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Information Sharing at Bank of America

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Note: Some material in this report has been removed upon the sponsor's request.

Abstract

This project, conducted concurrently in New York and London, sought to improve the information sharing practice for the trading support teams in the Global Credit Products division of Bank of America, which has gained vital importance due to the increased volume of business following the merger with Merrill Lynch. After an extensive assessment of the previous practice, detailed recommendations were made accordingly to address a formal knowledge management approach which would enhance the effectiveness and efficiency of information sharing. Finally, a new platform was implemented with a clearly defined structure and various features in order to streamline the information sharing procedure.

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Authorship Page

Marco Angulo, Burcu Bora, Kimberly Gallagher, and Chao Zhang contributed equally writing the report, completing the methodology, and developing our final product.

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Executive Summary

Following the merger with Merrill Lynch, Bank of America has become the largest brokerage firm in the world. With thousands of employees spread around the globe, the knowledge that each employee possesses is one of the most important assets of the company.

The trading support team at Bank of America provides assistance for traders using different proprietary applications, resolves technical issues, as well as helps developers improve the applications used by traders. Especially after the merger, the support team faced many obstacles and restrictions that limited their information sharing within the company. Additionally, temporary means of communication such as emails, phone calls, and instant messages have proven neither efficient nor effective for sharing large amounts of information as they lack organization and have eventually caused a significant amount of information loss.

Consequently, conscientious practice of knowledge management became crucial to sharing information globally in an effective and efficient manner. With the goal of helping the trading support team in the Global Credit Products division to improve their information sharing practice, we collaborated in Bank of America's New York and London offices to address the core components of knowledge management – people, processes, and technology. Specifically, our project entailed achieving the following objectives.

1. Identify the strengths and areas that need improvement in the current information sharing practice.
2. Recommend strategies for improving the information sharing practice from knowledge management perspectives:
    - People: Management involvement and team member responsibilities;

- Processes: Choice of the information distribution method and structure of the information sharing platform;
- Technology: Merger of existing tools, administrative issues, and removal of outdated or inefficient tools.

3. Implement a new information sharing platform modeled according to the recommendations above.

In order to assess the strengths and weaknesses in the existing information sharing practice, our team first examined the relevant applications currently used within Bank of America. These included the enterprise wiki Confluence, the document management system SharePoint, the bug trackers JIRA and PaPa (the complementary tool developed by the legacy Merrill Lynch for JIRA). Most of these applications have extensive capabilities, providing features that could enable efficient information sharing. However, we found that Confluence was not used to its full potential, since the content in it was not properly structured for knowledge management. Although valuable information was present, it was scattered throughout the platform, making it difficult for employees to find the pieces of information needed.

Next, we conducted interviews with members of both the support teams and different teams they work closely with in order to understand the information sharing across these teams. After the interviews, we were able to specify the areas in information sharing that required the most improvements. First, there existed too many information sharing applications, and the procedure of sharing the information through the applications was tedious and time-consuming. Second, employees had a very limited time frame to contribute to information sharing. Third, given the lack of a rigid structure and organization within each application, the information from different locations was not linked together and employees needed to search through different platforms in the hope of reaching the desired information. Moreover, the information in platforms eventually became outdated which further diminished the effectiveness of information sharing. Lastly, there was no management backing or incentive for employees to contribute to information sharing.

Based on feedback from the support team and our examination of multiple information sharing platforms in use by the support team, we implemented a new wiki space for the support teams to share information globally. This wiki space was structured with a hierarchical tree and predefined templates for all content coming from previous platforms and those to be added in future. This wiki had extensive functionality that was requested by the support team including a discussion board and issue tracker. Furthermore, we created a training section in that wiki which demonstrates to the support team members how to efficiently make contributions to the wiki space in an organized manner following the structure and templates available.

Additionally, with a clear understanding of the current practice at Bank of America and our research of the best practices of knowledge management, we developed the following specific recommendations to formally address a knowledge management approach to improving information sharing.

1. In the people framework, we suggested:
    a) Active management involvement in order to initiate knowledge management and ensure continuous practice;
    b) Providing incentives for support team members to make contributions to the information sharing platform by incorporating their effort into the teams' performance review.
2. Regarding processes, we emphasized:

    a) Following the clearly defined hierarchy and templates in the new wiki space so support team members can effectively find and upload information;
    b) Encouraging periodic updates of the wiki to keep information updated;
    c) Relying less heavily on email and adding frequently referenced information to the wiki.

3. In the Technology framework, we recommended:
    a) Migrating from the previous information sharing platforms to the structured and centralized new wiki space with various features;
    b) Making good use of all features provided by Confluence, following the examples and tutorials provided in the wiki space;
    c) Integrating the issue tracking platform, JIRA, with the new Confluence wiki space that was implemented as part of our project;

Among the recommendations, *1.b), 3.a),* and *3.c)* were designed to be realized in the short term, although *1.b)* may be extended to a longer period if needed. All other recommendations were made for the long term, to be followed continuously, because of the ongoing nature of the knowledge management practice.

Our creation of a new information sharing platform in association with the aforementioned recommendations aimed to give the trading support team in the Global Credit Products division at Bank of America the resources to collectively share knowledge with each other and increase the efficiency of their practice. In this way, the support team was given the means to which they can share information globally in an organized and efficient manner.

Part One: Introduction

Currently, Bank of America faces many obstacles that are limiting its ability to effectively share information within the company. With offices spanning the globe, Bank of America's resources are split up among numerous time zones. The time discrepancy triggers complexities relaying information as data and personnel are not always readily available. Additionally, temporary communication platforms such as emails, phone calls, and instant messages are found to be occasionally ineffective; these platforms have a tendency to be overlooked over time, causing a large degree of information loss. Furthermore, due to the merger of Bank of America and Merrill Lynch, there are many legacy employees of Merrill Lynch worldwide that must now learn the applications used by Bank of America. However, with limited information sharing capabilities, it has proven extremely difficult to relay information and teach them how to use new applications. The unsystematic approaches employed by Bank of America are thus limiting its abilities to efficiently distribute knowledge.

As one of the largest financial services companies in the world, it is imperative that effective methods of information sharing are implemented and utilized within Bank of America. Consequently, this project sets out to minimize the effect that localized knowledge and isolated solutions have on the company. More specifically, this project will analyze current platforms for usability, content, and participation and finally suggest ideas that limit information loss. The final goal of this project is to recommend and implement platforms that allow information to be shared globally in a more organized and efficient manner.

Part Two: Background

2.1 Bank of America

Bank of America Corporation is one of the world's largest financial institutions and a component of the Dow Jones Industrial Average. With a full range of banking, investing, asset management and other financial and risk-management products and services, the Bank serves individual consumers, small and middle market businesses and large corporations in more than 150 countries and has relationships with 99 percent of the U.S. Fortune 500 companies and 83 percent of the Fortune Global 500 (Bank of America, 2009). Following the acquisition of Merrill Lynch on January 1, 2009, Bank of America has become

- The largest bank in the United States by comprehensive measure;
- The largest brokerage in the world, with more than 20,000 advisers and $2.5 trillion in client assets;
- A leading provider of global corporate and investment banking services, including commercial lending, global high-yield debt, global equity and global merger and acquisition (M&A);
- A global leader in wealth management, private banking and retail brokerage;
- A global leader in investment management, with approximately 50 percent ownership in BlackRock, which has $1.4 trillion in assets under management, in addition to the $589 billion in assets under management with Bank of America as of June 30, 2008 (Bank of America, 2009).

2.2 The Global Markets Group and Global Credit Products

Under the new brand Bank of America Merrill Lynch, the bank's Global Markets Group is "a premier provider of sales, trading, structuring and advisory services to money managers, hedge funds, pension funds, endowments, financial institutions, governments and corporations around the world" (Bank of America, 2009). The group has a major presence in the Americas, the EMEA region (Europe, the Middle East, Africa), and the Pacific Rim, "serving clients in virtually all countries" (Bank of America, 2009). The Global Credit Products (GCP) division provides its clients with ideas and market insights, trading services, analytics and new products in the asset class of interest rate and credit products, including government bonds, municipal bonds, corporate bonds, credit derivatives, etc.

2.3 Corporate Bond and Credit Default Swap

A bond is a contract that promises to repay borrowed money with interest at intervals over a specific period of time. A credit default swap is a financial contract that allows one to take or reduce credit exposure. Essentially, it is very similar to insurance contracts, as they are a promise to cover losses on certain securities (e.g. municipal bonds, corporate debt, and mortgage securities) in the event of a default. The buyer of the credit default insurance pays premiums over a period of time and in return the seller provides protection to cover any loss on the face amount of the security (Parker, 2008). For more information, please refer to Appendix D.

2.4 The Support Team

In order for the GCP division to have a highly profitable trading business, processes such as pricing, risk valuation, and profit and loss (P&L) calculation need to be conducted accurately and efficiently for all credit securities bought, sold, borrowed, or lent. Due to the differences in the nature of various credit products, a number of separate computer programs have been developed in Bank of America or the legacy Merrill Lynch to facilitate the above-mentioned processes for all types of products.

There are multiple programs that calculate the risk of different trades. Additionally, a program is used to calculate the P&L of trades (i.e., the net present value of their position). Other programs are used to calculate the prices of credit default swaps or bonds and to book the trades once they are finalized.

With several programs being utilized by credit traders who are in charge of making risky multimillion dollar deals, it is essential that when problems arise with these programs, they are dealt with immediately. As users of those programs, however, traders usually do not possess the knowledge about the programs' technical details. On the other hand, developers of those proprietary applications may not have adequate familiarity with day-to-day trading activities in order to completely understand traders' requests and facilitate problem solving. This makes the role of the GCP Trading Support team not only necessary but crucial.

Working side by side with traders and salespeople, the Global Credit Product Support Team bridges the gap between users (i.e., traders) and developers of the Bank's in-house applications for credit trading. Whenever there is a request for improvement, a functionality issue, or a question regarding how to use a specific feature, the support team provides assistance. In order to provide this help, the support team needs to be an expert of at least using all applications they cover. If an issue's technical level goes beyond the support teams' knowledge, then a member(s) of the support team notifies the relevant development team of issue. As these programs are being constantly reviewed, modified, and upgraded, the support must also continuously contact business analysts and developers to receive the most up-to-date information.

Developers and business analysts also assist in providing valuable resources for the credit traders. Developers are responsible for enhancing all the applications to satisfy traders' varying needs and keep track of fast changing technology in the business world. Business Analysts play a middle man role between traders and developers. Business analysts receive the information about how to use new functions of these applications from developers and transfer it to the traders. Additionally, they learn from traders what changes are required to improve the efficiency of the applications and transfer this information to the developers.

2.5 Knowledge Management

2.5.1 A Brief Introduction

In its application, knowledge management is comprised of organizational practices such as creating, acquiring, identifying, adapting, organizing, distributing, and applying knowledge-based intangible assets (Ward & Aurum, 2004). Intangible assets, or intangibles, are identifiable assets that cannot be physically touched or measured. Two major forms of intangible assets of an organization are legal intangibles (such as patents, trademarks, copyrights, etc.) and competitive intangibles (such as people's knowledge and skills gained through experience). Although, unlike legal intangibles, competitive intangibles do not involve legal ownership, they directly impact the productivity of members in the organization. Intangible assets are also referred to as either explicit or tacit knowledge. Explicit knowledge is the information that can be easily communicated and formalized, such as processes, templates, and data. On the other hand, tacit knowledge is individuals' internalized knowledge gained through personal experience and difficult to express, and sometimes people are not even consciously aware of their possession of it (Rus & Lindvall, 2002). Tacit knowledge may include how to use algebra, how to ride a bike, or how to use the specific features of a tool that are not described in its users' manual.

In today’s knowledge economy, companies differentiate themselves by their capabilities for managing information. A company’s ability to deliver the right information to the right people at the right time is crucial to its business success (Druce, 2008). While legal intangibles may be straightforward to manage just like tangible assets, managing the information that falls into the category of competitive intangibles can be an extremely challenging task. In order to help organizations leverage the collective knowledge of its members, several methodologies have been practiced, one of which is knowledge management. This methodology first started emerging in the mid 1980's used mainly for the "business world", by the early 1990's it had been adopted for more widespread use by many industries (Rus & Lindvall, 2002), and since then, approximately "80 percent of the world's largest organizations have implemented knowledge management solutions" (Ward & Aurum, 2004).

2.5.2 Components of Knowledge Management

Knowledge management concentrates on three main issues, typically categorized as individual, organizational, and technological (Rus & Lindvall, 2002). In our project, we refer to these main issues as people, processes, and technology. This refers to people's performance, procedure and methodology improvement, and introducing new technologies (Cortada & Woods, 1999) (Day, 2006).

People mainly involves the effort and actions each individual must perform in order for knowledge management to be successful. Since this component involves the assignment of responsibilities, it is of great importance that the management be attentive so the knowledge management initiative runs as smoothly and efficiently as possible. First and foremost, the goals and strategies must be clearly established before the implementation takes place in order to make sure everyone is on board and understands the future gains from this transition. Without a vision, a set of responsibilities for each individual, or incentives to motivate the employees, it is difficult to maintain a knowledge management effort since employees will be unwilling to work with the process (Rus & Lindvall, 2002). The motivation for employees through incentives helps them cooperate and start a routine of contributing information and knowledge to the repositories. Thus, incentives foster a culture of information and knowledge sharing within the company, as employees become accustomed to such a routine. By having employees build routines for information sharing, the organization has a better chance of continuing the initiative, although the benefits of such a knowledge management process are usually seen in the long-term.

Processes are the second component, which involve the means which the organization exercises in order to assure itself the efficiency of knowledge sharing. The most important aspect of this component is contributing to the knowledge repositories during or immediately following the completion of a project in work, since it is much more difficult to go back at a later stage to try to recompile all that absorbed knowledge into the repository. Thus, as mentioned earlier, routines are essential in helping employees become used to incorporating the process of knowledge sharing in their work. Without a clear procedure, it is likely that the implementation will not succeed in the long-run, as "50 to 60 percent of knowledge management deployments failed because organizations did not have good KM deployment methodology or process, if any" (Rus & Lindvall, 2002).

The third and last component of knowledge management is technology. Although there are tools and applications that are geared specifically towards knowledge management, this does not mean that the tool or application itself will be in charge of performing all the necessary steps towards achieving the goal. Nor does it imply that other tools or applications cannot be used in conjunction with different procedures in order to achieve that same goal (Day, 2006). The importance of having the technology is to facilitate sharing the knowledge that can be presented to the employees that need it. However, technology means nothing if the employees in an organization are unwilling to cooperate. The tools and applications that can be utilized for this purpose fall into one or more of the following categories: knowledge repositories, expertise access tools, e-learning applications, discussion and chat technologies, synchronous interaction tools, and search and data mining tools. Examples of tools that fall into these categories are wikis, semantic wikis, document management systems, content management systems, bug/issue tracking systems, forums, instant messengers, and learning management systems. Given their different capacities, these systems can in some cases work simultaneously to provide a complete coverage on the knowledge that will be captured within the organization (Cortada & Woods, 1999).

2.6 Tools for Knowledge Management

2.6.1 Content Management System

One example of technology that leads to improved knowledge management is a content management system, a system that has been emerging from a basis of previously existing systems such as document management systems, editorial process management systems, workflow management systems, and database management systems. A content management system is geared towards the challenges faced with the increasing amounts of information provided by organizations as well as the also increasing amount of information that users require (Bergstedt, Wiegreffe, Wittmann, & Möller, 2003).

The purpose of a content management system is to keep all information centralized in a single repository. This ensures that management of that information can be done easily, thus maintaining organization and the ability to share and track all knowledge. Additionally, once the content is stored within the system, it can be reused as needed.

Additionally, for organizations that expand and start working globally across different time zones, having such a system becomes useful to the organization so they can track any changes, especially if those changes have to be then applied to any translations. By having the ability to track such changes, the time and cost can be significantly reduced for such an organization.

Along with the global collaboration, organizations must be able to use the content management system wherever they are. In this particular case, there are three options for the organization: client/server, web application, and application service provider. These all provide ways to access the information within the system, yet the last two are more appealing given the accessibility through the web browser (Mescan, 2004).

2.6.1.a SharePoint

The content management system in use my members of the support team is SharePoint. This site also allows for document sharing, as files can be stored, downloaded and edited (Microsoft Office SharePoint Server, 2009). SharePoint improves knowledge management by "accelerating shared business processes and facilitation information sharing across boundaries for better business insight" (Microsoft Office SharePoint Server, 2009). SharePoint has many capabilities including discussion boards, blogs, wikis, task lists, business process and forms. Its enterprise content management allows the huge volume of information a company has to be structured.

2.6.2 Issue Tracking System

An issue tracking system is a software tool used in the process of requirements management whose purpose is to collect requirements, manage those requirements, and track their progress. An issue tracking system requires discussion and agreement between software developers and their customers regarding the requirements that the customers have towards the software they desire. By establishing such an agreement, the software developer can then use the set of requirements by planning, performing, and tracking project activities throughout the project as well as maintaining and enhancing the software in development. This involves controlling requirements changes, minimizing the addition of new requirements, tracking progress, resolving issues with customers and developers, and holding requirements reviews. (Janák, 2009) There exist different types of issue tracking systems, such as Trouble Tracking Systems, Bug Tracking Systems, Requirements Tracking Systems, yet all serve a similar purpose, given their nature of issue tracking.

2.6.2.a JIRA

The support team and many other business practices at Bank of America use an application called JIRA. JIRA is a tool that allows for simple and effective bug and issue tracking, project management, software development, and workflow. JIRA is able to increase the efficiency of software development teams and ensure superior software is delivered on-time (Bug Tracking, Issue Tracking & Project Management Software - JIRA, 2009).

The support team uses JIRA for issue tracking. Using JIRA, the support team can easily create new issues, find new issues based on users or projects, and see the history of recently opened issues. When creating an issue support team will select the region and application the issue stems from, decide on a priority, and include a description of the problem. Issues are monitored in order to assess the amount of time that the support team spends on specific functions of different applications (Bug Tracking, Issue Tracking & Project Management Software - Jira, 2009).

2.6.2.b PaPa

A similar issue tracking software used by the support team is PaPa. Originally in use at Merrill Lynch, it is now being used by many members of the support team at Bank of America. This application was created so users could create issues more rapidly than JIRA. Information added into PaPa is redirected to JIRA, giving the support team another resource to keep track of issues.

2.6.3 Forums

Forums aid in improving information flow within a company. Company forums are vital for knowledge transfer, as they allow users to post questions and answers globally which can be shared with various other users. These learning networks provide opportunities for individuals seeking and providing information and for creating shared mindsets (Gray, 2004). Individuals find essential information that will help develop their skills and make sense of everyday information. Additionally, forums allow for “individual discoveries at a time of convenience, and better, at the time of thought” (Akers, 1997).

Studies have shown that in situations where individuals have few opportunities to meet face to face or few local resources available, forums can instead provide the knowledge and direction for users to get their questions answered (Gray, 2004). These learning networks are able to encompass the globe, and overcome the problems of distance and time zones that exist in an international organization (DeSanctis, Fayardb, Roacha, & Jianga, 2003). Individuals from across the globe can access group discussion spaces and online communities which are able to hold vast amounts of information. With more information sharing available on a forum brings improved learning effectiveness and an increase in creative problem solving across a company (Gray, 2004).

Furthermore, by using a forum, participants in a forum are able to bypass a temporary communication platform (e.g. phone call, e-mail, etc.) and maintain automatically a log of all messages in a threaded, hierarchical structure. Forums have many valuable characteristics including “persistence, near instantaneous communications, specificity, and accessibility” (Pitta & Fowler, 2005).

2.6.4 Wiki

A wiki is a real-time editable web site which includes features that enable asynchronous communication between different members within the organization. The wiki was first implemented by Ward Cunningham in 1995 in an attempt to discuss software design in a new way, emerging after organizations were finding that email had its limitations on the effectiveness on collaboration, even though email was the most dominant collaborative tool (Bean & Hott, 2005). This limitation first promoted blogs, and later evolved into wikis, providing features such as "one place publishing, simple and safe collaboration, easy linking, and description on demand" (Decker, Ras, Rech, Klein, & Hoecht, 2005).

One place publishing assures that only one version of a page can be displayed at a time, since that version is considered the current version at that moment. With simple and safe collaboration, there is always awareness for the state of a page by means of versioning and locking mechanisms that can let users know if more than one person is editing that page simultaneously. The page titles provide a way to link the pages within the web site. In cases where the specified title does not link to a current page, this provides its users the ability to populate that page in the future. Once a page is in existence, the page can be edited, removed, renamed, or moved to another place within the web site.

Wikis are a technology that is simple to implement and intuitive to users, enabling them to collaboratively create and manage content. Additionally, wikis are easily accessible through a web browser. An aspect that arises from the versioning of pages is tracking and archiving those old revisions and through the use of rollback there is a way to restore any previous content whenever a user accidentally removes valuable information. Even though this technology provides features that can be useful for collaborative work of employees, it is important that there is information provided on how to use the wiki in order to make sure its users understand all of its capabilities. Wikis are often used in corporate intranets[1] as part of the knowledge management system as an efficient way of collaboration. Allowing everyday users to create and edit any page in a web site encourages widespread use of the Web and promotes content composition by nontechnical users (Godwin-Jones, 2003). Large companies such as Motorola, British Telecom, Disney, and SAP have already started incorporating this technology in order to help their employees collaborate across different locations. Meanwhile, smaller companies such as Aperture Technologies Inc. have been implementing wikis for managing documentation and projects (Bean & Hott, 2005).

2.6.4.a Confluence

Confluence is currently a wiki in use by the support team members at Bank of America. Confluence is an online encyclopedia that provides a simple but effective way to share content within the support team. Confluence "combines powerful online authoring capabilities, deep Office integration and an extensive plugin catalog to help people work better together and share

[1] An intranet is a private network used to share information within organizations.

information effortlessly". (Enterprise Wiki Software - Confluence, 2009). It is used in almost one hundred companies, thousands of organizations and across many Fortune 1000 companies. Confluence provides a space where members can create share and edit information with each other. Additionally, information is easily searchable and organized, allowing team members to stay on the same page (Enterprise Wiki Software - Confluence, 2009).

2.6.5 Computer Based Education and Intranets

In addition to forums, computer based education is also able to provide employees with a large source of knowledge within an organization, thereby improving knowledge management. There are numerous benefits of using computer based education for training of employees. These benefits include flexible timing, a reduction in training time, and improved retention (Fastrak Consulting Ltd., 1998).

However if employees do not use the intranet for training or just for overall information sharing, it would become useless. It is therefore crucial to encourage employees to use the intranet (Hawley, 2008). Furthermore, the visual design of an intranet is important, as it should be attractive while not interfering with the usability of the site and the ability of content to be discovered.

Past studies have also shown that people find employee-generated content valuable, including having the functionality to include reviews and ratings as available features. In order to make employee contributions valuable, it is important to recognize employees for their contributions. By recognizing and encouraging employees, company morale will increase and employees will be more inclined to contribute. When an employee is recognized, news will spread fast within their department or division which will prompt people to visit the site and follow suit (Hawley, 2008).

Past research has shown that intranets are underutilized because employees are unaware of the benefits of using the site. Consequently, instructing employees on the features an intranet offers will increase both awareness and use (Spencer, 2004). Employees need an overview of an intranet's offerings and step by step instructions on how to share or find information. Furthermore, different mediums like videos, animations and graphics will increase the efficiency of training also increase the interest of employees. Thus, providing guidance on an intranet is crucial for increased utilization.

2.7 Information Sharing Platforms in Bank of America

Effective communication by the support team, both within the team and with business analysts, developers and traders is important for successful business. For this reason there are many different information sharing platforms employed by the support team. The support team has a wiki to share pertinent information called Confluence. A wiki is an online form of communication that is valuable for collaboration. Its purpose is to be an online encyclopedia that provides a simple but effective way to share content within the support team (Enterprise Wiki Software - Confluence, 2009). Similarly, the team also uses SharePoint as a content management system. This site also allows for document sharing, as files can be stored, downloaded and edited (Microsoft Office SharePoint Server, 2009).

There are also multiple issue-tracking programs in use by the support team. The support team at Bank of America uses an application called JIRA to track issues. In JIRA, the support team will select the region and application the issue stems from, decide on a priority, and include a description of the problem. Issues are monitored in order to assess the amount of time that the support team spends on specific functions of different applications (Bug Tracking, Issue Tracking & Project Management Software - Jira, 2009). A similar issue tracking software used by the support team is PaPa. Originally in use at Merrill Lynch, it is still being used in conjunction with PaPa. It has very similar functionality to JIRA, allowing the support team to track issues.

Noticeably, multiple forms of information sharing and issue tracking software are available; this project sets out to determine the effectiveness of each tool in order to determine the most efficient ways that the support team at Bank of America can share information. Aspects of information sharing platforms that seek to limit information loss and instead, assist in organizing and sharing information globally were researched. Successful practices of knowledge management were investigated in order to determine their effects on improving knowledge sharing.

2.8 Is Technology the Problem?

Many studies have been completed to analyze whether knowledge sharing dilemmas are due to technology problems or the unwillingness of employees to cooperate and share their respective knowledge. In one study, only seven percent of companies mentioned technology as a barrier when implementing knowledge management (Cabrera & Cabrera, 2005). For successful knowledge sharing, another ingredient besides technology is the creation of a social environment which both supports and enforces knowledge sharing. Previous studies have researched successful knowledge management systems that have incentives for employees to contribute (Goh, 2002). The importance of improving the social dynamics so that employees feel personally responsible for successful information flow and building a sense of group identity within a company is imperative for effective distribution of knowledge. Many companies do not encourage integrating the task of sharing information into an everyday duty and many employees feel that they do not have enough time to share their experiences and learn how to navigate through the available information systems. Consequently, many shortcomings can exist within a company's approach to encouraging knowledge transfer that even the most advanced technology cannot resolve (Goh, 2002).

Many companies have existing platforms that encourage effective sharing of information. However, these platforms, whether they are databases, intranets, message boards, or content management systems, are not utilized to their highest capabilities across a company. Information sharing is instead most valuable in an encouraging, open environment which allows for the commitment to development of employees. In this environment, the benefits of knowledge exchange are regularly communicated and individual participation is rewarded (Cabrera & Cabrera, 2005). Research shows that by aligning human resources policy to encourage knowledge sharing, improving training and development of employees, and incorporating knowledge contributions into performance evaluations, employees will be more willing to assist in improving the flow of knowledge within a company.

Part Three: Methodology

Interested in analyzing the problems with information sharing at Bank of America, we examined the sources of inefficiencies within the current information sharing platforms. We evaluated the functionality, content, and participation of the platform, and incentives in place to contribute to it mainly through user feedback. We interviewed members of the support team, business analysts, and developers in order to find the most effective way for the support team to communicate more effectively by sharing information with each other. This information assisted us in making recommendations the most feasible platforms to limit information loss within the support team at Bank of America.

In addition to studying the technical aspects of information sharing, this project also studied the information sharing philosophy within Bank of America. This project analyzed whether employees were collectively being encouraged to cooperate with each other by contributing their knowledge to the company. This element of the methodology was accomplished mainly through interacting with employees during structured interviews.

After fully understanding the current strengths and areas of improvements in the information sharing practice of the support team, we were able to implement solutions to their problems. Based on feedback from the members of the support team and our assessment of the available information sharing platforms, we created a new platform that has the specific functionality that fit the support team's needs. Along with the implementation of an improved information sharing platform, training for the wiki was also created so the support team can effectively make changes to the platform.

3.1 Interviews

Interviews allowed us to learn employees' perspectives on information sharing, which information sharing tools are used within the organization, the strengths and weaknesses of existing tools, any problems that employees encountered while trying to access and upload information, and their suggestions on how to improve existing information sharing platforms. Additionally, the interviews uncovered the role that management involvement and incentives played in the knowledge management practices of the support team. Interview questions can be seen in Appendix A while answers to questions can be found in Appendix B.

3.1.1 Interviews with Support Team Members

Interviews with six members of the support team were completed over the course of the project. This included three members from the United States, one from Asia, and two from London. By gathering opinions of members of the support team globally, this project was able help the team improve their information sharing techniques. Questions we asked them concern the functionality they would like to see in their platforms in order to make them more efficient. Additionally, they were asked the problems that currently arise when they share information in a wiki or through the issue tracking software. Furthermore, since there are so many different platforms available, we asked members of the support team which methods they use the most often and which ones they prefer.

The support team interviews involved many questions about incentives behind sharing information. Since past research shows that management involvement through initiative, vision, and requirement lead to successful knowledge management practices, we asked questions to gauge management backing and the reasons why employees may or may not contribute.   Additionally, we inquired for feedback regarding how they could incorporate the process of knowledge sharing in their work and fostering the culture of sharing.

Input was very important for the support team, as they will be the sole users of the platforms we recommend and implement. Members of the support team were consulted with numerous times for their feedback. As we implemented changes to the platforms, we sought their reactions to make sure we met their approval. By interviewing them to see what their needs were, platforms with the specific functionality and content they were looking for could be created.

3.1.2 Interviews with Business Analysts

Additionally, it was important for us to meet with Business Analysts for their input. We conversed with five different business analysts that were in charge of four different applications. These applications deal with booking trades, risk, profit and loss, and pricing- encompassing all of the different applications that the credit traders rely on.

By speaking with multiple business analysts, we were able to comprehend how their own team shared information and how successful they were in doing so. Additionally, since they work closely with the support team, we inquired for ways in which they believed the support team could improve their communication with the business analysts. Interviewing many employees working on different applications allowed us to discover which applications were causing the most problems for both the business analysts and the support team, and how improving information flow between these two groups could aid in improving the business.

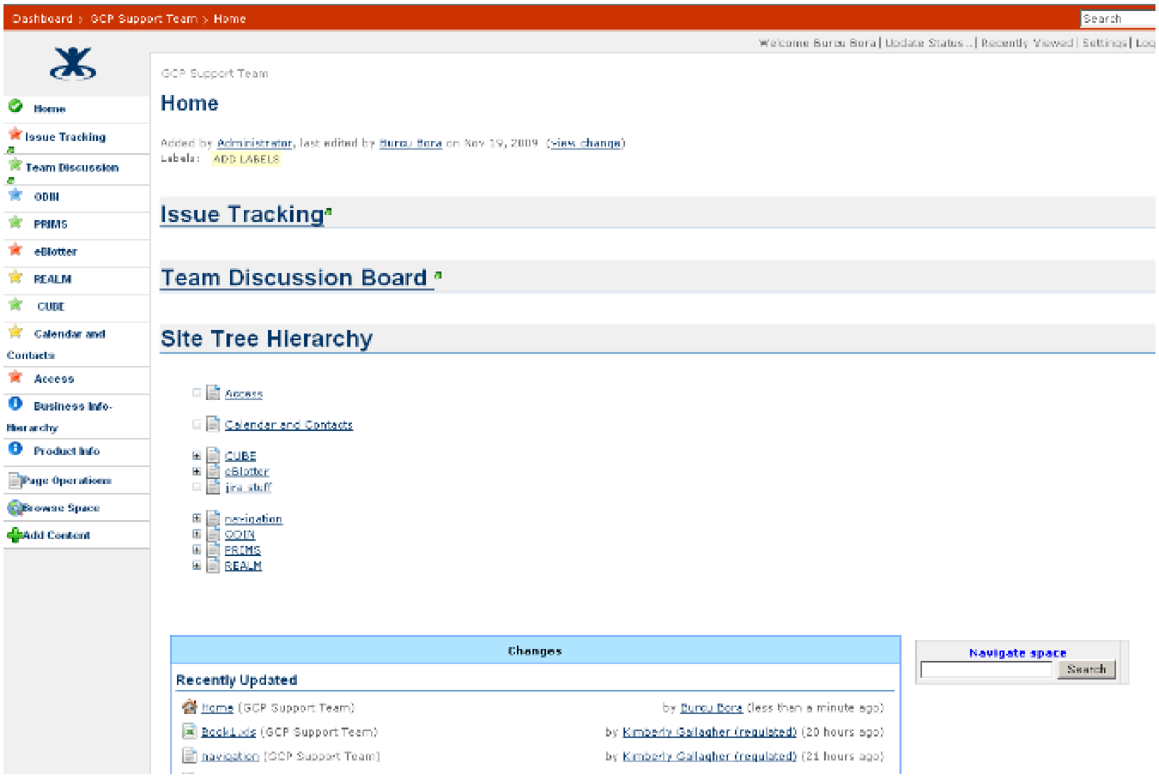
3.1.3 Interviews with Developers

We interviewed three developers in order to grasp how the support team communicates with them. By asking the developers how efficiently problems brought to the attention of the support team are relayed to them, recommendations to improve interactions between the teams could be made. Additionally, interviews were carried out with the developers to see how they successfully communicate issues between each other. This information is needed to learn what works well for them and what does not so the support team has the opportunity to emulate the information sharing techniques of the developers. To find out what tools they use as collaboration devices and bug tracking applications would allow the support team to assess whether they should look into different ways of information sharing.

3.2 Implementing Improved Information Sharing Methods

3.2.1 Wiki

Based on feedback from the support team, the second part of our methodology was to improve their information sharing platforms. By sitting down with members multiple times, we were able to design a wiki that met the team's needs globally. This process involved using an existing wiki, Confluence, to add the specific functionality that was requested of us.



Added by Administrator, last edited by Burcu Bora on Nov 19, 2009 (view change)

Home (GCP Support Team) by Burcu Bora (less than a minute ago)

Book1.xls (GCP Support Team) by Kimberly Gallagher (regulated) (20 hours ago)

navigation (GCP Support Team) by Kimberly Gallagher (regulated) (21 hours ago)

Figure 1: Wiki Home Page

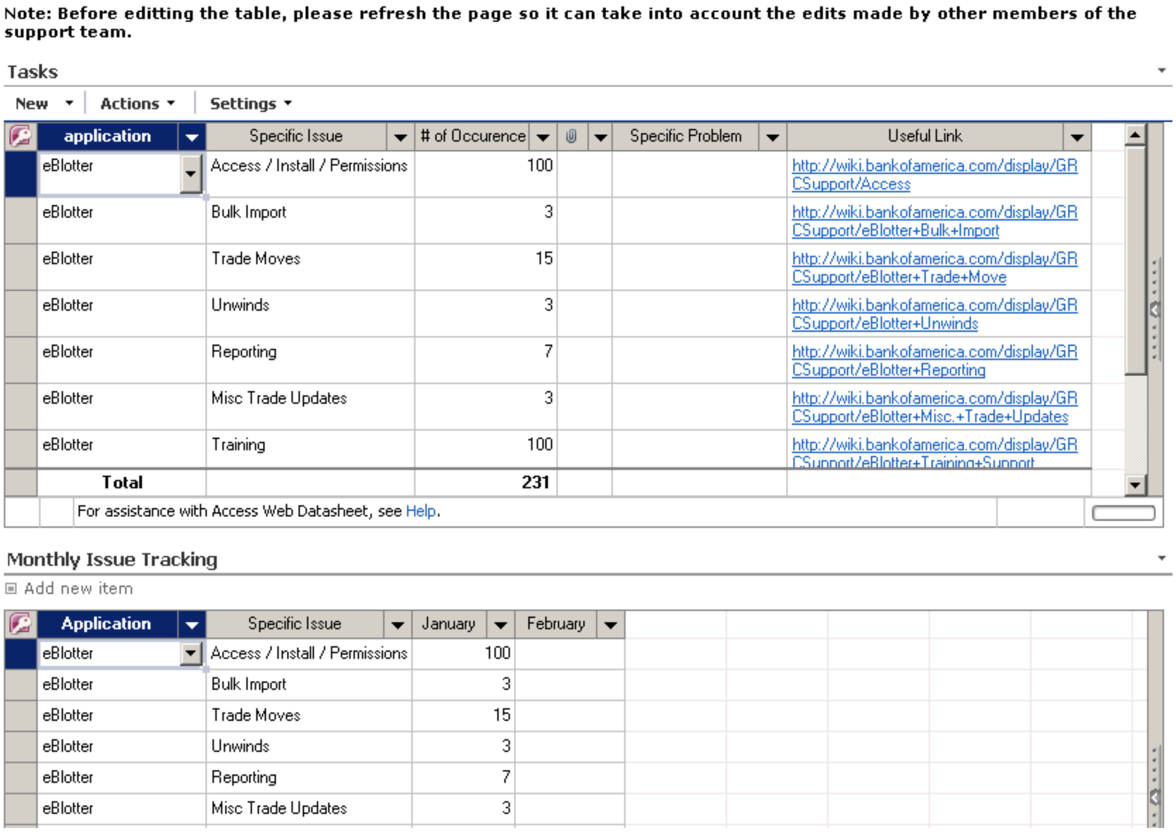
On the main page we developed a discussion board, recently updated section, site tree hierarchy, search box, as well as a link to an issue tracking tool. We developed the new issue tracking tool using another information sharing platform, SharePoint, since Confluence did not have the capabilities to meet the specific needs of the support team. This issue tracking tool keeps track of the number of times the support team deals with specific issues in the applications they support. The tool includes a monthly report for management to show them where the support team is spending a majority of their time. The forum was created to give daily updates from the support team members across the United States, Europe, and Asia. The recently updated section is useful for determining what changes have been newly added so workers can gather the most updated knowledge. The hierarchical tree aimed to share knowledge effectively. The tree begins with the different applications the support team must be experts at, and under each application are subcategories such as training, known issues, functionality, and a library. Some of the subcategories have further groupings underneath. The hierarchy was created in order to structure the wiki so members of the support team could easily find the information they were looking for. Besides the hierarchy, we also placed search boxes on every page so users could easily search for the documents they are looking for.

In Confluence, we also added a calendar and a list of contacts to the left navigation bar. The calendar is an effective tool to keep track of meetings in the team and know when different applications have releases. The list of contacts includes information for everyone in the support team globally as well as distribution groups, phone numbers, and other contact information for convenient interactions between important people they communicate with frequently. Additionally, we added a section called Access to the left navigation bar, which support team members can easily refer to in order to see how to give traders access to all of the different applications. On the left navigation bar, we also included links to workspaces for the three different areas the support team is located: New York, London, and Asia. This allows information to be shared that is pertinent to only one location.

3.2.2 Documentation Templates

Along with the improved platform we added templates for documentation. This is based on feedback from not only the support team, but the development team and business analysts. It was brought up multiple times that there needs to be criteria present so the support team can contribute the necessary information in an organized way to solve a problem. When an issue arises, information should include exactly the steps a person did, the errors they encountered, and in what application, incorporating the use of screen shots. However, it was brought to our attention that the support team is not always aware of exactly what information they should share, and that other teams don't get precisely the information they are requesting when an issue arises. Thus, formal processes on how to put information into a wiki are useful to help employees contribute to the wiki and later, find valuable information. By implementing a method for documentation, business analysts and the development team can know what information to expect from the support team, and the support team can now effectively communicate with each other.

Below is an example of the task list we created for the support team. Here they are able to clearly describe the problem they have encountered, attach screenshots or pictures that depict the problem, and how many times the problem has happened. This aids in their reporting, as upper management must see what applications and functions they are spending the most time supporting.



Note: Before editting the table, please refresh the page so it can take into account the edits made by other members of the support team.

Tasks

application	Specific Issue	# of Occurence	📎	Specific Problem	Useful Link
eBlotter	Access / Install / Permissions	100			http://wiki.bankofamerica.com/display/GRCSupport/Access
eBlotter	Bulk Import	3			http://wiki.bankofamerica.com/display/GRCSupport/eBlotter+Bulk+Import
eBlotter	Trade Moves	15			http://wiki.bankofamerica.com/display/GRCSupport/eBlotter+Trade+Move
eBlotter	Unwinds	3			http://wiki.bankofamerica.com/display/GRCSupport/eBlotter+Unwinds
eBlotter	Reporting	7			http://wiki.bankofamerica.com/display/GRCSupport/eBlotter+Reporting
eBlotter	Misc Trade Updates	3			http://wiki.bankofamerica.com/display/GRCSupport/eBlotter+Misc.+Trade+Updates
eBlotter	Training	100			http://wiki.bankofamerica.com/display/GRCSupport/eBlotter+Training+Support
Total		231			

For assistance with Access Web Datasheet, see Help.

Monthly Issue Tracking

Application	Specific Issue	January	February
eBlotter	Access / Install / Permissions	100	
eBlotter	Bulk Import	3	
eBlotter	Trade Moves	15	
eBlotter	Unwinds	3	
eBlotter	Reporting	7	
eBlotter	Misc Trade Updates	3	

Figure 2: Representation of the Issue Tracker

3.2.3 Creation of Training Resource

After implementing an improved information sharing platform, it became apparent that a training resource was necessary so the support team could contribute and find necessary information in an efficient manner. Therefore, it was necessary for our team to create pages on our wiki that would show users how to code when uploading their knowledge base. With the training that we have provided, users can find instructions on how to insert and edit information, and the examples of different methods and formats of sharing information. Users have an access to see the coding that we used to create the examples so they can learn from our code and even copy and paste it to add their own information. We provided visuals in the training on our wiki for certain steps, as well as links to deeper training tutorials that they can refer to.

There are many different pages that we created that will aid in training the employees. The first page we created showed the difference between the two ways that employees can add information. There are two different editors available- Rich Text and Wiki Markup. The Rich text tab lets you edit a page with a WYSIWYG (What You See is What You Get) editor. This refers to an editor in which the content displayed during editing appears extremely similar to the final output. This is a straightforward method to editing information. On the other hand, Wiki Markup allows you to enrich a page with a multitude of features by coding. It is often used by people who are familiar with wiki editing.

The other training pages then proceed to instruct employees how to share information through use of these two different editors. See Appendix F for visuals of the different pages that we have created for the support team to learn how to contribute to the wiki. Some of the pages we created include:

- Making titles and tables
- What you can do with text (e.g. changing the color, bolding, italicizing)
- What the different buttons mean on the editor- This page details all of the buttons that you see when you are editing a page. The buttons showcase the capabilities of the editor (e.g. inserting images, macros, tables, etc.)
- Creating pages and links- this deals with linking certain pages to other wiki pages in addition to external links.
- Attaching documents
- Creating macros

3.2.4 Training Session for Support Team

Besides leaving training resources on the wiki so the support team could access them at any point in time, our team also put together a training session for the support team. We compiled information from the tutorial that was previously created for Bank of America wiki users and the training pages we created, and were then able to successfully carry out a one hour training session in both NY and London. We planned this session because the support team members mentioned that with both online resources and the training session, they would be more prepared to utilize the wiki. By learning all of the capabilities now that the wiki has to offer, they could start immediately distributing their knowledge among the different pages. We showed them how to create and edit pages, effectively use the issue tracking sheet, using the different macros provided by the wiki, and creating tables.

3.3 Conclusion

Through feedback from the support team and the examination of many information platforms available within Bank of America, we were able to make multiple recommendations as well as develop a solution that aid the support team in improving knowledge management. This solution is an integrated platform with many capabilities (discussion board, issue tracking, calendar, etc.) so employees do not have to look anywhere else to find pertinent information. Additionally, the platform has an efficient structure so employees can easily maneuver to find the specific page they are looking for. Further, training pages and a training session were also created so that the support team has the resources necessary to actually put the newly created platform to use.

Part Four: Analysis

4.1 Technology

4.1.1 Confluence Wiki

One of the first applications we assessed was the current wiki that was in place and in use by the support team. They were utilizing Confluence as a means to publish information for future reference, yet as part of the preliminary assessments we deemed that the use by the support team was not optimal. Some of the areas of improvement that we pointed out were also reinforced by the comments that we received when we spoke with the support team members themselves. These were areas in the scope of structure and management of content within the wiki.

The feedback from the support team mentioned that the current wiki they are using, Confluence, lacks structure, causing most of the information to be scattered and not properly linked together. There is not a clear hierarchy in place to find pertinent information, a problem that many members of the support team mentioned because there is no easy way in which they can navigate the wiki. For example, all of the material that supports a specific trading application is not in a specific section for the support team members to find easily. They mainly have to rely on the search function to find the information they need, which is a timely process.

Additionally, a large amount of information on their Confluence wiki is outdated. When looking at the recently updated section, a lot of information had not been touched in a few years, despite changes being made to the platforms on a monthly basis. It was apparent the site was extremely outdated when we could only find one out of the four members on of the support team from New York with contact information listed on the site. With such a problem, the support team members infrequently used the platform to find solutions because there was not much valuable information available.

Despite finding many problems with the specific wiki in use by the support team, there were many useful characteristics that Confluence had to offer. Most importantly, through interviews with the support team and by analyzing the platform, it was found that the platform was easy to use. The functionality provided by Confluence allowed for a hierarchy of parent and children pages to be set up, which would make it much easier to categorize at a preliminary level the content that would go into the wiki. Users could easily customize the pages of the wiki to meet their needs by means of formatting text through a rich text editor or having the markup language to do so in plain text. For more advanced features, the macros provide a range of functionality that can facilitate the sharing of information by the team members. Not only are these macros useful, but the wiki itself provides a means to browse through them and set each of them through an interface, which is much more intuitive than having to remember all of the syntax for each. Members reported that it would be useful to be able to track their daily tasks through a message board and through the use of a specific macro, the sub section macro, a general forum was put in place as a means to share each other's status on the work assigned to each of them. Also, the search function within Confluence allowed for simplicity in finding a document or page that a member was looking for.

Confluence was able to track issues as well, through the use of a table where team members would only need to input a new row or update the count when necessary. Unfortunately, this functionality did not fulfill the requirements of a dynamic spreadsheet, and the other option was even more inefficient since it involved downloading an attached spreadsheet, making the necessary changes to it, and then re-uploading it. Thus, it was decided that it would not be effective to have the specific support team's issue tracking within the wiki; rather it would be best to look at alternatives that could provide better results.

4.1.2 SharePoint

Another information sharing platform that was being used in Bank of America was SharePoint. SharePoint was popular within employees to attach documents that they wanted to share. However, through interviews, we learned that the employees found SharePoint very limited when it came to customizing pages. Some of the employees stated that maintaining SharePoint (creating a new page in SharePoint, changing the view, removing an outdated file, etc.) was usually very time consuming. Additionally, our team created a sample SharePoint site to test its capabilities. Our experience showed that searching for information in SharePoint site was very hard which could be an enormous time constraint for the team.

Although SharePoint did not offer satisfactory capabilities for the development an effective wiki to store information, it provided one important function that Confluence did not provide- dynamic spreadsheets. Dynamic spreadsheets provided information storage space in which information could easily be sorted, categorized, and edited by users. Our team used these dynamic spreadsheets to track the number of problems that each function of the trading applications caused.

Our interviews with the support team and analysis of the platform concluded that SharePoint was not the most effective way to share information for the support team because it had limited customization. However, since it has spreadsheets that could be easily edited, we found that linking it to the main platform we were creating would be useful.

4.1.3 JIRA

JIRA was the main bug tracking tool that was commonly used among the divisions in Bank of America during our interviews. Users had to fill out a ticket to describe the problem they encountered in order to track the issues they were following. The developers and business analysts pointed out that this tool was used for project management purposes and to keep track of development issues and bugs. A manager in the development team emphasized that JIRA was effective in terms of providing easy reporting for 300 to 400 development items in every release. Another business analyst who was using JIRA daily also stated that JIRA is effective for reporting, but the time consumed to enter the information in JIRA was excessive.

When we talked to the New York support team about reporting, we learned that they had to only report the number of problems that each application function gave. Additionally, they are not even in charge of reporting issues, as this is a job function of the business analysts. The feedback from the support team concluded that it was extremely inconvenient to track the issues using this platform. The support team said that it takes them between 5 and 10 minutes to fill out a ticket in JIRA. This was one of the reasons why the support team members were scarcely updating it.

In London, however, support team members did not interface as much with the bug tracking tool directly. In London, there is currently a lack of business analysts that mediate between the support and development teams. Thus, the support team members rely mostly on the bug tracking and instant messaging systems to communicate directly with the development team members when they need to resolve any issues that arise. Yet, support team members here in London did not use JIRA directly when reporting bugs, but instead used PaPa.

4.1.4 PaPa

PaPa was another bug tracking tool that was mainly used by Merrill Lynch, but the support team from Bank of America does have access to this tool. Both PaPa and JIRA had very similar capabilities, yet one of the features of PaPa was that it could also link to JIRA. Some members of the support team believed that it was more efficient to track issues through PaPa. However, Papa was not completely in sync with JIRA, given that not all information that was in JIRA could be queried within PaPa and in a similar way. If a member did not link a PaPa ticket to a JIRA issue, the other members would not see that information uploaded into JIRA. Therefore, it was complicated to employ multiple ways of tracking issues at once and it would be advisable to carry out a single one to avoid any information loss.

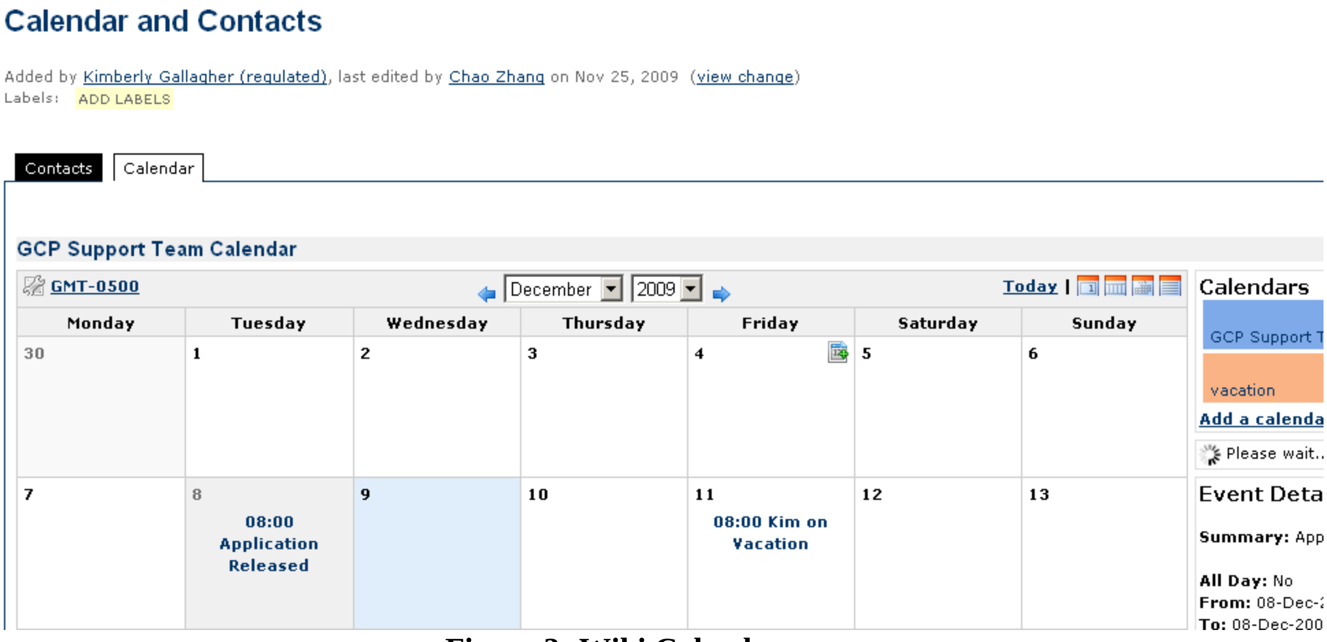
4.1.5 Technological Needs of the Support Team

4.1.5.a Fewer Platforms

Through interviewing seven members of the support team and analyzing the capabilities of the many different platforms that are available to them, it has been concluded that the support team needs one centralized information sharing platform. This allows support team members to keep track of fewer passwords and have one source to access all of the important documents and knowledge. Since many of the platforms previously in use by members of the Bank of America support team had overlapping capabilities, our product was a single platform that incorporates all of the capabilities that Confluence, SharePoint, JIRA, and PaPa have. The product our team created mainly uses Confluence, but since SharePoint has easily modifiable spreadsheets, there are links from the homepage to this source. However, there are no accessibility issues going back and forth between the two.

4.1.5.b Calendar and Contacts

Additionally, it is very important for the support team to keep each other updated on their schedules, as they are constantly travelling and in meetings. Additionally, since they support five major applications that are constantly being updated, the calendar is able to record all of these dates. This is why a central calendar for the team to record information about events is very important. Below is a portion of the calendar page.



Calendar and Contacts

Added by Kimberly Gallagher (regulated), last edited by Chao Zhang on Nov 25, 2009 (view change)

Labels: ADD LABELS

GCP Support Team Calendar

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
30	1	2	3	4	5	6
7	8 08:00 Application Released	9	10	11 08:00 Kim on Vacation	12	13

Calendars

GCP Support T

vacation

Add a calenda

Please wait..

Event Deta

Summary: App

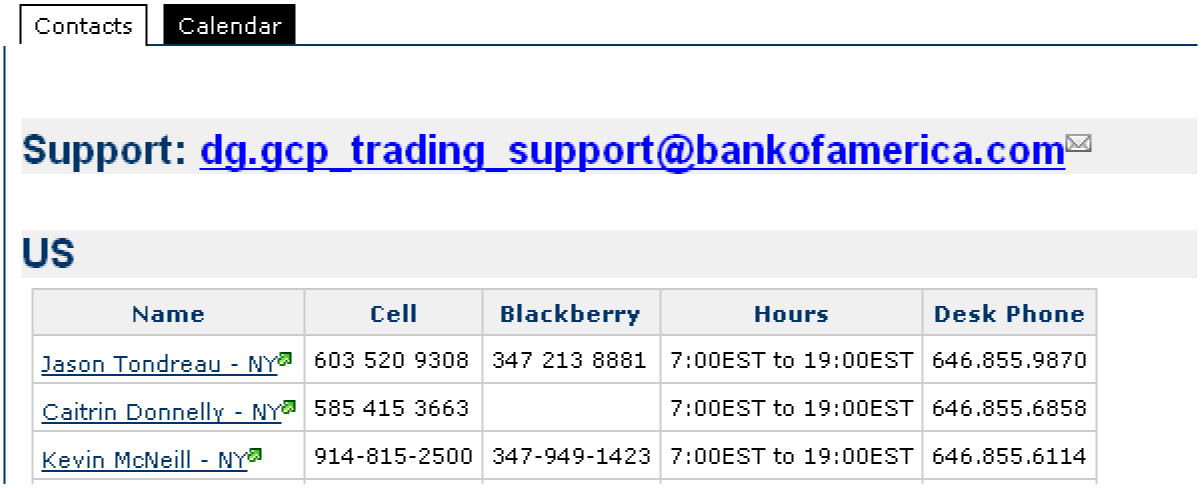
All Day: No

From: 08-Dec-2

To: 08-Dec-200

Figure 3: Wiki Calendar

Contact information is also important for swift access to the information of many key contacts at Bank of America. It provides the email address, desk, cell and blackberry numbers of everyone on the support team globally. Additionally, there is information present for key distribution groups that the team regularly contacts. Business analysts, development team members, and many other significant individuals are also at hand. Below is a portion of the contact information page on the wiki.



Support: dg.gcp_trading_support@bankofamerica.com

US

Name	Cell	Blackberry	Hours	Desk Phone
Jason Tondreau - NY	603 520 9308	347 213 8881	7:00EST to 19:00EST	646.855.9870
Caitrin Donnelly - NY	585 415 3663		7:00EST to 19:00EST	646.855.6858
Kevin McNeill - NY	914-815-2500	347-949-1423	7:00EST to 19:00EST	646.855.6114

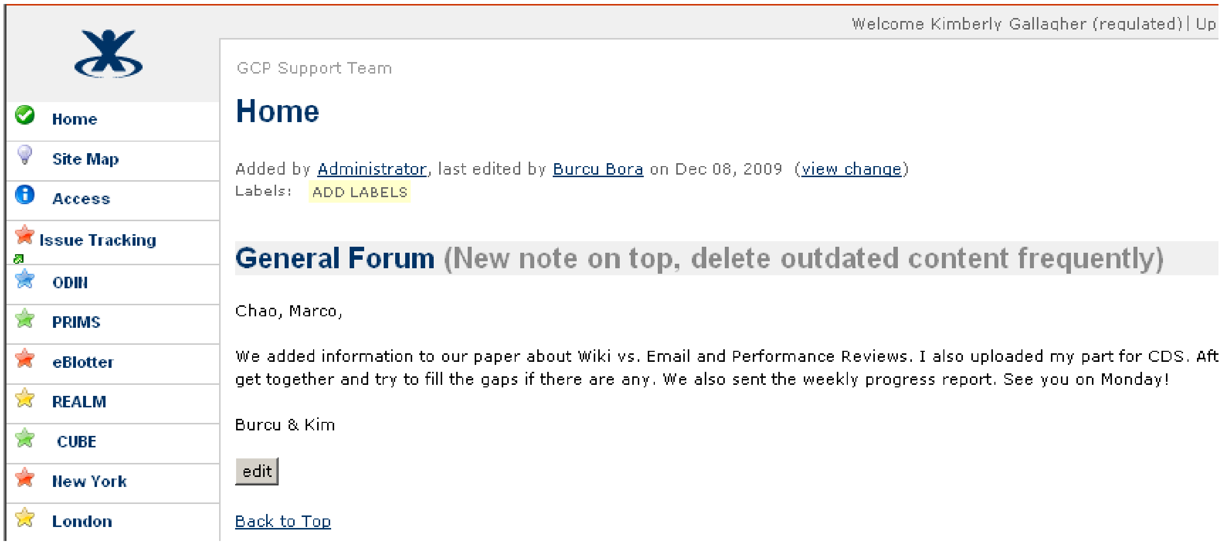
Figure 4: Wiki Contact Page

4.5.1.c Issue Tracking

It is also important for the support team to have metrics that summarize the many support functions they have dealt with over a period of time. This brings up the importance of issue tracking. A dynamic spreadsheet is what the support team needs to continually update counts of how many times they have encountered a specific issue. Beside a specific issue of an application, the support team needs to keep track of this number. Therefore, using SharePoint, an easily adjusted table was created. This table will allow management to keep track of where the support team is spending a majority of their time.

4.1.5.d Discussion Board/ Daily Updates

Members of the support teams who are located in different parts of the world often need to communicate with each other globally. The time difference between continents and countries restrains the verbal communication between the support teams. So, the most common method of communication that they were currently using was email. However, since the support team members usually receive more than 300 daily emails, the emails from the other support team members were sometimes overlooked and information loss problems arose. In order to address this inefficiency in the information sharing process, the support team suggested developing a discussion board. The discussion board aimed to provide a space for the support team members to leave messages to each other regarding any daily issue. Thus, other teams members could reply to these messages and by this way, these messages do not only inform each other but also help them to keep track of the problems. Below is the forum that we have developed which allows users to easily put messages on the front page of the wiki for all members of the support team to see.



GCP Support Team

Home

Added by Administrator, last edited by Burcu Bora on Dec 08, 2009 (view change)
Labels: ADD LABELS

General Forum (New note on top, delete outdated content frequently)

Chao, Marco,

We added information to our paper about Wiki vs. Email and Performance Reviews. I also uploaded my part for CDS. Aft get together and try to fill the gaps if there are any. We also sent the weekly progress report. See you on Monday!

Burcu & Kim

Figure 5: Wiki Discussion Board

4.1.5.e NY, Asia, London Workspace

Additionally, it was very important to create work-spaces for each location the support team is located. In this way, information that is only pertinent to a specific location can be shared just within that location's support team. On each of the work-spaces, the members of the support team wanted a forum where they could communicate with each other.

4.2 People

4.2.1 Incentives

Many members of the support team also expressed that there is no push from management to use information sharing platforms to record knowledge about issues that are arising and problems that are constantly occurring. Management not being actively involved in encouraging knowledge management diminishes the importance of contributing the wiki according to members of support team. Additionally, employees do not have incentives to contribute to information sharing platform. Although many members can see the long term benefit of effective information sharing, some incentives that will pay them back sooner can increase the employees' participation to the information sharing platform.

4.2.2 Performance Review

Given that there is a lack of management and employee involvement and information, our team then analyzed the current performance review that the support team is subject to. Currently, the performance of members of the support team is based on the following aspects:

- Enhancing relationships with traders
- Learning the applications and how to support them
- Training new members of the support team on the systems and give them the tools to thrive on the support team
- Providing trading support and tactical development.

Although a large portion of the performance review concerns becoming experts in the applications they support, training other members of the support team, and providing support to traders, none of their performance is based on information sharing. However, by contributing knowledge to an information sharing platform, it would help improve the knowledge of the support team collectively, make training easier, and in turn, provide better support to traders.

4.3 Processes

4.3.1 Wiki vs. Email

From interviews with the support team, we found that the support team relies too heavily on email. They receive hundreds of emails a day and have important information scattered throughout their inbox. Further, the support team is continuously searching through their inbox to find information they have received in emails months ago. Some of this information has important contact information and instructions to solve problems on the applications they support. On the other hand, the use of information sharing platforms, especially wiki's, is scarce. This suggests that members are unaware of when they should add information to the wiki and when they should just leave the information in email messaged.

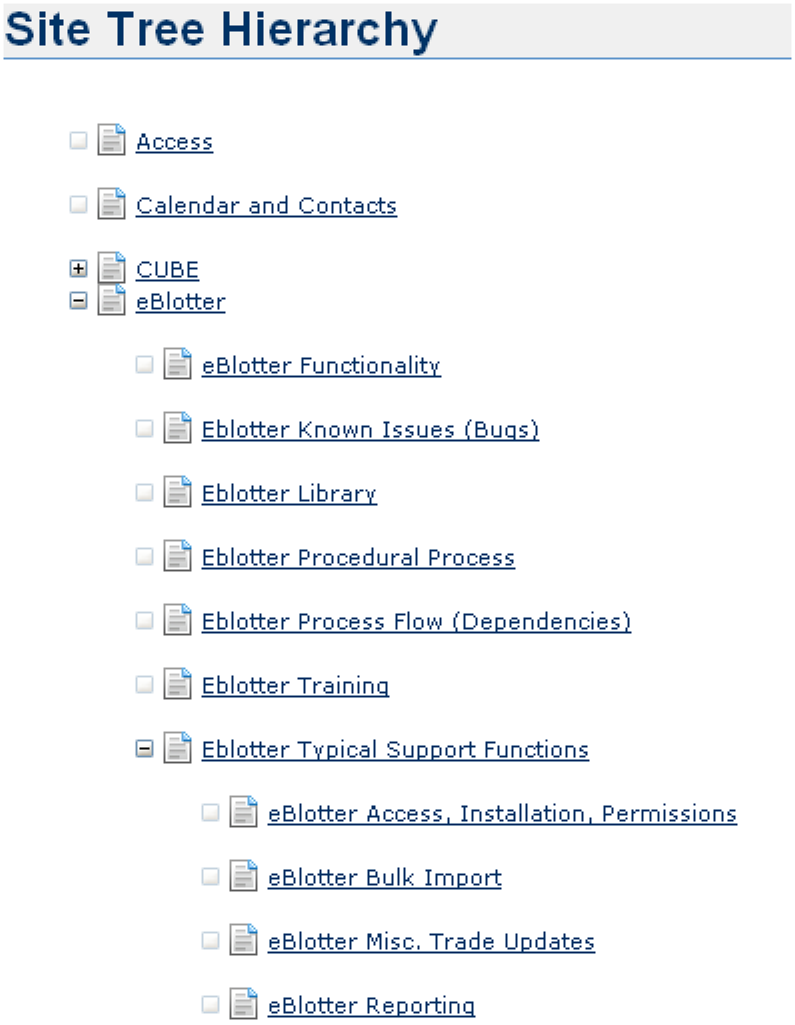
4.3.2 Wiki Structure

After choosing Confluence as the centralized information sharing platform, we then had to incorporate user feedback when structuring it. Users wanted a clear configuration of the platform- a hierarchy that begins with each application and further breaks off into branches such as a library, application training, and typical support functions. By having a clear structure, the support team can be certain what kind of information is in a specified folder.

Additionally, when designing the platform it was important to not design anything too complicated. For example, at first putting tabs on the main page that the support team could click between seemed like an effective way to access information. However, the support team made the point that putting too much information on the main page would slow everything down, and the complexity of adding tabs would cause difficulties when making edits.

The main page of the wiki now has just 4 important resources as listed below:

- A search function so the support team can easily search and access a resource they are looking for
- A discussion forum, where the team can leave daily updates in order to inform team members globally on important information
- A site tree hierarchy where users can easily access the different subcategories beneath an application as shown in Figure 4.
- A recently updated table that allows users to be aware of the most current changes that are being made in the information sharing platform.



Site Tree Hierarchy

- Access
- Calendar and Contacts
- ⊞ CUBE
- ⊟ eBlotter
  - eBlotter Functionality
  - Eblotter Known Issues (Bugs)
  - Eblotter Library
  - Eblotter Procedural Process
  - Eblotter Process Flow (Dependencies)
  - Eblotter Training
  - ⊟ Eblotter Typical Support Functions
    - eBlotter Access, Installation, Permissions
    - eBlotter Bulk Import
    - eBlotter Misc. Trade Updates
    - eBlotter Reporting

Figure 6: Wiki Hierarchy

Part Five: Recommendations

The support team is situated in a fast paced environment where they are in charge of providing assistance to numerous traders and must have expertise on all major applications that traders are using. This makes knowledge management a vitally important component of successfully completing their duties. Thus, this project assessed the strengths and weaknesses of the current information sharing practices through analyzing how the three components of people, processes, and technology contributed to employees sharing knowledge effectively.

5.1 People

5.1.1 Performance Review

Analysis of the current information sharing practices at Bank of America revealed that members lack the initiative to contribute knowledge to information sharing platforms because there was no incentive for them to do so. Based on interviews with the support team, members of management were not effectively encouraging them to share their knowledge on the wiki. As past research showed that effective use of information sharing platforms leads to greater efficiency within the work place, we recommended adding specific components to the performance review that concern incentives for members of the support team to make contributions to wiki (Gray, 2004). In this performance review, we suggested that members be assessed on their ability to share valuable knowledge on the wiki.

Presently, a majority of the performance review involves training members of the support team, becoming more knowledgeable in the applications they support, and improving the quality of the support to traders. While none of these components mentions information sharing, uploading important information on the wiki we created would improve all three of these functions. Thus, we recommended integrating members' contributions to the wiki into future performance reviews and that the managers of the support team be in charge of evaluating the contributions by each of the members of the support team. The managers should determine contributions not just by the quantity of their contributions, but also by their quality. We suggested that ten to twenty percent of their performance review be determined by the quality of knowledge that they upload on the wiki.

5.2 Processes

When accessing the processes the support team had used to share information in the past, we found that information was not updated on a regular basis, that there was a lack of templates for uploading information, and that support team members relied too heavily on temporary forms of communication, especially emails. Since the temporary communication tools were not effective to keep track of large amounts of information that the support team dealt with, there was a need for a centralized information sharing platform to keep track of the information in an organized way. Because of this, we added specific functionality to our new wiki that would aid in the process of uploading information, in addition to making numerous recommendations so the processes of sharing information within the support team could be standardized.

5.2.1 Frequency of Sharing Information

When examining the current platforms in use by the support team to share information, it was found that the platforms were scarcely being updated. There was no process in place for members to periodically update and edit information by adding newly acquired knowledge. The lack of consistency when updating information led to outdated information and scarce resources for the support team to access when they were looking for prompt assistance. Therefore we recommended that members of the support team spend 10-15 minutes each day contributing to the wiki and surfing the site to become more acquainted with it. Especially since members of the support team were usually already documenting the problems through email, the time it would take to add this information to an easily accessible location on the wiki would be minimal. Adding information to the wiki could not only save time for training, but allow members to access faster solutions as well.

5.2.2 Wiki Structure

Based on user feedback, we concluded that having a clear structure to the wiki was extremely important for members of the support team. In order to minimize scattered information and have related information linked together, a clear hierarchy was created. This hierarchy begins with each application, and branched out into different categories that the support team has spent significant time taking care of. These branches involve training, known issues, and typical support functions. This clear structure allows members of the support team to be confident they know where exactly the information they are looking for is.

One of the common drawbacks that limited the users' participation in the information sharing platform was the frustration of deciding what information should be included when documenting in the wiki. Users of the information sharing platforms mentioned that sometimes when people shared information in the platform, they left out important data. In order to contribute to the solution of this problem, we created a template which specifies the information that needs to be shared when keeping track of an issue. The template we created, a dynamic spreadsheet, would also decrease the amount of time it takes for employees to report an issue occurring.

5.2.3 Email vs. Wiki

Throughout this project it had become evident that most of the employees had a strong inclination to share all of their knowledge through email, contributing to the mass amount of emails they received per day. Support team members saw email as one of the most convenient ways to share information within their team. This was a critical issue as information could be buried in emails easily. Therefore, it was important for employees to make a decision between wiki and email whenever writing down the information.

We recommended employees document in the wiki the information that might need to be referenced later on and use email to share information that would not be referenced by support team members in the future. For instance, if someone needed to know the location a specific meeting, email would be the appropriate communication tool. However, the conference call number used on a daily basis by the support team should be shared on the wiki. The information stored on the wiki would be more helpful because of its convenient availability.

5.3 Technology

After analyzing the current information sharing platforms within the support team, we concluded that there were ample platforms being used by the support team. The new platform, however, has extensive capabilities including message boards, issue tracking, calendars, and contact information. The functionality of the new wiki, part of which was requested by the support team, combined what all of the previous platforms were able to provide. Consequently, we recommended that the support team migrate from previous platforms, and focus on the utilization of the new one, since this could keep all information in one centralized location. Thus, it would be more efficient for members of the support team to find the information they were looking for.

With all of the feedback from the support team, the wiki was molded so that the team could enter information as quickly as possible. Instead of taking a significant amount of time to enter into JIRA the support functions the members provide each day, they can now easily access a table and update the number of times they help out with a particular function. Additionally, by using the centralized platform, support members will not have to use multiple usernames and passwords for different information sharing platforms when trying to keep track of issues and upload important information onto the wiki.

5.3.1 Confluence/JIRA Integration

We also recommended integrating the bug tracking tool, JIRA with the newly created wiki. This is especially important for the London support team. Usually, it would be the job of business analysts to track all issues that occurred, but since there were few business analysts in the London office, members of the support had to track bugs and communicate problems to developers. Since support team members already used PaPa when tracking issues which would then be uploaded into JIRA, we recommended that they make use of the integration between Confluence and JIRA when presenting or tracking specific issues for their team. This integration has been made possible by Atlassian, the company that developed both Confluence and JIRA.

We were aware that the integration had not been in use by the support team and had been in the process of refining, but we did believe that it could be very useful and efficient for support members to access recorded information about issues without having to navigate to JIRA and perform a search every time they needed an update on the issue status.

5.4 Conclusion

Based on our analysis of previous knowledge management practices and feedback from members of the support team, detailed recommendations were made regarding people, processes, and technology. For people, we recommended providing incentives for support team members to make contributions to information sharing platforms by incorporating it into the teams' performance review. For processes, we also emphasized the following:

1. Encouraging periodic updates of the wiki to keep information updated.
2. Relying less heavily on email and adding frequently referenced information to the wiki.
3. Creating a structured wiki with a clear hierarchy and templates so support team members could effectively find and upload information.

Finally, we recommended two strategies for improving technology:

1. Migrating from the use of previous information sharing platforms and instead, exclusively focus on uploading information into the new structured and centralized wiki that we have created.
2. Integrating the issue tracking platform, JIRA, with the newly created wiki.

Our creation of a new information sharing platform in association with the aforementioned recommendations was expected to give the trading support team in the Global Credit Products division at Bank of America the resources to establish a healthy knowledge management routine and thus encourage a information sharing culture within the team. In this way, the support team would be able to share information globally and harness the knowledge of each member in an organized and efficient manner.

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Appendix A: Interview Questions

Interview Questions for Support Team Members in New York

- Are you familiar with JIRA, Confluence, and SharePoint? Which platforms do you often use? How often do you use these platforms or do you use some other information sharing tool?
- Do you see a benefit of improving information sharing platforms?
- What problems do you encounter while trying to share or find information on each platform?
- How would you rate the quality of information on your wiki? Is the information useful or out of date?
- What aspects do you feel are most useful for the users of the wiki and bug tracking tool? Are any aspects of the wiki or bug tracking tool affecting you in a negative way or hindering the efficiency of your work?
- Are there some additional features that you would like to see in the platforms?
- Do you find it difficult or time consuming to post information on the wiki?
- How would you like to see the flow of information become more efficient?
- What changes do you think would increase the usability of platforms?
- How do you update information on the platforms? Do you update the wiki when things change, when you have free time, or at a specific time in the day?
- How do you share information with traders, developers, and business analysts?
- What applications cause you the most problems?

Interview Questions for Business Analysts in New York

- Are you familiar with JIRA, Confluence, and SharePoint? Which platforms do you often use? How often do you use these platforms or do you use some other information sharing tool?

- What problems do you encounter while trying to share or find information on each platform?
- How would you rate the quality of information on your wiki? Is the information useful or out of date?
- Are there some additional features that you would like to see in the platforms?
- Do you find it difficult or time consuming to post information on the wiki?
- How would you like to see the flow of information become more efficient?
- What changes do you think would increase the usability of platforms?
- How do you update information on the platforms? Do you update the wiki when things change, when you have free time, or at a specific time in the day?
- How do you share information with traders, developers, and the support team?
- What is your responsibility as a Business Analyst
- How can communication be improved with the support team?

Interview Questions for Support Team Members in London

Support Team's Wiki

- How do you use the wiki and why do you find it to be important to have one in place?
- Do you feel that sharing the information that is held within the wiki has enabled you to become more efficient when providing support to different users?
- When you need to solve an issue, do you usually go to the wiki as a first step or through a client tool such as MChat or Communicator to get help from a developer or other support teams/members?
- Does the method or channel depend on the urgency of the issue?
- Do you believe that if documentation on the developer wikis were updated it would be easier to understand the new functionalities that might cause bugs on the different systems used by the traders?

- Would you find it difficult to find time to read through the documentation on that new functionality on every release?

Development Team's Wiki

- Would it be more efficient to solve issues presented by traders if the developer wikis were more updated?
- How often would you say you use the developer wikis while solving an issue?
- What type of information do you want documented and provided to you by Dev?

Procedures

- What is the procedure for entering support information into the wiki?
- Does it involve providing a well-defined structure first and then coming back to fill in the content or is this because of the fact that the original wiki was actually based on Media wiki and is now being migrated to Confluence?
- Do you find it difficult or time consuming to read or edit the wiki or do you find it easy to do so?
- Do you think most other support teams feel that way?
- Do you know of incentives that could promote more documentation by support teams?
- How would you encourage development teams to also provide more up to date documentation that could be useful for support teams?

PaPa

- Do you feel PaPa has complemented JIRA in a helpful manner towards users?
- Do you believe that PaPa will ever replace JIRA, do you believe that it will continue to be a complement, or do you believe it is a temporary means to provide functionality to users?
- What major features does PaPa provide its users?

Forum

- Do you feel a forum would be helpful for questions and discussion on topics that are not covered in the wiki?
- Would it be possible to use MChat as a forum-like tool by adding logging functionality to the client and having the ability to search for previous discussions on issues?

Interaction with Traders

- How do you usually interact with traders (users) and development teams?
- Have you ever encountered any inconveniences that could otherwise be prevented with better procedures and tools at hand?
- Do you have any such procedures and/or tools in mind?

Learning to Use New Applications or Features

- Specifically, how do you learn to use a new application and constantly keep yourselves up-to-date with the new features of it?
- How do traders learn to use the applications? Just form the demos?
- What do they usually know about the applications?
- Is there any trouble shooting tool traders use themselves before going to Support?

Interview Questions for Development Team Members

Interaction with Support

- By what means do you usually interact with the support teams?
- Do you find this interaction useful in terms of perceiving the problems that users report as well as sending back feedback on the status of the different bugs that have been resolved?
- Would you think that support teams can work more efficiently with more Dev-based documentation?

Information Sharing

- What type of information do you usually share both across the development teams and to the support teams?
- How do you usually share this information?
- Why do you use this method of sharing information?
- Do you believe that there is another method that could provide more efficiency between the groups and could possibly enable greater progress in your work?

Bug Tracking

- Do you strictly use JIRA as the only bug tracking tool or do you find a need to complement it with another tool, such as PaPa?
- If so, why do you believe there is the need for a complement to JIRA? What functionality do you think JIRA lacks that could benefit users? If the complement to JIRA is not PaPa, what is it? How do you use it and what functionality does it provide over PaPa?

Use of Wiki

- What type of wiki do you use to share knowledge and information?
- In what occasions do you typically utilize the wiki and how often?
- Is there a general rule or procedure about posting a specific documentation on the wiki?
- What aspects do you feel are most useful for the users of the wiki?
- Are any aspects of the wiki affecting you in a negative way, especially hindering the efficiency of your work? Do you have some other tool in mind that can provide this functionality in a more efficient manner? If so, which one and why do you believe that it can be more efficient?

Difficulties with Using Wiki

- Do you find it difficult or time consuming to post information on the wiki? Why?

- Do you believe it is a specific issue with the wiki as a tool itself, or because of a time conflict with the work schedule and amount of tasks that you must do in your usual work day?
- Could the reason be affected by the notion that a number of people may benefit from your post?
- What other reasons could affect your incentive to post in the wiki?

Updating Wiki

- How do you go about ensuring that the information within the wiki is both organized and updated?
- In the case of outdated and old information, what procedures do you take in order to bring that information up to date for users of the wiki?

Wiki-Bug Tracker Integration

- Would you be interested in having integration between the wiki and bug tracker in order to be able to display information across each other dynamically without having to constantly copy from one another and have duplicates on both tools?
- Is there a similar method of displaying information currently that allows for bug tracking information to be displayed in the wiki, or vice-versa, without it being duplicated or being just a link?

Forum

- Do you have a forum in place for specific questions and discussion about topics that are not covered in the wiki?
- If not, how are these questions or discussions dealt with currently?
- Do you feel a forum for such a purpose could be helpful or the current way of handling works best?

Other Teams' Use of Wiki

- Which other teams use your wiki?
- How often do they use it?

Other Wikis or Collaboration Tools Possibly Used

- Which other types of wiki do you use, if any?
- How often do you use them? Do you find these wikis useful?
- What are the advantages and disadvantages of those wikis?
- Have you used other collaboration tools in prior roles or prior companies?
- What worked well there that you believe is missing here or that could improve the current practice of information sharing?

Possible Best Practice

- Have you ever had a team that could communicate well using these tools without the need for constant verbal communication?
- If so, why do you believe it has not been done here yet?
- Would it be because of a lack of awareness or the shortcomings of current tools?

Appendix B: Interview Answers

Interview Summaries from the New York Office

Risk Engine Team Member – New York

The risk engine team member that we interviewed manages REALM which is a reporting application for traders. REALM has more than 300 users. He is responsible of preparing update releases, testing and database development.

His team uses JIRA for development items in order to put enhancements and finds it very effective. His team also uses JIRA for new releases of REALM. JIRA makes reaching the information they need easy because information is categorized by release names. Additionally, he thinks that JIRA has a good filtering system and grids to categorize enhancements and bugs.

Another tool his team uses is Perforce which allows him to more easily test software. He checks code in and out of perforce like a library.

They also use wikis in order to post supplementary documents that users can refer to. It is user/support based. He thinks it is easy to make Confluence look nice if you take the time to learn the coding and available resources. There are also some problems with the wiki. First, it is slow and hesitates often. Second, while creating links, the links don't always refer to the same thing (like putting a user guide in multiple places). Third, while reloading the document into the wiki after some changes are made (when updates are made to a document), updates to the links are required.

Furthermore, employees don't have time for user's guides because of time constraints and the abundance of information. Short videos that explain specific functions of platforms would be more efficient. Live Meetings are useful too.

Support Team Member 1 – New York

When we first interviewed a support team member, she stated that she infrequently uses the Wiki. She mostly uses PaPa and then JIRA. Only Merrill Lynch and support team uses PaPa. Other Bank of America employees do not have access to PaPa. She would use Papa more if it synched more easily to JIRA. It takes her five to ten minutes to fill out a ticket in JIRA which is inconvenient. Additionally, there is no push from management to fill things out. There is no management backing and no incentives for employees to contribute to information sharing. An incentive to participate would improve information sharing.

A suggested idea to improve the information sharing was to create a matrix for JIRA that would be efficient for employees to use. A simple matrix that employees will just choose the category/type of problem would be sufficient. On a separate page it could be explained what caused the problem and how it was solved. Additionally, it would make it easier to calculate the statistics (the frequency of problems in certain applications).

Furthermore, she explained that Wiki should include general information, contacts, release notes, links to other Wiki's, integration to JIRA. Another Wiki that should be linked is ODIN Wiki and it can be used for a reference for updates. Finally, she said that SharePoint is a good place to share information, but it has limited customization. It is also hard to communicate through SharePoint.

Support Team Member 2 – New York

Our second interviewee was a new member of the support team. He was going to Hong Kong next week to bring support team up to speed. They are all legacy employees of Merrill Lynch. He was previously the Business Analyst for PRIMS so he has knowledge of risk flow. His first tasks are learning eBlotter and ODIN from the support team.

He used a wiki page for PRIMS. He believes it was not very effective because it was not polished. He liked the wiki better than SharePoint because it is more customizable, even if it is hard to customize. He also mentioned that it is difficult to push people to add information on a wiki. There needs to be criteria present so the support team can contribute the necessary information in an organized way to solve a problem. Information should include exactly the steps a person did, the errors they included, and in what application, incorporating the use of screen shots. Formal processes on how to put information into a wiki would be useful to help employees contribute to the wiki and later, find the information. There needs to be a way to organize information and review old information to see if it is still up to date.

He uses JIRA on a daily basis because it is customizable and easy to add new fields. He used it to track issues and improvements that his team was in charge of. He thinks it is helpful because they receive email when anything changes regarding the item. He sees it as a useful tool for task management.

His previous team usually trains employees through demos and over the phone. He was unaware of available resources to learn how to use Confluence. He advised us to limit information on home page of the Wiki so it doesn't take a long time to load. Additionally, making the homepage simple and easy to use will let the employees to contribute to Wiki more easily.

Support Team Member 3 – New York

The support team is in charge of a lot of information. They interact with many people at the trading floor like business analysts, developers, and traders. They oversee all the applications that traders use especially the five major ones. As an average, each support team member receives more than 300 emails every day. When they need information sent through email, they require using search function but it is not efficient since it is timely and filtering of the emails are hard processes when there exist a lot of them.

After the merger with Merrill Lynch, the support team now has more users than ever before. The more users mean more information to share which makes the information sharing more important than ever before.

Also the support team members work in different time zones. This also limits the capabilities of current information sharing practice. Email and temporary communication platforms have a tendency to looked over and forgotten over time. The tools referenced with this knowledge are dynamic to the point where most formally recorded information is obsolete within months. Support team needs instead must have the ability to share information globally in an organized and efficient manner, with lasting effects that can be referenced, reviewed, and augmented overtime as applications and the business evolves. The Platform needs a knowledge center for training and bringing new members up to speed. The platform is necessary for support teams to post questions and answers globally which can be shared by others. The wiki needs to be structured so employees can easily find the information they are looking for. Under each application, there should be different branches such as training, known issues, typical support functions. Some other suggestions were:

- Include a link called Access because our team frequently is giving traders access to many applications and it would be great to have a convenient location to put this information.
- Calendar is necessary so the support team is aware of what is going on with their coworkers
- Updated contact information is necessary
- Issue tracking needs to be completely changed around since keeping track of issues in JIRA is so time consuming. Spreadsheet would be so much easier when you could keep track of all of the issues and the applications that you are supporting. This would be

helpful for monthly reports so management can see what issues the support team is spending most of their time on.

Support Team Member 4 - Asia

The information the support team in Asia shares is:

- Structure of applications
- Detailed info about the underlying processes of the application
- Upstream/ downstream feeds, their scheduling...etc
- User related data such as what type of users use it and how they use it.
- Common issues and their resolutions
- Contact details of the parties involved with the application like business owner, development and QA details.

She said that they were using a wiki and confluence. In terms of bug tracking tool, they use ITRS (application processes, logs. monitoring tool).

The downside of the wiki is that the information is scattered across many entries and they need to link all that info to refer to one start point page and build a tree of application specific pages, with sub-trees of documentation for each application. They do need better structuring of the wiki and it would be great if we could help with that. Starting by a random search for keywords (ex: application name) and linking all of those items in one page would be a good start.

The other negative aspect of having a wiki is relying on it too much. People tend to reply to questions by: "please check the wiki" and it also kills the fun of the problem-solving process (diagnosis --> root cause detection --> trial and error...etc.) although it makes support more time efficient.

Uploading information is not difficult. It is time consuming sometimes, but with a better structured wiki, they can easily add a few lines in the right location quickly and that would be greatly helpful if the problem happened again in the future.

The gap the support team has in terms of information is merging the documentation that the developers and owners of the applications have in their wikis with the support teams documentation. It could be as simple as adding a "dev" section in each application page, which would include a link to the dev wiki. Dev wiki, if it contains enough information, will be a great help in trouble shooting, as it would have application server host names, data flow diagram, location of relevant log files that actually indicate the reason of the failure that the user is facing and much more, which would be very helpful in understanding the root cause of the issues, involving the right parties and applying work around on the spot.

She thinks the team is aware of the documentation available to them. However, she thinks it is time consuming to go through many unlinked documents to find one single piece of information. They are also pressured with the time. Most of the time, they cannot afford having one resource, looking at an endless amount of text to find something remotely relevant to the exact information they need. The solution again here is to merge all the very useful documentation they have into one big structured tree of document with one start point.

Business Analyst 1 – New York

Team is in charge of processing the risk evaluations for traders.   They prepare PnL (profit and loss) and risk valuations for traders. They provide support, QA (quality assurance), and testing. They daily use JIRA to assign issues to the correct teams within the risk engine team (valuation vs. infrastructure problem). They also use SharePoint for testing schedules, vacation time schedules, and project assignments. It is used a few times a week by her, but more often by her boss.

Perforce is another tool they use to share documents and reports and she finds it very easy to use. It is constantly being updated and only the risk engine team has access to Perforce.

There are also some difficulties to use it like reviewing documents and their history, because there are so many versions that are hard to follow since there are new copies for each big release. She also added that they have a website which has training and user and financial guides for users.

Business Analyst 2 – New York

His team doesn't use a wiki to share information with each other. They prioritize the bugs, and update their status on a weekly basis. Using JIRA often is part of the job function. Team is very good about updating JIRA. It is part of their job to constantly update it and make sure how everything functions successfully. He believes that too many categories are present in JIRA when creating/tracking an issue. He fills out the ticket anyway but unsure of what many of the categories mean.

Interviews Summaries from the London Office

Business Analyst - Qing

Business analysts are usually dealing with software that has been provided by a third party and the planning that has to go along with incorporating and managing such software. Documentation is done through a wiki was based previously on Media Wiki but recently has migrated to Confluence. This means of documentation has proven to be a good means of feedback when new functionality is incorporated and the right information is given to the support teams and traders for evaluation. However, it is difficult to maintain and update all functionality of a system when release cycles last around two weeks and many of the members involved in the cycle are struggling with time for the different tasks they must perform. Thus, the documentation for these release cycles is left undone for the specific functionality and is only done for the basic release information, which in turn does not provide much useful documentation to traders or support teams that will be having more direct contact with the systems. Therefore, when a problem or issue arises, any member of the support teams goes through their available channels to try to solve the issue.

The constraint at this point is the lack of a unified communication system between the support teams and business analysts that can discuss all through the same chat client. Instead they have dispersed groups talking to different clients, making it extremely difficult to solve problems efficiently. Once these issues have been taken by the business analysts, these go through a bug fix cycle, where they first must decide whether the issue can be resolved internally and if so, the solution will be provided back to support teams and traders. But, if that is not the situation, the vendor is usually contacted so as to get a solution in a later release for the third party software that will then need to be tested before its use by traders and support teams. One problem that business analysts see with the low response to updating documentation is the lack of standards of respecting code freezes to provide more time for such tasks. Additionally, business analysts think having template in the wiki would allow them to be aware of what information should be placed in the wiki. Another problem is the difficulty in finding incentives to increase the amount of input from users to document, which is why it was suggested that documenting the new functionality in systems should be part of a performance review for an employee so as to ensure that the documentation be done.

Quality Control (QA) – Praveen

The QA conducts testing, usually for one application at a time, throughout the application's release cycle and works intensely at the end of each cycle after coding freeze starts. The primary means of documentation is JIRA, where the QA keeps track of issues with the standard fields in it as well as with comments on each issue. JIRA notifies relevant QA members of the updates on each issue's status via email. QA and Support typically communicate though email and instant messenger (which is MChat for Praveen), which Praveen considers as effective means of communication.

According to him, it is difficult to give Support all information that the QA think might be useful rather than answering specific questions or solving specific problems when they come up, for two main reasons. First, there is too much information for QA/Dev to have the time to provide by documenting it, and the information keeps changing with each release cycle. Second, even if such extensive information is provided, users of the documentation will not have the time to get the desired information. More specifically, rapid updates in the application do not allow Support ample time to go through the documentation every time updates are made, and without going through the documentation in advance, Support may not be able to solve a specific problem when it occurs. In sum, Praveen thinks the current information sharing practice is effective, and he prefers the current-focused means of communication with the Support team.

Development (Dev) - Justin

Justin finds that Support sometimes provides either incorrect information or little substantial information that helps solving the problems. In those cases, Support often ends up asking questions for Dev and leaving the Dev investigating the problems. To improve this situation, he suggests defining a cut-off point in the information communicated from Support to Dev, where Support provides Dev with answers to the following questions, if possible.

1. Which system experiences the problem?
2. What is working wrong?
3. What is it supposed to be?

4. What are the details of the problem?

5. What is in the log of the application that has the problem?

6. Where in the dataflow does the problem occur?

On the wiki Justin’s team is using to provide information to both Dev and Support, there are specifications and install/release information of their applications accompanied by diagrams. Although Justin believes that documentation should be minimized, he did not imply whether the present documentation is adequate.

Appendix C: Assessment of Select Wiki Pages

Odin Wiki

Many pages have short contents followed by links to new pages, which could be condensed into sections on the same page. For example, the children pages of page "DB Settings" could be changed into sections of the page. Some pages contain only codes, which may be confusing to people without much experience with the application. For example, the page "Intraday PnL" has only SQL code. It might be helpful to include a brief background on the specific topic in those pages. On the page "Odin Support Tasks", there is a link to page "DB Settings" which also lists the DB settings of other applications. The general structure of the wiki should be clearly defined to prevent situations like this. In this case, the link should point directly to the specific DB settings page for Odin, i.e. the page "Odin-DB" under page "DB Settings".

iTrader Wiki

Page naming is clear and structured, yet there are some pages that are not linked, and some of them do not have contents. For example, among the children pages of page "iTrader", only pages "iTrader How To's" and "iTrader Support" have contents, but only the latter is linked. The page "ITrader Level 1 Support" has a well-structured layout, but many sections of the page lack actual specific content (other than the basic definition). There are two similarly named pages ("iTrader How To's" and "ITrader How Tos") at different locations. These pages should be either renamed or combined, depending on the contents of each.

Conparison between Odin Wiki and iTrader Wiki

The older version of the wiki for iTrader is more complete and has more content and specific information than the one within Confluence, probably because it might not have been ported totally. The wiki shows a mixture of both documentation of the whole product itself as well as support and troubleshooting information at certain sections of pages. This, in comparison to the Odin wiki in Confluence, seems to be a bit more complicated in terms of finding specific support functionality and information because of the navigation through all the product information that is in the wiki, which might not be something that the user might want or need at the time that they are using the wiki. We believe that it is useful to have such documentation, but that this documentation and support be more independent of each other in order to enable support groups and other users to access information more efficiently. We did find, in a particular case, that support pages, such as "What to do when the quoting strategy won't change" in iTrader and "BBG Runs Workaround" in Odin follow similar structures in terms of going through different steps of troubleshooting, and such pages of the iTrader wiki could be put into a space or wiki as Odin support has done, yet making sure to address the structure improvements mentioned previously. We also noticed that part of the support information seemed to be links to JIRA issues, which, if used in Confluence and within the specific support wiki could take advantage of the JIRA plugin for Confluence to provide additional information to the user before navigating to the specific page of the issue.

Appendix D: Credit Default Swap

An Introduction to Credit Default Swap

A credit default swap (CDS) is a bi-lateral financial contract that allows the owner of a third party debt obligation such as a municipal bond, a corporate debt, and a mortgage security, to buy protection against credit risk from a counter party. That is, the buyer of a credit swap receives credit protection and the seller guarantees the credit worthiness of the credit product. This transfers the risk of default from the holder of the security to the seller of the credit default swap. (Parker, 2008)

The third party debt obligation is called the reference obligation, and its issuer (the third party) is called the reference entity. A default by the reference entity is known as a credit event. The face value of the debt obligation is known as the par or the notional principal/value, which are often used interchangeably.

In a CDS contract, the buyer must periodically pay a premium to the protection seller. The seller profits from collecting the premium as long as the reference entity does not have a credit event or see its credit degenerate. In the case of any credit event or worsening credit, the CDS seller needs to pay the notional amount of a CDS to the buyer of protection. (Beinstein, 2006)

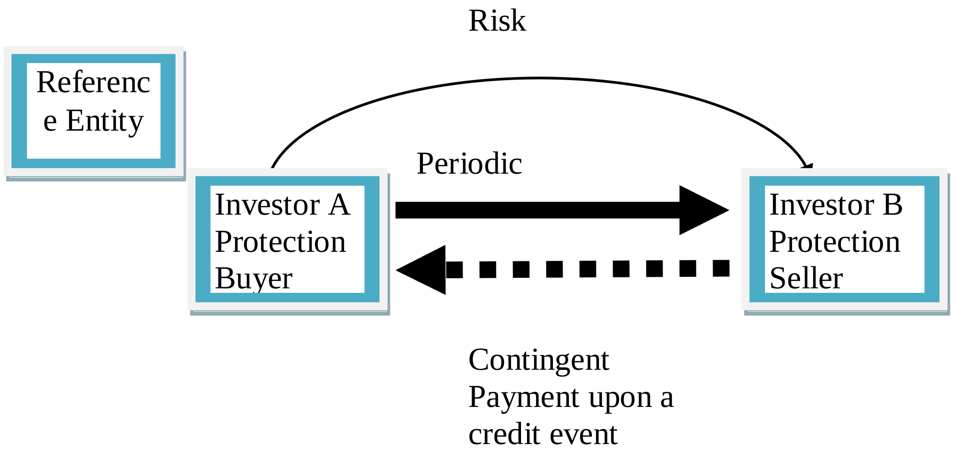


Figure 7: Diagram of Credit Default Swap

There are many different credit events that could trigger a contingent payment on credit default swap. Bankruptcy, failure to pay, and modified restructuring are the standard credit events and are explained below.

1. **Bankruptcy:** where the reference entity becomes subject to insolvency proceedings such as the appointment of administrators or it becomes subject to liquidation.
2. **Failure to Pay:** where the reference entity neglects to pay interest or principal payments when due.
3. **Restructuring:** where the references entity undergoes deterioration in creditworthiness after arranging for some or all of its debts to be restructured (decrease of principal/interest, deferment of payment of principal/interest, etc.)

   (Beinstein, 2006) (Benhamou & Wong, 2005) (Parker, 2008)

In the text that follows, we will sometimes simply use the word “default” as a general term for a credit event.

Following a credit event, there are two types of settlements for credit derivatives; physical settlement and cash settlement.

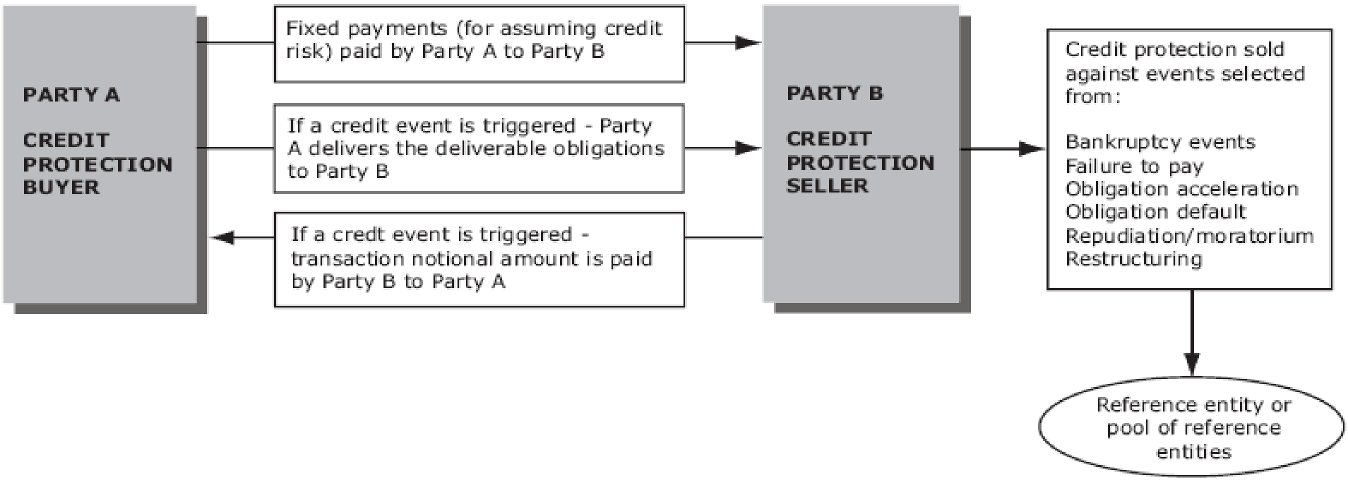

PARTY A
CREDIT PROTECTION BUYER
Fixed payments (for assuming credit risk) paid by Party A to Party B
If a credit event is triggered - Party A delivers the deliverable obligations to Party B
If a credt event is triggered - transaction notional amount is paid by Party B to Party A
PARTY B
CREDIT PROTECTION SELLER
Credit protection sold against events selected from:
Bankruptcy events
Failure to pay
Obligation acceleration
Obligation default
Repudiation/moratorium
Restructuring
Reference entity or pool of reference entities

Figure 8: Physical Settlement (Parker, 2008)

In a physically settled transaction, the buyer gives the defaulted bonds which have the total face amount equal to the notional amount of the CDS contract to the seller. In return, the seller pays the notional amount of the CDS contract in cash to the buyer. The buyer should also make the accumulated premium payment from the last coupon date until the credit event. The market price of the bonds that is de livered to the seller when CDS contracts are settled is known as the recovery rate.

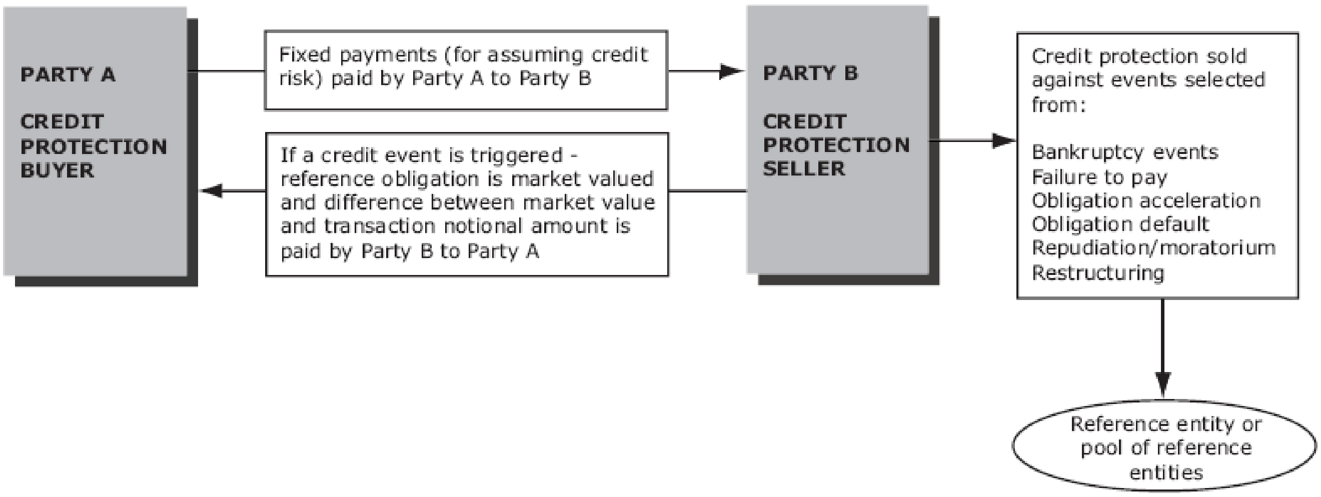

PARTY A
CREDIT PROTECTION BUYER
Fixed payments (for assuming credit risk) paid by Party A to Party B
If a credit event is triggered - reference obligation is market valued and difference between market value and transaction notional amount is paid by Party B to Party A
PARTY B
CREDIT PROTECTION SELLER
Credit protection sold against events selected from:
Bankruptcy events
Failure to pay
Obligation acceleration
Obligation default
Repudiation/moratorium
Restructuring
Reference entity or pool of reference entities

Figure 9: Cash Settlement (Parker, 2008)

In a cash settlement, the buyer and seller can both unwind the trade. Based on the market price of the defaulted bond, the protection seller pays the difference between the notional amount and market value (par minus recovery price) to the buyer.

Monetizing CDS Contracts

Apart from a credit event, investors continuously check their losses or gains against fluctuating market perceptions on the credit risk. For instance, Investor A buys 10 years of protection paying 100 basis points (100 bps is equal to 1 percent) per year and after a year, the credit risk has increased and investors were willing to buy the same CDS for 120bps.

There are two methods to monetize the unrealized profits. First, the buyer could sell nine-year protection at 100bp and make a profit of 20bp per year until the contracts mature. In the second method, the buyer can agree with the seller to unwind the contract. The seller needs to pay the difference between the notional amount and the market value or more to the buyer.

CDS Pricing

A CDS contract involves two potential streams of cash flow. The stream known as the Fee Leg (or Fixed Leg, Premium Leg) is the periodic payments made by the CDS buyer to the seller until the earlier of a default or maturity of the contract, in exchange for the other stream, the Contingent Leg (or Floating Leg, Default Leg), which is the pay-off made by the CDS seller to the buyer at the time of a default. The pay-off is the difference between par and the recovery value of the reference obligation. (Agrawal, 2009) (Beinstein, 2006) To price a CDS is to determine the periodic fee assessed to the buyer, which is typically quoted in basis points, called the CDS spread, as an annualized percentage of the reference obligation's notional principal.

A fine parallel can be drawn between a term life insurance and a CDS. The Fee Leg of a CDS corresponds to the periodic premium payments made by the insurance policyholder, and the Contingent Leg the benefit payment made by the insurer should death occurs during the term of the insurance contract. For this reason, it is not surprising to discover a close resemblance of pricing a CDS to pricing a term life insurance policy in both discrete time and continuous time models.

Beinstein (2006) introduced a simple discrete time pricing model for a plain vanilla CDS (an ordinary CDS as defined earlier) on a $1 notional. For the purpose of illustrating the idea of CDS pricing only, we further simplify the model by assuming zero accrual on default, i.e., the protection buyer is not charged a partial regular payment for the period between the time of default and the last payment date before default. Define

$Sprd$: CDS spread.

Δ_i: Length of time period *i* in years.

S_i: Probability of non-default up to the end of period *i*.

v_i: Risk-free discount factor between time zero and the end of period *i*.

$\hat{R}$: Estimated recovery rate on the reference obligation.

Since $PV(Fee\ Leg) \ = \ PV(Contingent\ Leg)$,

$$Sprd \cdot \sum_{i=1}^{n} \Delta_i S_i v_i = (1 - \hat{R}) \cdot \sum_{i=1}^{n} (S_{i-1} - S_i)\, v_i$$

where $(1 - \hat{R})$ is the ratio of the claim amount to the notional, and $(S_{i-1} - S_i)$ is the probability that default occurs in period *i*.

Solving for the CDS spread, we get

$$Sprd = \frac{(1 - \hat{R}) \cdot \sum_{i=1}^{n} (S_{i-1} - S_i)\, v_i}{\sum_{i=1}^{n} \Delta_i S_i v_i}.$$

Similarly, for an n-year term life insurance with death benefit $(1 - \hat{R})$, the periodic premium payment *during the term of the contract* is calculated as

$$Premium = \frac{\left(1 - \hat{R}\right) \cdot Expection[PV(Death\ benefit\ of\ \$1)]}{Expection[PV(Annuity\ of\ \$1\ per\ period\ until\ death)]}.$$

We now move on to formally present (with our notation) a continuous time CDS pricing model introduced in Hull and White (2000), which works under the following assumptions.

1. There is no counterparty default risk.
2. Default probabilities, interest rates, and recovery rates are independent.
3. The claim in the event of default is the face value of bond plus accrued interest.

We define

$Sprd$: CDS spread.

$\hat{R}$: Estimated recovery rate on the reference obligation.

$S(t)$: Survival function (probability of non-default up to time *t*).

$f(t)$: Probability density function for default at time *t*.

$v(t)$: Risk-free discount factor between time zero and time *t*.

T: Length of the CDS contract.

$u(t)$: Present value of annual payments of \$1 on payment dates between time zero and time *t*.

$e(t)$: Present value of an accrual payment for the period between time t and the payment date immediately preceding time *t*.

For convenience, we consider a CDS with a \$1 notional principal. Then

$$PV(Fee\ Leg) = Sprd \cdot \int_0^T f(t)\,[u(t) + e(t)]dt + Sprd \cdot u(T)S(T)$$

where $S(t) = 1 - \int_0^t f(x)\,dx$.

If default occurs at time *t* $(t \leq T)$, the present value of fees is $u(t) + e(t)$. Thus,

$$Sprd \cdot \int_0^T f(t)\,[u(t) + e(t)]dt$$

is the present value of fees weighted by the probability of default, and

$$Sprd \cdot u(T)S(T)$$

is the present value of fees paid up to time T weighted by $S(T)$, the probability that default never occurs during the life of the CDS contract.

Since we assume the claim amount is the face value plus accrued interest, in the event of default at time t,

$$Payoff = 1 - [1 + A(t)]\hat{R} = 1 - \hat{R} - A(t)\hat{R}$$

and thus

$$PV(Contingent\,Leg) = \int_{0}^{T} \left[1 - \hat{R} - A(t)\hat{R}\right] f(t)v(t)\,dt.$$

Again we need $PV(Fee\ Leg) \ = \ PV(Contingent\,Leg)$, which gives

$$Sprd \cdot \int_{0}^{T} f(t)\,[u(t) + e(t)]dt + Sprd \cdot u(T)S(T) = \int_{0}^{T} \left[1 - \hat{R} - A(t)\hat{R}\right] f(t)v(t)\,dt$$

and therefore,

$$Sprd = \frac{\int_0^T \left[1 - \hat{R} - A(t)\hat{R}\right] f(t)v(t)\,dt}{\int_0^T f(t)\,[u(t) + e(t)]dt + u(T)S(T)}.$$

Both models shown above can accommodate constant and variable interest rates, which affect the calculation of *v*, *u*, and *e* in the models. Although more rigorously presented, the second model is still a simplification given its assumptions, which unfortunately are hardly possible to be relaxed without a significantly more complex model. However, some general conclusions have been reached about the impact of those assumptions on CDS pricing. (Hull & White, 2000)

The question yet remains how we can obtain the inputs to the pricing models, such as the second one shown above. With risk-free yield curve projected, we still need the recovery rate and default probability at different future times. The former must be estimated from empirical data, and the later from the reference entity’s bond yields, which reflect the default of the issuer.

(Hull & White, 2000) In fact, a simple estimate of T-year CDS spread itself, as pointed out by Hull and White (2000), is the difference between the yield on a T-year bond issued by the reference entity and the T-year U.S. Treasury yield, which is considered a benchmark[2] (risk-free yield).

The Current Role of CDS in the Economy

Credit default swaps, a $62 trillion dollar market as of 2008, play a large role in the current economy, currently being about 4 times greater than the New York Stock Exchange (Philips, 2008). These swaps, however, are not well regulated and are very risky; CDS are traded over the counter instead of being on an exchange, they are not subject to current securities laws, and they are extremely risky considering Warren Buffet calls them a "financial weapon of mass destruction" (Rappeport, 2008). Contracts are traded from investor to investor without anyone overseeing the trades to ensure the buyer has enough money to cover the losses if the security defaults (Morissey, 2008). One of the biggest risks with credit default swaps is that if the party providing the insurance protection doesn't have money to pay the buyer after a credit event or it goes bankrupt, the buyer is not covered to receive the money as part of the agreement. Suddenly, premium payments can disappear, as can the insurance against default. Furthermore, an original CDS can go through more than 10 trades, so when a default occurs, the insured party may not know who is responsible for making up the default, and if that person even has resources to cover the default (Morissey, 2008). Additionally, litigation is becoming more and more popular due to losses from high-yield bonds and the fact that a "credit event" can be unclear (Rappeport, 2008).

[2] Due to miscellaneous issues, academics also use Agency rates or LIBOR as the benchmark, while the market usually uses LIBOR because CDS buyers are assumed to fund (borrow money) at LIBOR. (Hull & White, 2000) (Taksler, Rosenberg, & Bortz, 2008)

About a decade ago when credit default swaps were first created, they were an easy way for banks to make money. This was because the economy was doing well and a minimal number of companies were defaulting. CDS were low risk and companies could collect premiums to earn extra cash In the 1990's the swaps focused mainly on municipal bonds and corporate debts (Philips, 2008).

Since the 1990's, however, credit default swaps can be written for subprime mortgage securities. Trillions of dollars of credit default swaps involved subprime mortgage securities. Sellers of the credit default swaps who believed that the subprime mortgages wouldn't default (as they were over-rated) got slaughtered as defaults rose dramatically starting around 2007. Nobody knew if parties holding the CDS insurance would have the financial capability to pay off obligations in the event of many defaults. Companies like Bear Stearns almost experienced bankruptcy but the Federal Banks wouldn't allow this to happen because it could wipe out trillions of dollars of credit default swaps easily. Their bankruptcy could easily affect other institutions that had insurance written by Bear Stearns. These institutions would no longer be hedged anymore against their risky securities, and they would in turn write-down huge multi-billion dollar losses (Gilani, 2008).

Lehman Brothers on the other hand went bankrupt after having more than $700 billion worth of CDS (Philips, 2008) and a large amount were backed by American International Group Inc. (AIG). Parties who sold CDS for Lehman Brothers' bonds were stuck being obligated to pay their counterparties. Because the Federal Reserve did not bail them out, a potential "domino effect" is in the works as these companies could now default on their own obligations.

AIG meanwhile had over $400 billion dollars worth of written credit default swaps when their largest loss in US history occurred in 2008 (Gilani, 2008). They ended up having to be bailed out by the US government when the value of these insured-referenced entities fell. They had more money in bonds than they could afford to cover, as they defaulted on $14 billion worth of credit default swaps it had made. The reason that AIG was bailed out was because they were just providing the swaps and holding on to them unlike other businesses that would buy and trade them frequently to offset losses (Philips, 2008). If they were not bailed out, everyone who bought a CDS contract from the company would have suffered huge losses in the event of default.

Speculators have also started playing a huge role in CDS. Although they do not actually own any underlying credit, if they believe that a certain company is in trouble and will experience a credit event like bankruptcy they can buy a credit default swap on the company's bonds. That way if the company actually defaults, the speculators will receive the full face amount of the bonds. At the same time speculators who think a company is doing tremendously can instead offer insurance to other speculators who think that the company will default. This occurs when a speculators holds the belief that they will collect all of the paid premiums and never have to pay off the insurance. Both of these examples display how easily speculators can become involved with credit default swaps and place these risky bets (Gilani, 2008).

Appendix E: Knowledge Management in Software Engineering

As in any other organization, software engineering organizations also see a trend for the need to harness their intangible assets in order to survive in such a competitive global market. This competitiveness is troubling when reports for software projects show that "31.1 percent of projects will be canceled before they ever get completed" and also "52.7 percent of projects will cost 189 percent of their original estimates". (Dingsøyr & Conradi, 2002) This makes it important for a software organization to reduce the time and cost of production so they are able to find a means to supply their products. These organizations also suffer pressure in terms of trying to capture the tacit knowledge of their employees because of the typically fast-paced working environment governed by recently emerging software development methodologies geared towards rapid delivery of high-quality software. These methodologies have been implemented in order to address problems dealing with "miscommunication between the end-users and the software developers, long time periods for resolution of minor bugs, and difficulty in estimating the amount of work left for tasks". (Dingsøyr & Conradi, 2002) Employees working with such methodologies are usually focused on the deadlines for the products and projects that they are currently assigned to and in some cases do not take into account the organization's efforts to contribute to the knowledge repositories. (Rus & Lindvall, 2002)

There are organizations that have been able to succeed and expand in the growing global market, thus being introduced to new challenges when employees and teams must work collaboratively in different locations. This situation is not uncommon, and it demonstrates a growing trend that software organizations are developing their software globally across different sites and cultures. (Herbsleb & Moitra, 2001) But, although this practice can enable the organization to extend the daily productive hours of work from 8 to nearly 24, there are other issues that arise with global software development. These issues can involve the various limitations that specific locations might have, expertise levels on the various technologies, or resistance due to uncertainty of job aspects such as relocation, extensive travel or even loss. There are also problems with cultural inexperience that can worsen communication between different locations as well as the reluctance to communicate when there is fear of losing intellectual property. These all present a challenge to the expanding organizations that must continue their production of software and do so at a more effective rate to keep in the market.

The nature of a software organization can both help in the implementation of a knowledge management approach as well as discourage it. Software engineering knowledge constantly changes with new advancements and discoveries. The various emerging technologies and the different practices that are employed within the organization will eventually change and mold the knowledge that is held by the employees of that organization. (Ward & Aurum, 2004) Thus, software engineers are not easily intimidated by the technological implementations that come along with a knowledge management initiative, especially since most of the information that is handled in a software development project is already electronic and easily distributable. However, taking into account the emergence of technologies, there is also a sense that current knowledge might not be useful for future projects because the assumptions and situations might be completely different. (Rus & Lindvall, 2002)

As part of the initiative to incorporate knowledge management as a solution in software engineering organizations, there have been implementations primarily with the concept of the Experience Factory. This concept was first suggested in the early 90's with the purpose of providing a means for an organization to effectively reuse and handle the experience held by its employees, preferably by a specialized team that is not part of the development sector. (Dingsøyr & Conradi, 2002) Thus, Experience Factory makes a distinction between two different sectors, the Project Organization and the Experience Factory Organization. Figure 1 below demonstrates the flow and structure around the concept of Experience Factory, noting that the Project Organization is concerned with delivering a software product while the Experience Factory Organization deals with using the experience from current and past projects as a means to improve the overall process. (Gomes de Mendonça, Seaman, Basili, & Kim, 2001) The NASA Software Engineering Laboratory, Daimler Chrysler, Telenor Telecom Software, ICL High Performance Systems, ICL Finland, and sd&m are all companies that have implemented the Experience Factory. Although not all had the same results, each one had benefits in one of the following three areas: improvement of software quality, reduction of software development cost, and positive influence on the work of employees of the organization. (Dingsøyr & Conradi, 2002)

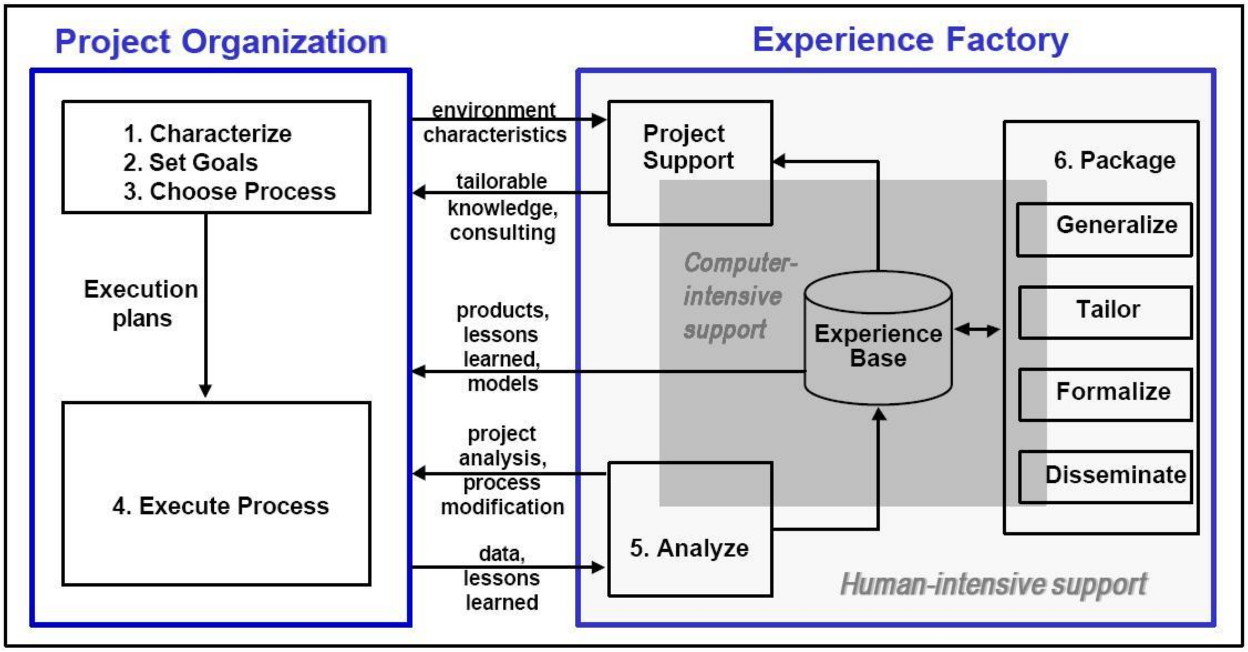


Figure 10: Experience Factory structure. (Gomes de Mendonça, Seaman, Basili, & Kim, 2001)

Although the experience factory is widely known, each organization must accommodate the implementation to their needs, such is the case of the Experience Engine that was implemented in the Ericsson Software Technology organization. This solution is based on the experience factory, yet it relies on tacit knowledge from employees themselves rather than the experience stored in the experience base. (Rus & Lindvall, 2002) By having employees, in this case referred to as experience communicators, that could match a person in doubt with an expert, also known as an experience broker, problems could be solved effectively and efficiently, since those people would be guided directly where they needed to go and, thus, solutions could be found faster. (Dingsoyr, 2000)

Experience Management Systems are another implementation that extended from the basis of an Experience Factory. The variation in this implementation of an Experience Factory is that an Experience Management System is concerned uniquely with managing the explicit knowledge of its employees, without any strong interest in providing means for externalizing tacit knowledge. (Gomes de Mendonça, Seaman, Basili, & Kim, 2001) As is the case for an Experience Factory, the Experience Management System sets "experience packages" as units for the information to be managed. These are established and defined by an experience classification manager or librarian in order to have a range in the size and scope of the packages. The Experience Management System can be expressed in three different levels, namely Repository Level, User Interface Level, and Procedural Level as shown in Figure 3 below. These levels are used in order to address the problem of managing software engineering knowledge. The first level, Repository, is concerned with the means of storing the packages within the repository. The second level, User Interface, deals with the best representation for the information as well as the interaction between the user and the system when utilizing information. The final level, Procedural, adresses the concerns of maintining and updating all the information stored within the repository. (Gomes de Mendonça, Seaman, Basili, & Kim, 2001) A sample Experience Management System was implemented in the organization Q-Labs, concluding that it was effective and eventually could be "successfully deployed throughout Q-Labs", although there was a clear recognition that work would need to be done to ensure its robustness. (Gomes de Mendonça, Seaman, Basili, & Kim, 2001)

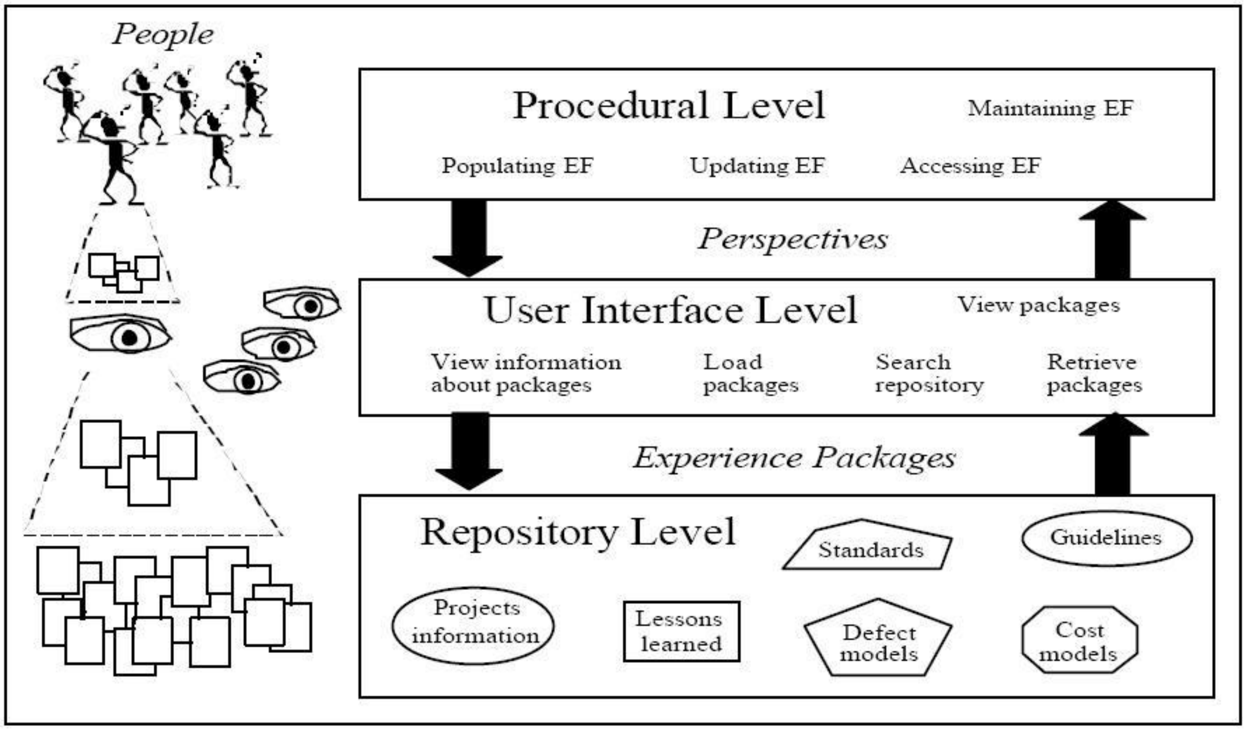


Figure 11: The three levels of an Experience Management System. (Gomes de Mendonça, Seaman, Basili, & Kim, 2001)

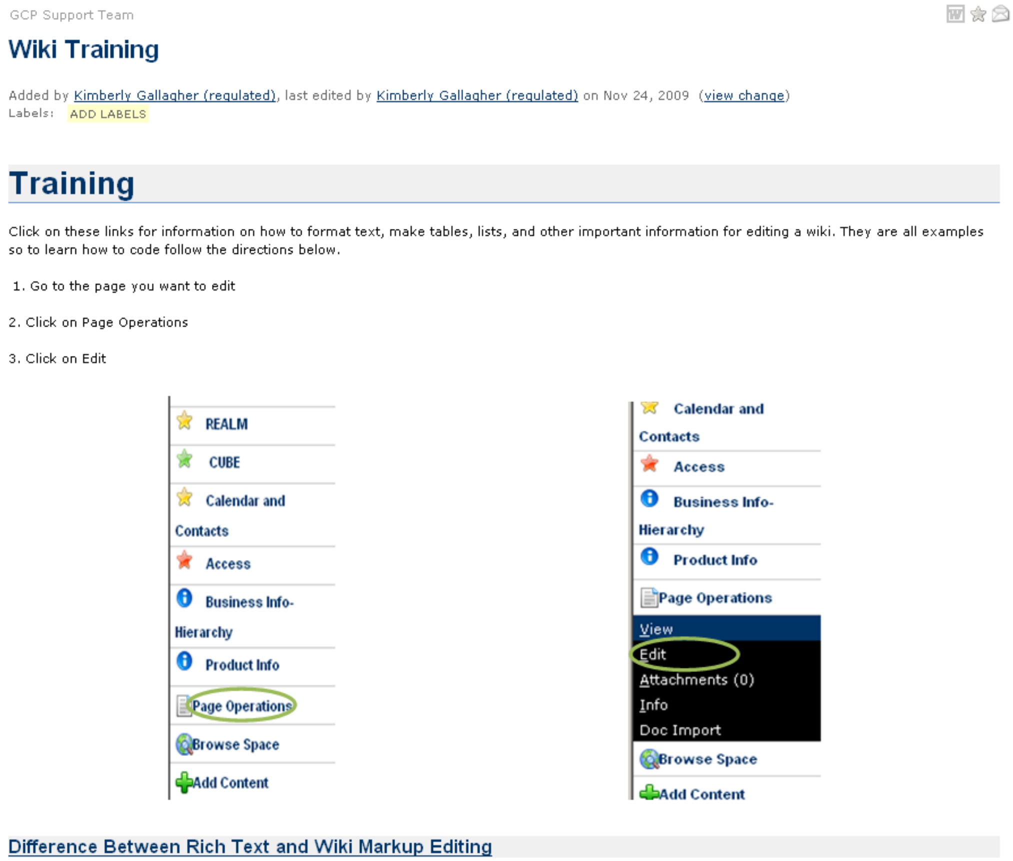
All the previously mentioned implementations of an Experience Factory demonstrate a strong need for knowledge management in software organizations, yet each had a specific approach. This seems reasonable when taking into account that each organization will have its differences in work-flow, but it also makes it difficult to portray a clear example of a given implementation that is considered a best practice. Although there is no rubric or template to follow and organizations do have to take care of identifying their characteristics to address the approach, the overall improvement within organizations of the process of software development shows that the concept of Experience Factory has been a useful tool and will probably continue to be.

Appendix F: Wiki Training Page Documentation

After creating the wiki for the support team, our next step was to create a training section so members of the support team could learn the capabilities of the platform and learn how to make edits and additions to the pages. This section details the different pages available that teach members of the support team how to effectively use the platform.

Main Page of Wiki Training

The Wiki training main page gives instructions on how the users should view examples and provides links for training instructions and examples. The main page of Wiki training is shown below:



GCP Support Team

Wiki Training

Added by Kimberly Gallagher (regulated), last edited by Kimberly Gallagher (regulated) on Nov 24, 2009 (view change)
Labels: ADD LABELS

Training

Click on these links for information on how to format text, make tables, lists, and other important information for editing a wiki. They are all examples so to learn how to code follow the directions below.

1. Go to the page you want to edit

2. Click on Page Operations

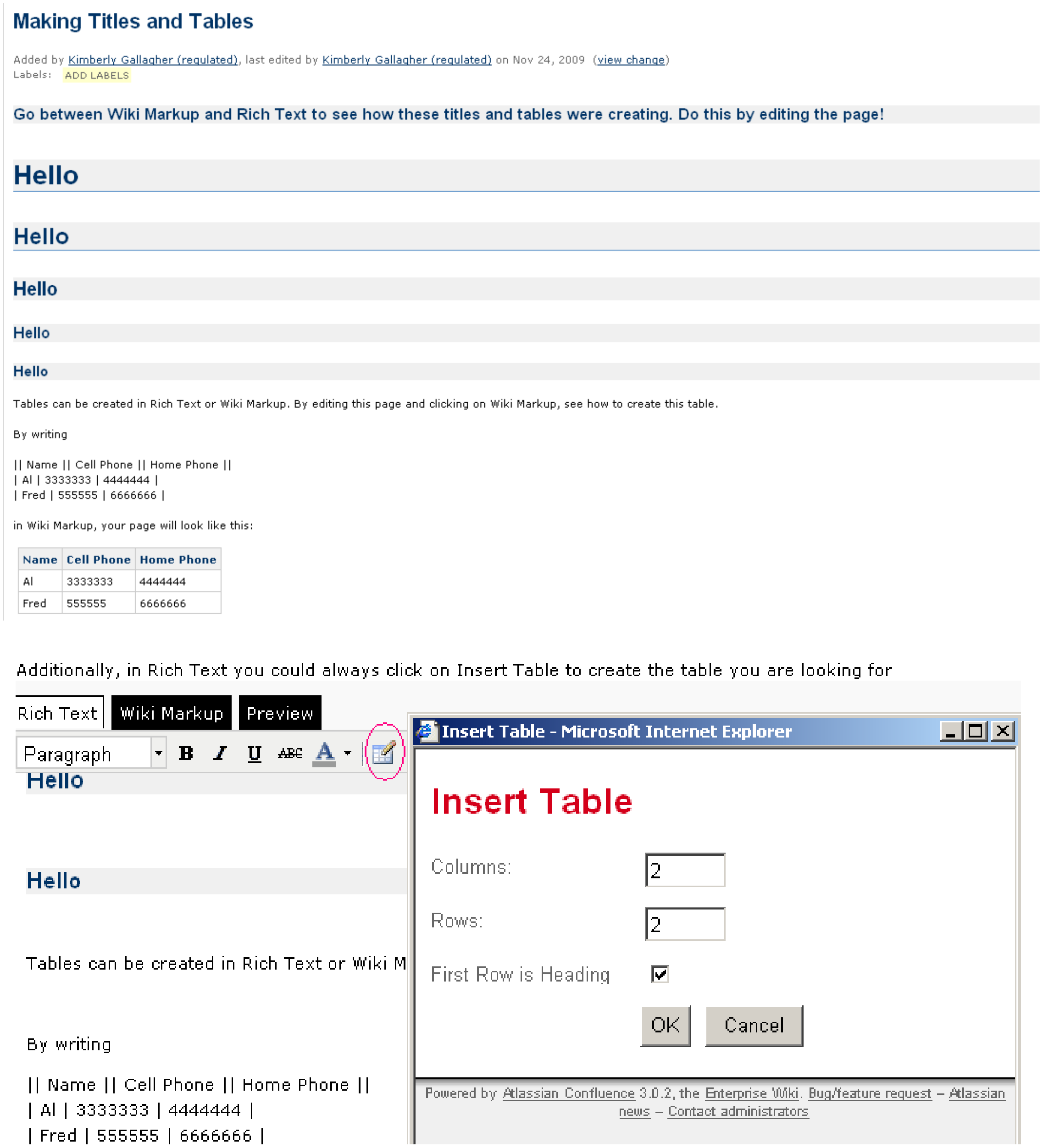
3. Click on Edit

Difference Between Rich Text and Wiki Markup Editing

Figure 12: Main Page of Wiki Training

“Making Titles and Tables” Page

The “Making Titles and Tables” link at the main page brings the users to making titles and tables page. This page allows users to see the instructions and examples of creating headings and tables. The page is shown below:



Making Titles and Tables

Added by Kimberly Gallagher (regulated), last edited by Kimberly Gallagher (regulated) on Nov 24, 2009 (view change)
Labels: ADD LABELS

Go between Wiki Markup and Rich Text to see how these titles and tables were creating. Do this by editing the page!

Hello

Hello

Hello

Hello

Hello

Tables can be created in Rich Text or Wiki Markup. By editing this page and clicking on Wiki Markup, see how to create this table.

By writing

```
|| Name || Cell Phone || Home Phone ||
| Al | 3333333 | 4444444 |
| Fred | 555555 | 6666666 |
```

in Wiki Markup, your page will look like this:

Name	Cell Phone	Home Phone
Al	3333333	4444444
Fred	555555	6666666

Additionally, in Rich Text you could always click on Insert Table to create the table you are looking for

Hello

Hello

Tables can be created in Rich Text or Wiki M

By writing

```
|| Name || Cell Phone || Home Phone ||
| Al | 3333333 | 4444444 |
| Fred | 555555 | 6666666 |
```

Insert Table - Microsoft Internet Explorer

Insert Table

Columns: 2

Rows: 2

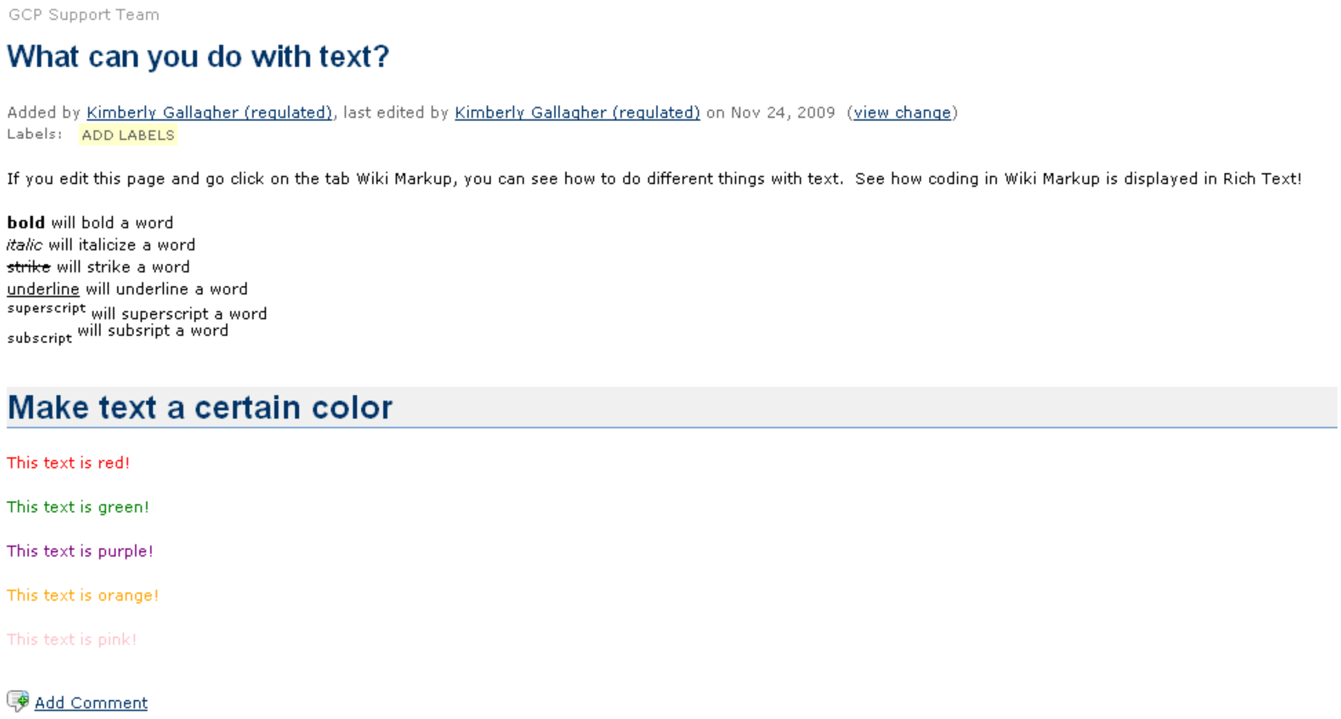
First Row is Heading ☑

Powered by Atlassian Confluence 3.0.2, the Enterprise Wiki. Bug/feature request – Atlassian news – Contact administrators

Figure 13: “Making Titles and Tables” Page

“What Can You Do with Text” Page

This link at the main page brings the users to what can you do with text page. This page explains different ways to edit the format and color of the text as well as providing examples for easier understanding. This page is shown below:



GCP Support Team

What can you do with text?

Added by Kimberly Gallagher (regulated), last edited by Kimberly Gallagher (regulated) on Nov 24, 2009 (view change)
Labels: ADD LABELS

If you edit this page and go click on the tab Wiki Markup, you can see how to do different things with text. See how coding in Wiki Markup is displayed in Rich Text!

bold will bold a word
italic will italicize a word
~~strike~~ will strike a word
underline will underline a word
$^{\text{superscript}}$ will superscript a word
$_{\text{subscript}}$ will subsript a word

Make text a certain color

This text is red!

This text is green!

This text is purple!

This text is orange!

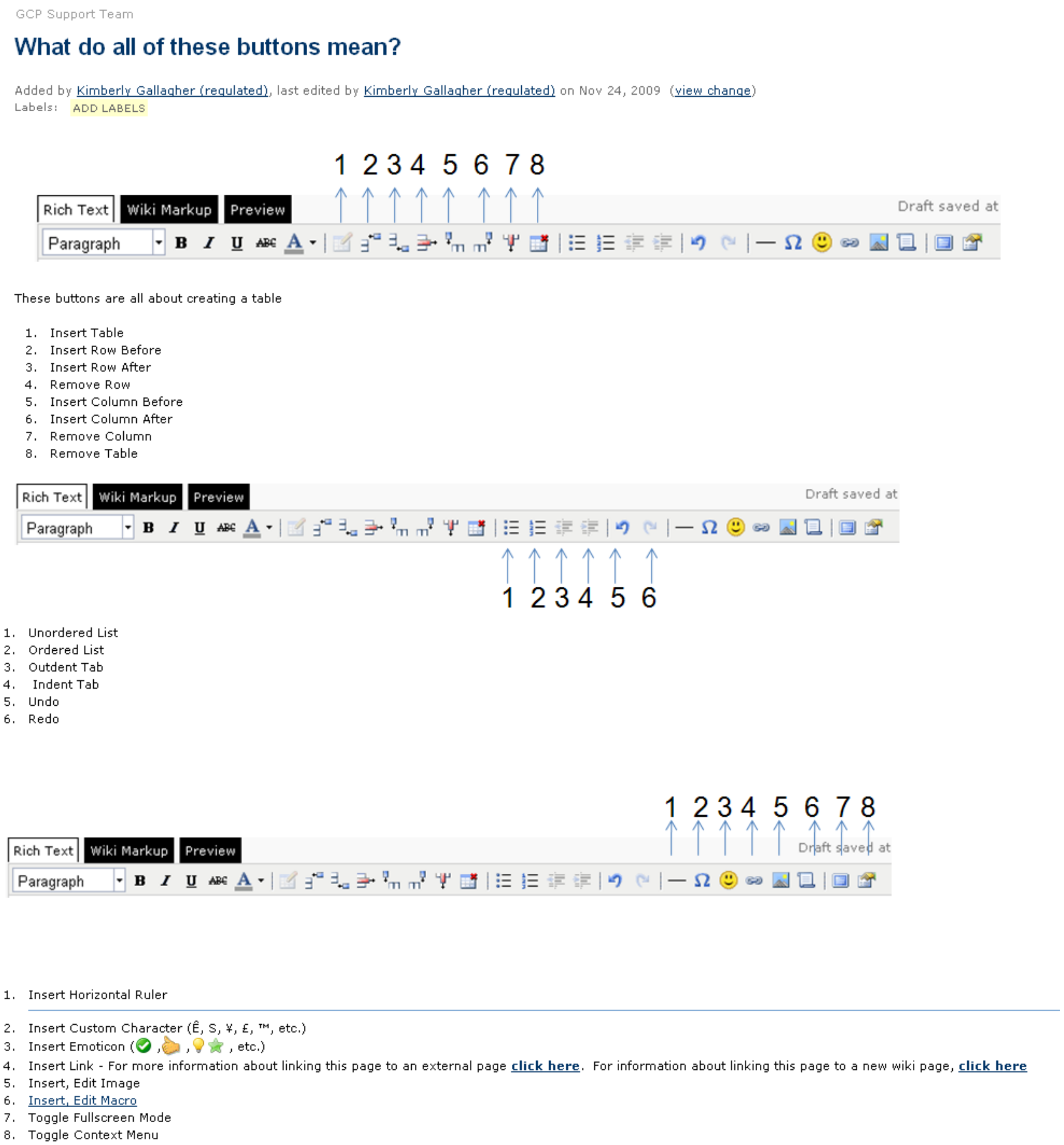
This text is pink!

Add Comment

Figure 14: “What Can You Do with Text” page

“What Do All of These Buttons Mean” Page

This link at the main page directs users to what do all those buttons mean page. This page gives detailed information on every button at the edit page, their functions, and examples on how to use them. The page is shown below:



GCP Support Team

What do all of these buttons mean?

Added by Kimberly Gallagher (regulated), last edited by Kimberly Gallagher (regulated) on Nov 24, 2009 (view change)
Labels: ADD LABELS

These buttons are all about creating a table

1. Insert Table
2. Insert Row Before
3. Insert Row After
4. Remove Row
5. Insert Column Before
6. Insert Column After
7. Remove Column
8. Remove Table

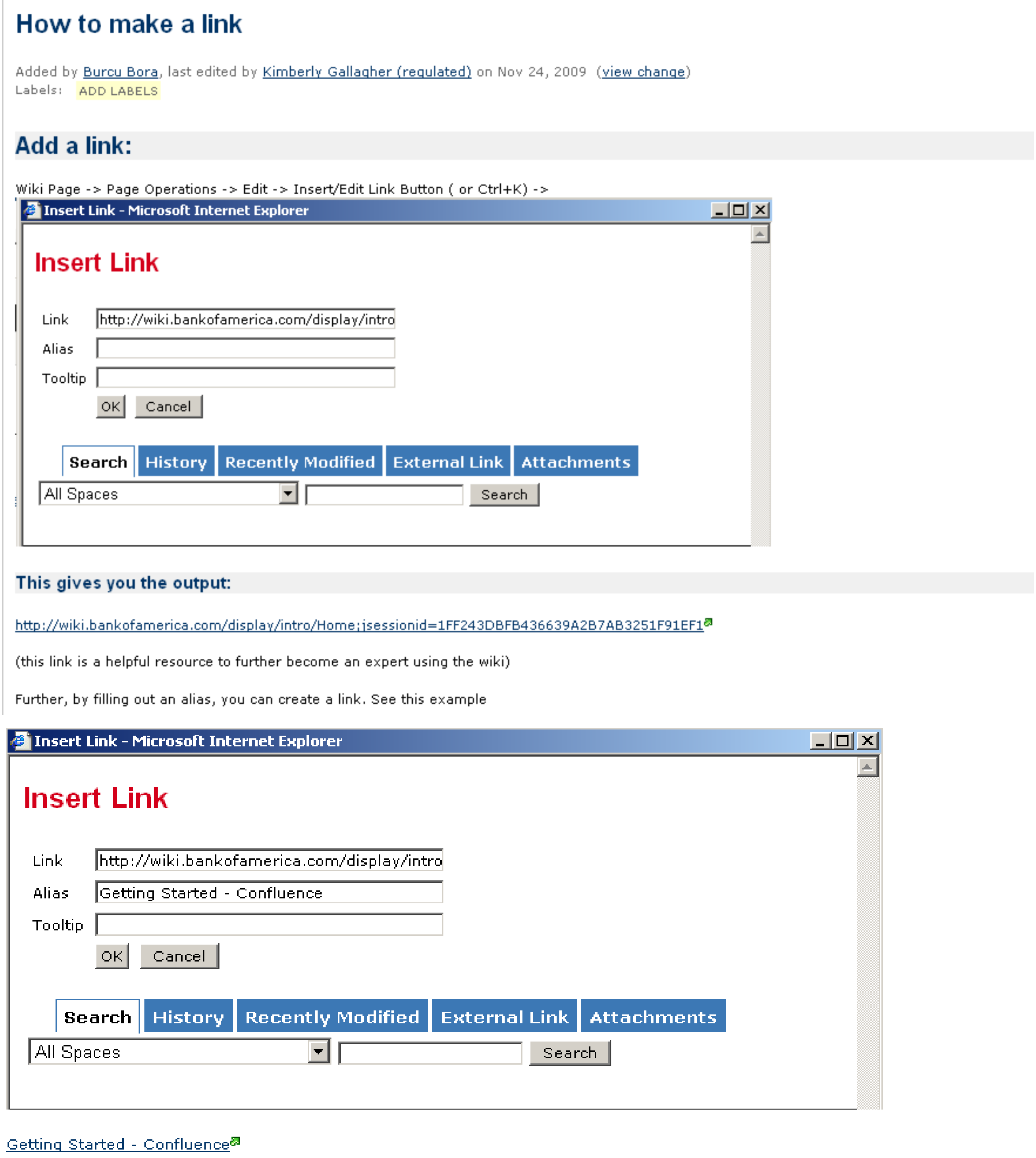
1. Unordered List
2. Ordered List
3. Outdent Tab
4. Indent Tab
5. Undo
6. Redo

1. Insert Horizontal Ruler
2. Insert Custom Character (Ê, S, ¥, £, ™, etc.)
3. Insert Emoticon (✓ , 👍 , 💡⭐ , etc.)
4. Insert Link - For more information about linking this page to an external page **click here**. For information about linking this page to a new wiki page, **click here**
5. Insert, Edit Image
6. Insert, Edit Macro
7. Toggle Fullscreen Mode
8. Toggle Context Menu

Figure 15: “What Do All of These Buttons Mean” Page

“How to Make A Link” Page

Another link off of the main mage shows the Linking This Page to an External Link Page to the users. This page provides detailed instructions on how to link a page to an external page as well as examples. This page is shown below:



How to make a link

Added by Burcu Bora, last edited by Kimberly Gallagher (regulated) on Nov 24, 2009 (view change)
Labels: ADD LABELS

Add a link:

Wiki Page -> Page Operations -> Edit -> Insert/Edit Link Button (or Ctrl+K) ->

Insert Link - Microsoft Internet Explorer

Insert Link

Link: http://wiki.bankofamerica.com/display/intro
Alias:
Tooltip:

This gives you the output:

http://wiki.bankofamerica.com/display/intro/Home;jsessionid=1FF243DBFB436639A2B7AB3251F91EF1

(this link is a helpful resource to further become an expert using the wiki)

Further, by filling out an alias, you can create a link. See this example

Insert Link - Microsoft Internet Explorer

Insert Link

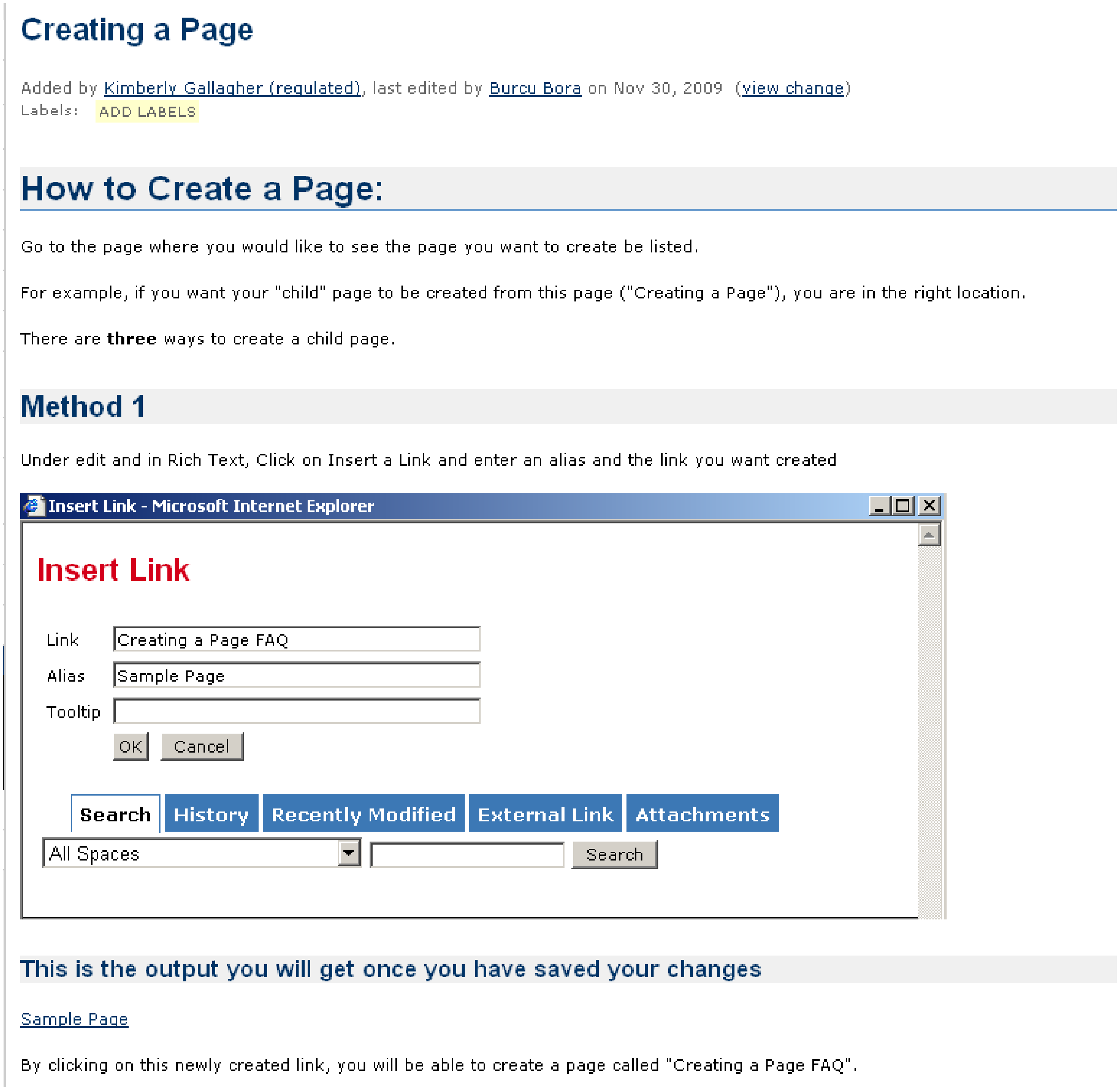
Link: http://wiki.bankofamerica.com/display/intro
Alias: Getting Started - Confluence
Tooltip:

Getting Started - Confluence

Figure 16: “How to Make a Link” Page

Creating a New Wiki Page and Linking to an Existing Page

This link at the main page brings users to creating a new wiki page and linking to an existing page. This page shows the users how to create a new wiki page or link any page with another in Wiki. Examples are provided for easier use and better understanding. The page is shown below:



Creating a Page

Added by Kimberly Gallagher (regulated), last edited by Burcu Bora on Nov 30, 2009 (view change)

Labels: ADD LABELS

How to Create a Page:

Go to the page where you would like to see the page you want to create be listed.

For example, if you want your "child" page to be created from this page ("Creating a Page"), you are in the right location.

There are **three** ways to create a child page.

Method 1

Under edit and in Rich Text, Click on Insert a Link and enter an alias and the link you want created

Insert Link - Microsoft Internet Explorer

Insert Link

Link: Creating a Page FAQ

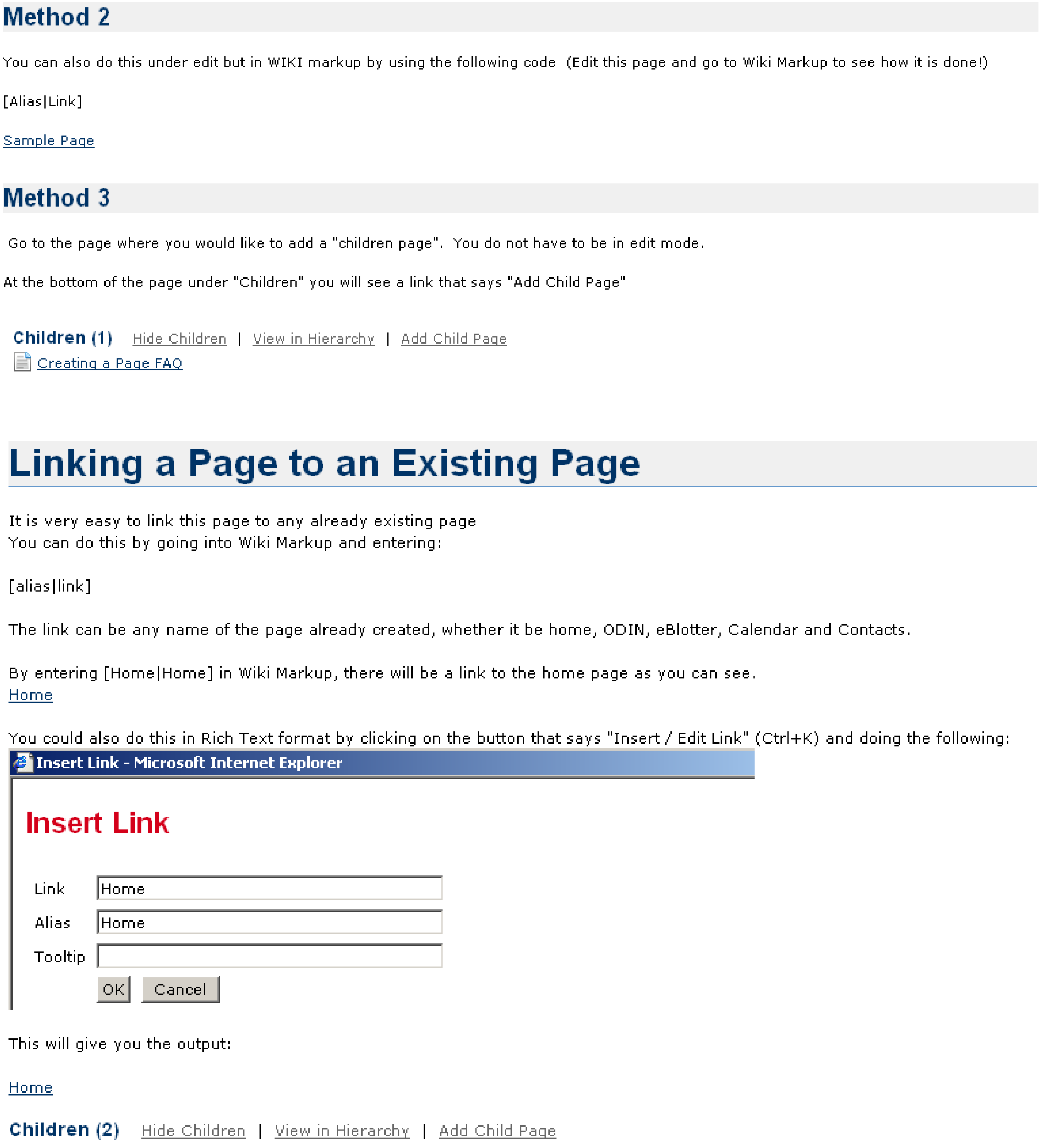
Alias: Sample Page

Tooltip:

This is the output you will get once you have saved your changes

Sample Page

By clicking on this newly created link, you will be able to create a page called "Creating a Page FAQ".



Method 2

You can also do this under edit but in WIKI markup by using the following code (Edit this page and go to Wiki Markup to see how it is done!)

[Alias|Link]

Sample Page

Method 3

Go to the page where you would like to add a "children page". You do not have to be in edit mode.

At the bottom of the page under "Children" you will see a link that says "Add Child Page"

Children (1) Hide Children | View in Hierarchy | Add Child Page

Creating a Page FAQ

Linking a Page to an Existing Page

It is very easy to link this page to any already existing page
You can do this by going into Wiki Markup and entering:

[alias|link]

The link can be any name of the page already created, whether it be home, ODIN, eBlotter, Calendar and Contacts.

By entering [Home|Home] in Wiki Markup, there will be a link to the home page as you can see.
Home

You could also do this in Rich Text format by clicking on the button that says "Insert / Edit Link" (Ctrl+K) and doing the following:

Insert Link - Microsoft Internet Explorer

Insert Link

Link: Home

Alias: Home

Tooltip:

This will give you the output:

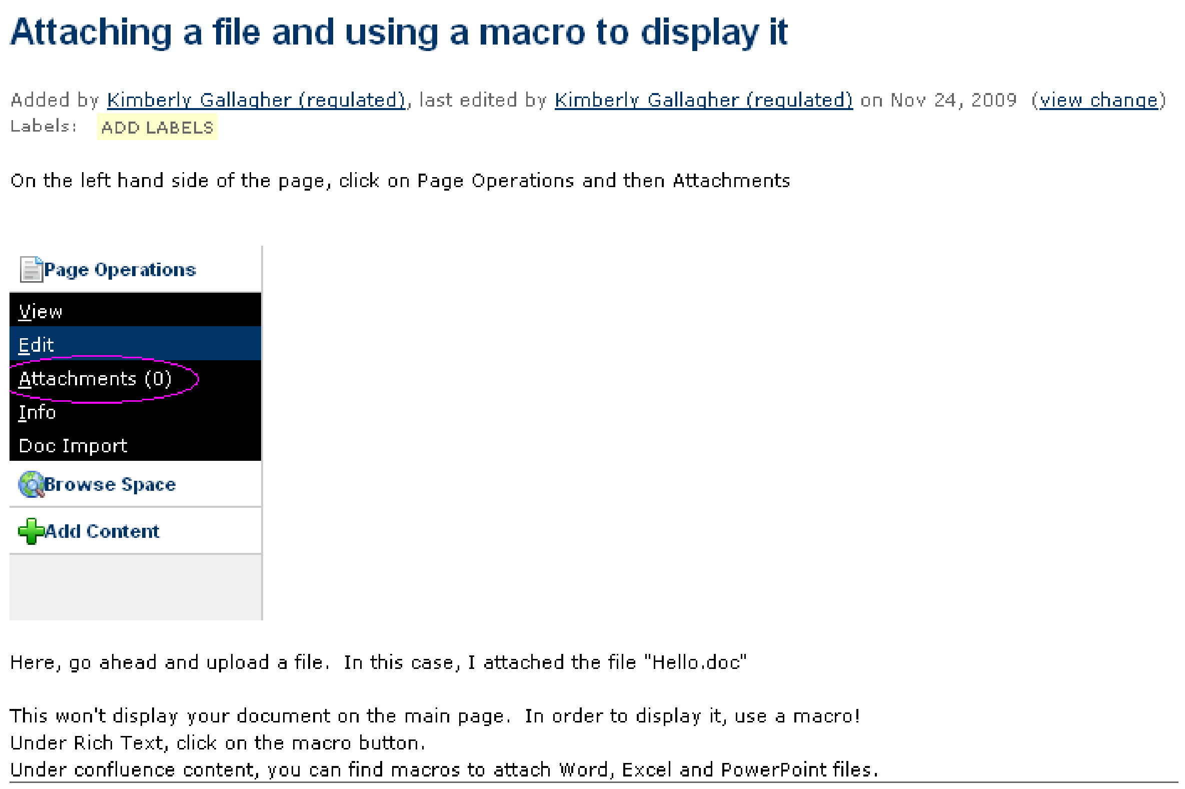
Home

Children (2) Hide Children | View in Hierarchy | Add Child Page

Figure 17: Creating a Page and Linking A Page to An Existing Page

“Attaching a File” Page

The last link at the main mage brings users to attaching a document page which introduces how to attach documents to Wiki and show them on the pages. The page is shown below:



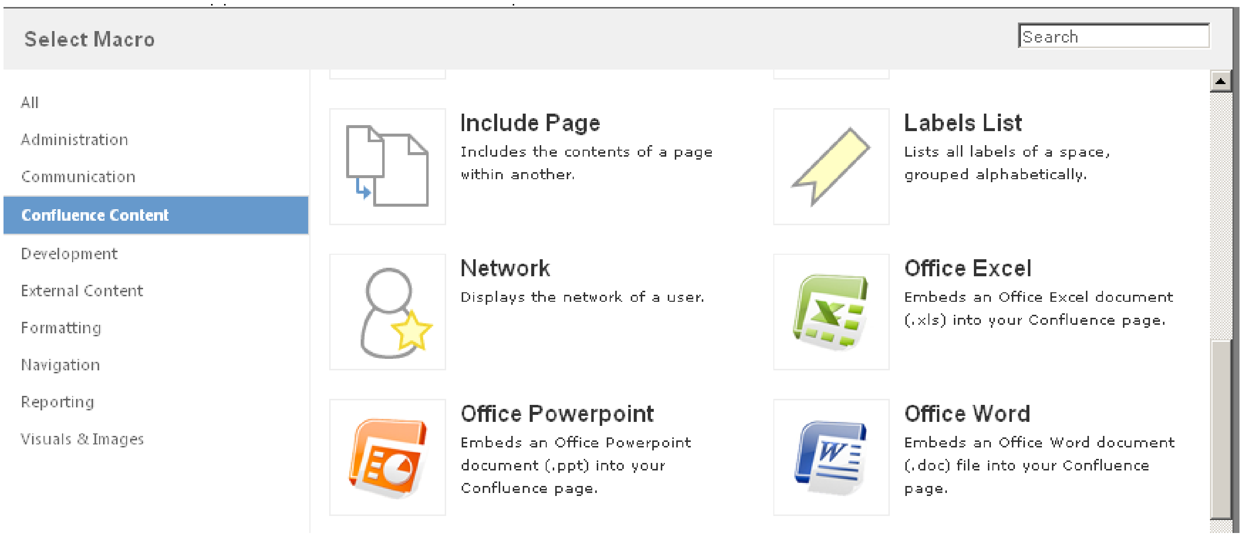
Attaching a file and using a macro to display it

Added by Kimberly Gallagher (regulated), last edited by Kimberly Gallagher (regulated) on Nov 24, 2009 (view change)
Labels: ADD LABELS

On the left hand side of the page, click on Page Operations and then Attachments

Here, go ahead and upload a file. In this case, I attached the file "Hello.doc"

This won't display your document on the main page. In order to display it, use a macro!
Under Rich Text, click on the macro button.
Under confluence content, you can find macros to attach Word, Excel and PowerPoint files.



Include Page
Includes the contents of a page within another.

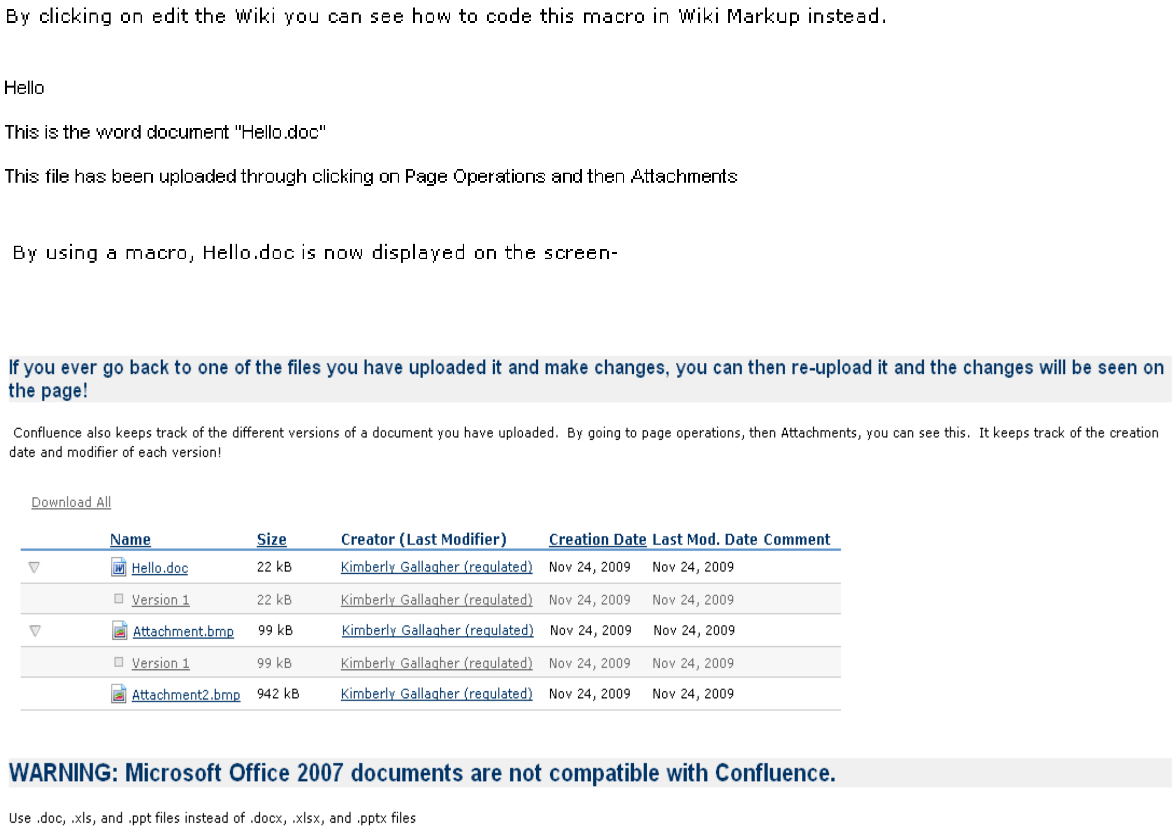
Labels List
Lists all labels of a space, grouped alphabetically.

Network
Displays the network of a user.

Office Excel
Embeds an Office Excel document (.xls) into your Confluence page.

Office Powerpoint
Embeds an Office Powerpoint document (.ppt) into your Confluence page.

Office Word
Embeds an Office Word document (.doc) file into your Confluence page.



By clicking on edit the Wiki you can see how to code this macro in Wiki Markup instead.

Hello

This is the word document "Hello.doc"

This file has been uploaded through clicking on Page Operations and then Attachments

By using a macro, Hello.doc is now displayed on the screen-

If you ever go back to one of the files you have uploaded it and make changes, you can then re-upload it and the changes will be seen on the page!

Confluence also keeps track of the different versions of a document you have uploaded. By going to page operations, then Attachments, you can see this. It keeps track of the creation date and modifier of each version!

Download All

	Name	Size	Creator (Last Modifier)	Creation Date	Last Mod. Date	Comment
▽	Hello.doc	22 kB	Kimberly Gallagher (regulated)	Nov 24, 2009	Nov 24, 2009	
	□ Version 1	22 kB	Kimberly Gallagher (regulated)	Nov 24, 2009	Nov 24, 2009	
▽	Attachment.bmp	99 kB	Kimberly Gallagher (regulated)	Nov 24, 2009	Nov 24, 2009	
	□ Version 1	99 kB	Kimberly Gallagher (regulated)	Nov 24, 2009	Nov 24, 2009	
	Attachment2.bmp	942 kB	Kimberly Gallagher (regulated)	Nov 24, 2009	Nov 24, 2009	

WARNING: Microsoft Office 2007 documents are not compatible with Confluence.

Use .doc, .xls, and .ppt files instead of .docx, .xlsx, and .pptx files

Figure 18: "Attaching a File" Page