entrepreneurial Studies (CES) had never used the BI Portal. This interview consisted of responses from Director Ted Zoller. The CES supports students in “helping them start their own companies, work for a start-up company, find an entrepreneurial opportunity within a large company, or go into related area like venture capital or social entrepreneurship” (Kenan Institute, 2008). Overall, the CES works with students to help them identify and embrace opportunities for entrepreneurship.

Typically, the center works on three papers per year. Currently, the center is working on a big project analyzing how Research Triangle Park (RTP) compares to Austin, TX and Portland, OR in terms of developing new companies and businesses. In addition, the center also works on the following projects: looking at clustering of Biotech companies, analysis of environmental impacts of small businesses, and the outcome of launching venture-environmental impact. For their big project the center needs data collection, raw data sets, analysis folders, draft manuscripts as well as manual labor

filling in databases, looking up information, and contacting local companies in RTP. In addition, this project requires access to databases like Dun and Bradstreet and Capital IQ for which the center has had minimal access.

Unlike many of the other Kenan Institute centers, Ted stores articles, data sets, and other important information digitally on his computer. He uses very few print publications and does not like his office cluttered with paper. Students and research assistants may access his data and resources, but other centers cannot access this information. Although this system works in maintaining organization, it offers no collaboration and resource sharing with other centers. In particular, CES would benefit in working with the Center for Competitive Economies, which also uses a version of Dun and Bradstreet that would aid the CES' big project. Overall, the CES requires a lot of human labor in conducting its research, maintaining databases, and retrieving information. However, it would greatly benefit from sharing databases, resources, and information with other centers.

The next center interviewed for this audit was the Center for Urban Investment Strategies, which consisted of responses from Director Jim Johnson. The Center for Urban Investment Strategies “helps develop innovative solutions to the challenges of revitalizing distressed communities” (Kenan Institute, 2008). In particular, the center focuses its research, outreach, and education initiatives to address the growing gap between the “haves” and the “have-nots” in U.S. society. In addition, the center also has the following goals:

- Creating knowledge in key area of community competitiveness

- Advising communities how to develop their community assets to thrive and prosper
- Developing market-based solutions that build community capital and promote urban development
- Teaching government, community, and nonprofit leaders to become more entrepreneurial and business-like in their operations and service delivery (Kenan Institute, 2008).

Specifically, Director Johnson's work at the center focuses mostly on immigration and illegal/legal immigration in the United States. He also looks at Latinos and immigration, competitiveness in the United States, urban-metropolitan, workplace, workforce, and diversity issues, minority entrepreneurship, offshoring of white-collar jobs, research and development activities, and medical tourism. Overall, he produces seven to eight papers per year, one big project, several consulting reports, and several research-based talks. In 2007, for example, he gave 40 different talks on immigration.

Like the Center for Logistics and Digital Strategy, Johnson has had past experience using the BI Portal. In the past, he would receive weekly emails containing three to five articles related to his research and projects. However, he found the weekly email useless because it did not contain the most up-to-date information and it did not provide him with enough articles. Since he gives a lot of talks he needs the most current research and cannot wait for one weekly email. He also mentioned that he received his weekly emails at the end of the day on Friday, which came too late. Johnson also expressed frustration with organizing articles and research materials specifically for publications. He has had problems in citing online articles used in his papers, especially

when he can no longer locate them on the Internet. Overall, the Director feels he is missing important resources and the most current information, particularly census reports and government data.

Currently, Johnson receives four Google alerts a day consisting of articles and popular press. Unfortunately, he wastes time looking through his alerts to find appropriate information and feels that he receives a lot of “old” news. However, although he does not receive as many scholarly and recent articles through Google alerts, he does receive articles from mainstream media that help keep him updated. In addition, he also uses scholarly databases like ScienceDirect, Lexis Nexis, and ProQuest. Typically, Johnson will print out scholarly and mainstream articles and compile them into a brief that he will read while traveling. Although his current system provides him with both popular press and scholarly articles, he still feels that he lacks important information and wishes he had a better process for collecting research.

The Center for Urban and Investment Strategies does have projects that overlap with other centers, specifically with the Carolina Center for Competitive Economies and the Center for Air Commerce. The director thinks it would be helpful to share articles and resources with other centers, particularly concerning census, demographic, and economic indicators. When asked about what he wanted in a new portal, Johnson emphasized having access to both scholarly and popular press articles, the ability to archive articles for papers, sharing information with co-workers and other centers, access to the most current census and demographic information, and a digital space to share slides, articles, and projects. In addition, Johnson wants a “push” system that would notify him of new articles, resources, and information by email.

Unlike Jim Johnson, Brent Lane, the Director for the Carolina Center for Competitive Economies, had no previous experience or knowledge of the BI Portal. The Carolina Center for Competitive Economies “works to address the challenges of global competitiveness in the 21st century” (Kenan Institute, 2008). The center works with clients to identify and address economic development opportunities. Specifically, the center conducts comprehensive analysis, works with community leaders, creates actionable and achievable plans with their clients, and provides ongoing analysis and benchmarking for these plans. Competitive Economies conducts mostly client sponsored North Carolina based research. Typically, clients will request information and the center will return this information as a scholarly publication or report.

Currently, the center has two county level economic development projects, a Marine Technology study, and an industry cluster analysis. The average time spent on these projects varies from one to eighteen months but in some cases can take up to two years. The center has a lot of competing deadlines and relies heavily on students to help conduct research. The center does both qualitative and quantitative research for its projects and Lane uses both popular publications and scholarly journals. Typically, he finds articles through Google Scholar and uses data sets for which his center purchases.

Although the center has access to data sets and publications, Lane still questions whether he is missing information when starting a project. He also wishes the center had access to government and federal resources. In addition, he also wants to change his subscription to Dun and Bradstreet so that he could access more data sets and allow multiple users to access the database. Director Lane also mentioned that other centers would benefit from having access to Dun and Bradstreet as well as his other data sets.

Currently, he does not collaborate or share resources with other centers, but thinks his center would benefit from sharing databases, resources, and information.

Lane's ideal portal would include access to databases, data sets, government/federal information, popular press, and scholarly publications. In particular, he would like data sets that contain specific company information for the state of North Carolina. In addition, he would like user-friendly search engines to help him navigate the portal as well as a page with useful links to helpful Internet sources. Overall, the director had no pre-existing knowledge of the BI Portal and did not seem interested in using a new intranet unless it offered helpful resources, Internet links, data sets, and publications.

The last interview conducted was the Center for Sustainable Enterprise, which consisted of responses from Executive Director Katie Kross and Program Manager Tracy Triggs-Matthews. The Center for Sustainable Enterprise (CSE) helps executives and future business leaders understand social and environmental considerations and needs. In particular, the CSE provides education, research, and outreach to business students, executives, and organizations to help them develop sustainable business strategies. The center continually works on consulting projects for companies and non-profit organizations.

Executive Director Katie Kross had past experience with the BI Portal that included her receiving weekly emails consisting of two to three research articles. According to Kross, a former Kenan Institute employee asked her for search terms based on her current projects. In return, Kross received articles relating to her research via email and in some cases received a photocopied article from a print resource in her work mailbox. Although the director received weekly emails from the portal, she did not know

that she could use it to search for needed information. Overall, Kross like the weekly emails and found the articles helpful, but would have liked to utilize the portal more.

Currently Kross and Triggs-Matthews use Green Business alerts, Greenbiz listserv, books, and a mix of paper and electronic resources for conducting research. When asked about collaboration and overlap with other centers, both Kross and Triggs-Matthews did not know about other centers' projects or resources they used. In addition, Triggs-Matthews expressed difficulty in finding relevant and useful information relating to sustainability. When researching she finds a lot of confusing websites and has difficulty locating relevant material. She also mentioned using primarily electronic resources and not paper materials since they cannot be easily stored. In addition, she wants to consolidate, maintain, and share her research.

When asked about their ideal portal, both Kross and Triggs-Matthews wanted access to relevant databases that would allow them to search for articles. They both mentioned wanting a quarterly report that would include information about current and completed projects from other centers. Kross also wanted the portal to contain a mix of popular press and scholarly articles as well as another "push" system that would notify her about articles or other relevant information. In addition, they both wanted a space to share information, advice, and resources.

Discussion

The findings from the audit reveal several problems with the information and knowledge management practices of the centers. Surprisingly, centers had minimal to no knowledge of the existing BI portal. Although some centers knew of the portal, others like the Carolina Center for Competitive Economies and the Center for Entrepreneurial Studies had no previous knowledge of it. In addition, some centers that received weekly portal emails did not know they could use it to search for other needed information. Only one center regularly used the portal and relied on it for retrieving articles.

The lack of portal use indicates that the Institute did not properly market it to the centers. It appears that the Institute did not promote the portal as a research tool and failed in trying to integrate it into centers' work habits. In addition, the portal is not easily located from the Kenan Institute website. In fact, it seems that the centers that knew of the portal only did so because of the weekly articles it sent to them. It also seemed that the portal prioritized centers and provided some with ten to fifteen weekly articles and others with only two to three weekly articles.

Along with a lack of knowledge of the portal, all of the centers had minimal to no knowledge of the projects and publications produced by other centers. Overall, it seemed that each center is bombarded with projects, papers, and research with little available time to connect with other centers. Unfortunately, the lack of communication resulted in a lack of resource sharing, collaboration, and the opportunity for mentorship. In fact,

most of the centers did not know of the resources used by the other centers even though many of them conduct similar research.

Although the centers do not share resources, they would benefit from access to the same scholarly journals and popular press. Every center interviewed uses a mix of scholarly articles and popular press for projects and publications. The centers also indicated that they have difficulties in properly archiving, storing, and sharing articles. Jim Johnson, the Director of the Center for Urban Investment Strategies, discussed his past difficulties in co-writing papers where he had problems sharing articles with co-writers. Overall, it appears that each employee works differently in collecting and maintaining articles, but would benefit by digitally storing articles and allowing others access to them.

It also appears that centers would benefit from sharing databases and data sets. Ted Zoller, the Director for the Center of Entrepreneurial Studies expressed his frustration in trying to access the Dun and Bradstreet database at the same time it was being used by another center. It appears that all centers would benefit from the databases subscribed to by a few centers. Unfortunately, centers do not advertise their databases in fear that multiple users will block them for accessing them. Instead of fighting over accessibility, centers could collaborate over subscriptions that would enable multiple users and allow access to all employees.

The interviews also indicated that centers waste a lot of time looking for relevant information. Most centers rely on Google Alerts to provide popular press articles for updated information and research. However, employees waste time looking through alerts to find relevant information. According to Jim Johnson, alerts provide him with

recent news, but he spends a lot of time skimming through articles and selecting ones that pertain to his research. In conclusion, it seems that Google Alerts offer a quick fix for collecting popular press articles and recent news, but results in employees wasting time skimming and locating relevant information.

In addition, the centers want information “pushed” to them instead of having to search and retrieve it themselves. Each center is overwhelmed by projects and has little time to conduct research. By having information pushed they can easily retrieve needed and relevant research without wasting time searching for it. However, there is no software that can navigate scholarly journals, popular press, and electronically “push” all relevant articles and information to centers via email. In the past, a Kenan employee individually sought and retrieved relevant articles for a few of the centers. Unfortunately, this method requires a lot of manual labor and an individual who understands all of the research needs for each center. This method also seems to favor one center over another as seen in the past with the Center of Logistics and Digital Strategy receiving ten to fifteen articles per week and the Center for Sustainable Enterprise receiving only two to three articles per week.

Along with the difficulties in creating a “push” system, center employees have different levels of information literacy further complicating the re-design of the new portal. Some employees regularly store articles digitally and have experience navigating databases for needed information while others rely on print publications. In addition, the idea of adding fancy “groupware” seems less useful due to the fact that not many employees have experience blogging or creating wikis. Also, employees will forgo using

new technology if it is too intimidating or causes them to drastically change their work habits.

Overall, the interviews revealed a lack of use of the current portal as well as a lack of communication, collaboration, and resource sharing amongst centers. In addition, each center wastes time weeding through Google Alerts and searching for needed information. Employees also indicated that they want to digitally share articles, resources, and information within and amongst their centers, but do not have the technological tools to do so. The responses also revealed gaps in information where employees felt they did not have all relevant and needed information for projects and papers.

Future Research

Although this audit provided useful responses that helped understand the information and knowledge management needs and practices of five of the Kenan Institute centers, a full-scale information audit should include all eight centers. A new portal needs to support the entire Institute and meet the research needs of all employees. In addition, all employees should be interviewed to fully understand work processes and flows of information within the Institute.

Along with assessing the informational needs of all employees, the new portal should be tested for usability. An information audit can help plan and develop an intranet, but it must also be constructed in a helpful and user-friendly manner. Usability testing allows employees to test new software and provide feedback for further improvements.

Recommendations

The interviews indicate that the new portal needs to include scholarly journals, databases, discussion boards, and tools that would allow employees to share advice, articles, and information. The responses also revealed that employees do not want to drastically change their work habits and deal with intimidating new technology. Although each center wants an “ideal” portal customized to satisfy their specific research needs, realistically no technology could provide each center with their perfect intranet. However, the most effective approach for creating and implementing a new portal would be to add new features that fulfill needs previously not met by the old portal.

All of the software reviewed for the portal did not support all information and knowledge management needs. However, Twine, a new online service does provide some hope in meeting some informational and knowledge management needs. Twine is a new service that allows individuals, organizations, and companies “to share, organize, and discover information” (Twine, 2008). Members use the service to bookmark web content, automatically tag online information, send information via email, share information with other co-workers, comment on shared information, and search Twine.

In addition, Twine acts as a “push” rather than a “pull” system. Users can send themselves and co-workers emails containing notes, messages, and web content. Twine makes it easier for employees and centers to connect and communicate about similar projects, information, and useful resources. Also, employees can conduct searches on the

site to locate needed and relevant information. Overall, this system offers tools to help centers communicate, collaborate, and offer advice. Initially, users may feel intimidated by the technology but after usability testing and training sessions will learn how to use it and hopefully integrate it into daily work habits.

Although Twine solves some of the Institute's knowledge management needs, it cannot automatically tag and retrieve all needed scholarly and popular press articles. Twine is a central repository meaning that it cannot search all information on the Internet for popular press and recent new articles. Employees will still have to look for information and needed articles; however, they will be able to share their findings with co-workers and other centers. Therefore, by using Twine relevant information can easily be passed along without getting lost in office files or on personal desktop folders.

Along with Twine, the Kenan Institute might also consider including Factiva Alerts in the new portal. Factiva Alerts is software that pulls headlines from specific industries, companies, topics, or keywords and delivers the alerts directly to a computer desktop. Factiva Alerts works similarly to Google Alerts in that it retrieves articles from the Internet by the user's requested criteria. However, unlike Google Alerts, Factiva Alerts pulls information from "22 newswires, including Dow Jones, Reuters, The Associated Press, PR Newswire, Business Wire, as well as 11 newspapers including The Wall Street Journal, Financial Times, and The New York Times" (Factiva Alerts, 2008). The advantage of the service is that it would push information from credible sources to employees and reduce time spent weeding through useless articles.

The new portal should also include databases and data sets. Currently, centers have access to their own databases and data sets; however, all centers might find these

helpful for current and future research. Also, instead of centers having their own individual subscriptions, the Institute should purchase them to allow access for all employees.

Conclusion

This paper has presented a small-scale information audit of five of the eight Kenan Institute centers. The purpose of this audit was to identify the information environment of the Kenan Institute, understand the flow of information, and assess its knowledge management practices. The audit revealed that Institute employees cannot access needed information from the BI Portal and waste time looking for information elsewhere. Sherman and Feldman argued that organizations squander their time looking for information; this is evidenced by the Institute wasting time locating appropriate resources and information. Most of the directors relied on Google Alerts for current articles, but spend time skimming through them to find relevant information.

Sherman and Feldman also argue that while employees keep information scattered in different locations, Institute directors do store information in several places instead of one central location. Directors keep information on personal computers, office files, and in personal folders. Employees cannot easily access this information and waste time trying to locate it.

In addition to wasting time looking for information in multiple locations, Institute employees do have different levels of information literacy. Some directors regularly use electronic databases and store information on digital files while others acquire information from print sources and keep articles in desk drawers. Some employees used the portal while others had no knowledge of it. These findings support Clarke and

Preece's argument that employees have different levels of experience with technology and that a new intranet could better accommodate the varying levels of experience.

The audit also indicated the need for more communication and collaboration within the Institute. As Goetz suggests, the new portal should incorporate groupware and social networking tools to increase employee discussion and resource sharing. Currently, the centers work independently from each other and would benefit from sharing articles, databases, and resources. By using a system like Twine employees can email notes, articles, and engage in discussions. Also, groupware and social networking tools offer more opportunities for promoting both explicit and tacit knowledge.

Overall, the audit reveals a lack of knowledge management. As Choi, Poon, and Davis' study suggests that an organization that wants to improve performance and efficiency can do so with the promotion of explicit and tacit knowledge management practices. However, the audit suggests that the Institute lacks both types of knowledge management and needs to incorporate new practices and technology to promote them.

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Appendix A

Interview Questions

1. What are your three to five biggest knowledge management needs? What are the core subject areas under investigation by your center and keywords describing them? How would you rank these needs?
2. How many projects do you have each year and how long does it take to conduct research for these projects?
3. What have been the most helpful resources in completing projects? Activities? Tasks? And how would you rank them?
4. Do you work on similar projects as other centers? Do you share resources? Do you collaborate and share ideas?
5. How have you used the Business Intelligence Portal in the past? If so, how, and what is most useful about it to you? If not, why not?
6. What were the five most helpful aspects of the current Business Intelligence Portal? And how would you rank them?
7. What were the five most frustrating aspects about the Portal? And how would you rank them?
8. Is there paper documentation or other electronic data that you would want in the Portal database?
9. For completed projects you found successful, what types of research tools did you use?
10. What kinds of resources have you found to be unhelpful and why?

11. Are there resources you want but do not have?

12. Describe your ideal Business Intelligence Portal. How would it function? What kind of databases would it have? How would you search it? What would it do for you to better satisfy your research needs?