

# **The Future of Financial Messaging**

An Interactive Qualifying Project  
submitted to the Faculty of  
WORCESTER POLYTECHNIC INSTITUTE  
in partial fulfilment of the requirements for the  
degree of Bachelor of Science

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Date:

30 April, 2014

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*This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI, see*

*<http://www.wpi.edu/Academics/Projects>.*

## **Abstract**

Financial telecommunication governs the exchange of information between the computer systems of banks, their clients and other financial institutions. The purpose of this project was to inform a major Swiss bank, Credit Suisse, of market trends and future potential in the sector of financial messaging systems. By interviewing internal and external clients of Credit Suisse, financial software vendors, and competing banks, we identified potential future improvements to Credit Suisse's current financial messaging system. On a larger scale, this study investigated the impact of changing technology on the marketplace and the financial industry. After analyzing our interview and survey results we developed a list of major findings and a set of recommendations regarding 'Big Data,' infrastructure development, the adoption of the ISO 20022 international standards, and the process and impacts of organizational change.

## Acknowledgements

We would like to thank the Credit Suisse team that graciously supported our project. Thanks to Souleymane Bah for helping to organize our various interviews and introductions as well as for answering our incessant questions, Andrew Küpfer for reviewing our draft papers and offering advice, Klaus Drexelius for giving guidance to our project and connecting us with valuable contacts, Evan Tomlin for inviting us to the EAM Technology Fair, locating valuable information, as well as distributing our questionnaire to EAMs, and Dirk Wierdemann for providing us with the background information we needed to begin work at Credit Suisse.

We would like to also thank all whom we interviewed, software vendors, EAMs and industry experts who all provided valuable information, without which this project could not have succeeded. Thanks to Bertram Dunksus and Kathy Dawson-Townsend for their insight into the challenges inherent in the financial industry and IT systems.

We would finally like to thank our advisors. Thanks to Dominic Golding for being an excellent advisor, constantly answering our questions and providing superlative feedback for our drafts. Thanks to Jerry Schaufeld connecting us with his valuable alumni contacts, as well as providing us current data on the financial sector. Thanks to Tara Mann for organizing the logistics of our stay in Switzerland. Thanks to Laura Hanlan for her researching advice as well as continuing to answer our research and stylistic questions throughout our IQP.

## Executive Summary

The primary goal of this project has been to assist Credit Suisse in identifying the best path forward for the development of PsN in order to meet the demands of its users and stay competitive in the future marketplace. This goal has been achieved through four main objectives. We have:

- (1) Determined the current mid-term (1-2 years) and long-term (5+ years) client needs for investment business processing;
- (2) Assessed the future developments of portfolio management system (PMS) vendors;
- (3) Identified how other banks connect their clients to backend financial data processing networks; and
- (4) Explored PsN's role in the new business unification initiative.

Our methodology primarily relied on a series of interviews conducted with various parties while on site in Switzerland. We interviewed and surveyed nine Credit Suisse employees and ten clients that use the system (external asset managers) as well as seven software vendors, four industry professionals and three Credit Suisse competitors. Based on the information gathered during these interviews and other background research we have arrived at a set of conclusions and recommendations that we hope will be useful to Credit Suisse as it moves forward with various initiatives associated with PsN.

### Conclusion 1: Upgrades to PsN

There are two primary recommendations specifically regarding PsN upgrades we believe Credit Suisse should look into for further considerations. These are (1) working to upgrade all booking centers to the same level of data granularity, (2) the potential integration of a validation file for PsN Light between PsN Light and EAM Net, and (3) heightened user control of data delivered.

Clients desire that each booking center have the same level of data granularity, allowing the capability to seamlessly set up any currently available message type

transaction with any client in the world. Currently, Credit Suisse has global booking centers on different levels of maturity which can limit a client's ability to conduct certain message transactions via PsN such as APAC, which is still a developing market.

Generated as a side offering to PsN for smaller clients and EAMs who have much smaller financial messaging demands than their corporate office counterparts, PsN Light has proven to be a useful tool that has gained the approval of many of its users. However, one criticism of PsN Light that surfaced was the lack of a validation file built into software. In the current state, if an EAM is trying to onboard new clients into their monthly fees file, which may contain hundreds of lines of code, there is no way to ensure that all of the additional lines of code were correctly transposed from EAM Net to the CSV file for delivery.

A major trend we found in the short answer portion of the external client questionnaires was a request for more control of data delivery. Multiple respondents stated that they would like to have the ability to choose what data types are delivered through PsN and PsN Light. This currently can only be done by calling a banking representative. EAMs would like to have the ability to change this through an electronic dashboard.

#### **Recommendation 1.1: Data Granularity**

**We recommend that Credit Suisse ensure that all booking centers be brought to the same level of data granularity within their messages.** Large concerns have been raised within Credit Suisse on this matter, and it appears that many internal employees are very aware of the importance of elevating the booking centers to the same threshold. More importantly, external users of PsN are realizing the restraints that this lack of uniform booking center maturity creates and have expressed their concerns.

#### **Recommendation 1.2: Validation File**

**We recommend that Credit Suisse incorporate a data validation method for PsN Light.** Implementing such a robust feature into PsN Light may be seen as problematic due to the fact that PsN Light was developed on the principle of being a simplistic, streamlined software alternative to PsN for smaller clients. However, this development appears to be desired by current clients, and may be worth implementing if

it can be found that this problem is widespread enough among EAMs to add this layer of validation.

### **Recommendation 1.3: Control of Data Delivery**

**We recommend that Credit Suisse create an electronic dashboard that allows clients to control their data delivery.** This dashboard can replace the current solution of calling a bank representative and make the possible opportunities for data delivery more apparent to the clients.

### **Conclusion 2: Implementation of Standards**

After speaking with standards experts at Credit Suisse and SWIFT, as well as looking at the locations of current implementations of ISO 20022, we determined that the global market is moving toward implementing ISO 20022. ISO 20022 is accepted and often preferred by vendors due to the XML format's large industry acceptance and availability of tools for its development. In addition, there is also a push toward incorporating the FIX standard into post-trade and PsN. FIX is a faster messaging system that has the potential for more post-trade field development, and could be more useful to both vendors and certain markets, such as APAC.

#### **Recommendation 2.1: ISO 20022**

**We recommend that Credit Suisse update their infrastructure to allow for the delivery of ISO 20022 through PsN from ISO 20022, despite larger file size.** Message parsers will also need to be updated to accept ISO 20022's use of XML schema. These upgrades will be needed in the next few years to keep up with the current adoption of ISO 20022.

#### **Recommendation 2.2: FIX**

**We recommend that Credit Suisse offer FIX messages through the PsN channel.** While changing the software and infrastructure to allow for ISO 20022, FIX could be included as well. This would give an opportunity for real time data as well as faster processing with simpler messages. FIX also allows for connections to clients to be created faster and more efficiently avoiding the overhead of SWIFT.

### **Conclusion 3: Incorporation into Unified Business Plan**

According to multiple Credit Suisse employees, PsN is the only fully horizontally integrated data channel across all businesses. As PsN is unified with other applications in this new initiative, there are many possibilities for how it could be incorporated. PsN is a channel with very high quality raw data that could be used in many different ways to support a front-facing interface. Regardless of the functionalities developed for this new initiative, back-end data delivery from PsN will be a necessary component to allow for clients to be able to access information. PsN Light may also prove a valuable addition to the interface's list of features.

#### **Recommendation 3.1: PsN**

**We recommend that PsN be incorporated into the new initiative as the data delivery channel.** PsN is the best choice as a fully horizontally integrated data delivery channel for the success of this new initiative.

#### **Recommendation 3.2: PsN Light**

**We recommend that PsN Light be incorporated as a data processing and visualization offering into the new unified business plan.** Specifically, the True Advice<sup>®</sup> PDF generator could be an ability of this initiative that allows EAMs to create simple reports to print out for clients. As a streamlined integrated solution, this new initiative could replace the need for PsN Light. However, if it does not integrate this type of functionality, PsN Light should remain a separate application for smaller clients and middle-office calculations.

### **Conclusion 4: Big Data**

With recent trends in data mining and data enrichment, and with higher projected trends according to International Data Corp, data mining and data enrichment should be looked at intensely for developing future initiatives (Rockel, 2012). These recommendations can help clients make faster and smarter decisions within the market. Credit Suisse sits on a large reserve of underutilized data that can be mined for value-added offerings. As a data channel, PsN provides a large amount of information from all business sectors. A great example of a data mining process flow is SWIFT's implemented

business intelligence processing on its own network. Credit Suisse could do something similar, since PsN was designed as a parallel to SWIFT's proprietary network.

Where data mining can reveal trends valuable to Credit Suisse, further manipulation of data before its delivery to the client – data enrichment – can allow for clients to make faster and smarter decisions within the market. This would increase the value of the data provided through PsN while providing an in-house alternative to expensive third-party solutions.

#### **Recommendation 4.1: Data Mining**

**We recommend that Credit Suisse explore the use of data mining for future initiative implementation.** This topic could be investigated further and in a more technical fashion by either Credit Suisse themselves or a future WPI student group.

#### **Recommendation 4.2: Data Enrichment**

**We recommend that Credit Suisse investigate further avenues for enriching their own data from PsN and integrate this enriched data into the new unified business development.** Enriched data can reveal trends and provide market insight to empower clients.

#### **Conclusion 5: Organizational Change**

After working at Credit Suisse for seven weeks, we found several overall trends at the organizational level. After interviewing employees from several different business segments, we found that many feel that a greater communication between business groups is needed. In addition, greater understanding of PsN as a whole is necessary for it to be maintained in the future. Further maintenance should include eventual upgrades of core systems that are over thirty years old. We also found that the investment banking sector is a good source of upgraded technology, as they are often much more progressive with technology change.

As very few employees understand the entire technical process of PsN, more training is needed to ensure engineers fully comprehend the system for which they are developing. The core systems that currently run Credit Suisse financial messaging, as well as others, are often written in COBOL, a language which is largely obsolete. This means that very few employees can read or write in this language.



In the financial industry, new technological developments are generally advanced by investment banking due to the sector's extreme emphasis on minimizing time-to-market. While some of these advancements trickle-down to the slower-paced PB&WM industries, this process generally takes years. With banks having branches for both investment and private banking, there is an opportunity for a greater exchange of ideas that may help quicken the pace of technological development in fields such as PB&WM.

Finally, there appears that there may be some disconnect between the implemented functionality of PsN and the functionality perceived by vendors. This was found during our discussion with Allocare, when their list of data channel functionalities (Figure 9) did not match what Credit Suisse currently offers through PsN.

#### **Recommendation 5.1: Understanding of PsN**

**We recommend that Credit Suisse increase understanding of PsN within Credit Suisse.** Either these systems need to be upgraded to a more modern language, or Credit Suisse needs to retain employees with a working knowledge of legacy programming languages.

#### **Recommendation 5.2: Cross-Business Collaboration**

**We recommend that Credit Suisse explore the incorporation of information from investment banking into the private banking and wealth management sector.**

#### **Recommendation 5.3: Vendor Miscommunication**

**We recommend that Credit Suisse investigate possible communication lapses between the bank and vendors.** This could be a miscommunication internally at Credit Suisse, or in the communication with the vendor.

#### **Final Remarks**

Financial telecommunication governs the exchange of information between the computer systems of banks, their clients and other financial institutions. The purpose of this project was to inform a major Swiss bank, Credit Suisse, of market trends and future potential in the sector of financial messaging systems. By interviewing internal and external clients of Credit Suisse, financial software vendors, and competing banks, we identified potential future improvements to Credit Suisse's current financial messaging system. Such results we found from our interviews were: adding functionalities to PsN,

upgrading to ISO 20022, heightened data analytics, incorporating PsN into the new unification initiative, and considering organizational change. Besides being utilized as an internal report for Credit Suisse officials, this project can provide deeper understanding of PsN's role within Credit Suisse to any of the clients, vendors, or other financial institutions who may be interested. In conducting this study, we discovered not only interesting trends in financial messaging that inform future developments for Credit Suisse, but also the impact of large IT development projects on an organization and the problems inherent with balancing business sense and technological advancement. Given our lack of experience in the areas of finance and computer science we may have missed certain technical aspects, but we hope that our outsider status may have brought other valuable perspectives. In the future, we see opportunities for teams of WPI students to further delve into the intersection of IT systems and finance in an MQP. MQP opportunities may cover the implementation of topics addressed in our report - such as data mining - or even tangential subjects such as front office trading. Whatever the subject of any future projects, we are sure that Credit Suisse will be as hospitable and helpful in the future as they have been during our study.

## **Authorship**

In several sections of our report, pinpointing ownership to one or two individuals would be difficult due to the collaborative nature of our writing and editorial processes.

While at WPI developing our project proposal during the school's preparatory course, our writing sessions commenced as an open discussion in which each member of the group reported back on the literature they discovered on their assigned topic since the previous meeting. During these discussions, Sam Friedman was usually the individual in charge of editing the controlled copy of our report, which he displayed on a projected screen to allow for all members of the group to contribute to the production of the paper's content. The revision and editing of drafts received with comments from our advisors was conducted in a similar manner.

The general nature of our writing and revisions maintained the same process once we arrived on site while in Switzerland. Sam Friedman or Jennifer Garbarino typically managed the controlled copies of our drafts and were responsible for the incorporation of changes and comments received from our advisors. While on site, certain members of the group took different leads on the various aspects of the paper, which can be identified in further detail below. Here group members are identified by their initials.

1.0 Literature Review.....	All
1.1 Society for Worldwide Interbank Financial Telecommunication (SWIFT)...	JF, JG
1.2 Private swift Network (PsN).....	SF, JK
1.3 Portfolio Management Software (PMS).....	JF, JG
1.4 Market Research.....	JF, JG
1.5 Digitization of Banking.....	SF, JG
2.0 Methodology.....	All
2.1 General Approach.....	All
2.2 Internal and External Clients.....	SF
2.3 Vendors.....	JK
2.4 Competing Banks.....	JK
2.5 Data Analysis.....	All
3.0 Findings.....	SF, All
3.1 PsN Client Need.....	JF
3.2 External Client Questionnaire.....	SF, JG
3.3 Vendor Need.....	SF, JG
3.4 Competitor Comparison.....	JG, JK
3.5 Integration into Unified Business Plan.....	JG
3.6 Organizational Change.....	JF
4.0 Conclusions & Recommendations.....	All
4.1 Conclusion 1: Upgrades to PsN.....	JF
4.2 Conclusion 2: Implementation of Standards.....	JG
4.3 Conclusion 3: Incorporation into Unified Business Plan.....	JG, JK
4.4 Conclusion 4: Big Data.....	SF, JK
4.5 Conclusion 5: Organizational Change.....	JF, JG

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## Introduction

In the financial industry, efficient communication between the interacting parties, whether it be buying and selling securities or simply moving funds from one account to another, is essential to success. Between banks, communication takes the form of financial messaging: a standardized way to describe actions and information transferred by financial parties. Financial messages can be used to describe wire transfers, account inquiries, corporate actions and countless other operations. With the advent of computer networks, banks have been able to send and receive financial messages between each other more rapidly than ever before. As the volume of financial messaging between and among these institutions increases, technological solutions must advance to meet the needs of the industry in terms of speed, security, and ease of use. Credit Suisse, our sponsor, is a major international bank currently grappling with the realities of the increasing need for improvements to interbank communication (Reference Appendix A for a description of Credit Suisse). Credit Suisse's solution to aging financial messaging infrastructure is an internally developed messaging network they call Private swift Network (PsN). Credit Suisse wants to define the future of PsN in a way that will best satisfy the growing needs of their customer base and discover the future potential of financial messaging networks internally as well as between banks.

The primary goal of this project has been to assist Credit Suisse in identifying the best path forward for the development of PsN in order to meet the demands of its users and stay competitive in the future marketplace. This goal has been achieved through four main objectives. We have (1) determined the current mid-term (1-2 years) and long-term (5+ years) client needs for investment business processing, (2) assessed the future developments of portfolio management system (PMS) vendors, (3) identified how other banks connect their clients to backend financial data processing networks and (4) determined PsN's role in the new unified business initiative.

Our methodology primarily relied on a series of interviews conducted with various parties while on site in Switzerland. We interviewed and surveyed Credit Suisse employees and clients that use the system (External Asset Managers, Corporate and Family Offices) as well as software vendors and competing banks. We interviewed a selected sample of these clients to

research the needs of a variety of clients based on size and use cases. After analyzing our interview and survey results we developed a list of major findings and a set of recommendations regarding 'Big Data' and analyses, infrastructure development, the adoption of the ISO 20022 international standards, and the process and impacts of organizational change.

## 1. Literature Review

Credit Suisse is a publicly traded private banking, wealth management and investment banking company that was founded in 1856 in Zurich, Switzerland. Since then, Credit Suisse has grown to 46,400 employees located in more than 530 offices and 22 booking centers worldwide (Credit Suisse Group AG, 2014a). Alfred Escher was a politician, businessman, and pioneer who founded Credit Suisse on July 5, 1856 to finance the new Switzerland railroad system. Since its beginnings, Credit Suisse has striven for innovation. In 1951, Credit Suisse was the first large Swiss bank to create a direct telex connection with New York. Throughout the 20th century Credit Suisse continued to leverage technology for its commercial growth, becoming the first Swiss bank to establish a drive-in banking system in 1961, a telephone banking service in 1993 and Internet banking in 1997 (Credit Suisse Group AG, 2014b). Credit Suisse's commitment to technological improvements is reflected in its role in the formation of the Society for Worldwide Interbank Financial Telecommunication (SWIFT) in 1973. SWIFT was set up by the world's major international banks as a non-profit organization for the control of communication standards in the banking industry. The organization is mainly responsible for developing and maintaining a standard for the exchange of financial messages. The SWIFT standard codifies the secure exchange of financial messages for financial institutions that are members of SWIFT. The international organization provides products and services that allow this exchange to occur reliably and consistently among its members. The SWIFT standard is a standardized way of communicating financial data between institutions; it does not "hold funds nor does it manage accounts" (SWIFT, 2014a). Though the technology SWIFT regulates is responsible for financial transactions, the organization itself neither invests in nor trades with the markets it serves. In 2006, Credit Suisse developed a "Private swift Network" (PsN). PsN allows Credit Suisse's clients to use the same SWIFT messaging standard, while enabling the development of new tools and services unique to Credit Suisse (Bah, K pfer, Wierdemann, & Drexelius, 2013).

## 1.1 Society for Worldwide Interbank Financial Telecommunication (SWIFT)

SWIFT is, at its core, a protocol for the exchange of secure data between computer systems. Specifically, SWIFT is used to send financial messages such as wire transfers, account inquiries, and trade orders. The SWIFT protocol defines a message block containing five required blocks of data. The first three blocks acts as “headers”, containing information relevant to the computer systems responsible for routing the message and determining its purpose. The fourth block contains the message body itself, including instructions for the desired message type. These instructions use specific codes to represent distinct entities (banks, accounts) and functions. Finally, the message is terminated by a trailer block, which contains data responsible for error checking. The creator of the message is usually responsible for crafting the message body, while software will generate the required headers (IBM, 2004).

While SWIFT is the current international standard for interbank transactions, this was not always the case. Telebanking began in the late 1840s as a means for banks within the United States to promote faster transactions. Completion of the trans-Atlantic telegraph cable in 1866 elevated interbank telecommunication to the next level of development. *Telex*, or the *teleprinter exchange networks*, became the standard across the world. Telex is considered to be the first telecommunications network and used phone lines and telegraph machines as a means to send and receive messages. Telex gained popularity in the banking sector in the early part of the twentieth century and by the late 1950s there were 30,000 unique banking-related subscribers. At that time, these systems were tailored to serve particular regions and varied slightly in process and form depending on the location, but the internationalism of Telex systems was vital to the success of the banking system. By the 1970’s, trans-national banks (TNBs) became the main players in the international banking industry. A majority of the international trading was conducted at the time by 12 TNBs including Citibank NA, Bank of America, Barclays, Lloyds, and Midland Banks. Due to their sizable involvement with Telex, the TNBs held sufficient power to reform Telex to meet many of their collective needs. With their ability to shape the telecommunications landscape, the large TNBs “found themselves in the role of pioneers developing proprietary private networks using circuits and satellite facilities” (Scott & Zachariadis, 2012). Ultimately, the major banks discovered that in order to increase efficiency in the telecommunications industry, which directly translates into cheaper transaction costs in the

banking sector, they needed to unify their communication systems under one standard language protocol (Scott & Zachariadis, 2012).

In 1977, the world's major banks conceived SWIFT as a part of the effort to redefine bank communications. As illustrated in Table 1, SWIFT offered substantial advantages over Telex in five major areas, including speed, costs, message volume capacity, message security, and the universality of message formats. The first benefit listed in Table 1 pertains to the desire for greater message speed, which SWIFT provided over Telex. SWIFT was created not only to increase messaging efficiency between banks, but also to deal with the problems posed by the enormous volume of messages that were being sent. The second benefit shown in Table 1 defines how cost was a limiting factor of Telex that SWIFT could improve. Since Telex was formatted in free text, users were able to input message information in various forms, which the receiver then would have to decode based on the format. Additionally, telex messages sent across varying telex systems would require up to 10 additional messages that would be costly and tedious to process. Finally, as shown again in Table 1, security of SWIFT was a pivotal part of the decision for banks to move away from Telex. The banks wanted to improve the reliability of security measures and reduce message failure rates with the implementation of a new system. SWIFT officially came into existence on May 3, 1973 as a not-for-profit cooperative organization for the implementation and regulation of an international private proprietary financial message network. As a non-profit body, SWIFT has a duty to maintain neutrality and fairness in the implementation of the network. To keep the network universal and open to any financial institution that wished to join, SWIFT maintained telex compatibility in the beginning while transitioning from one system to the next (Scott & Zachariadis, 2012).

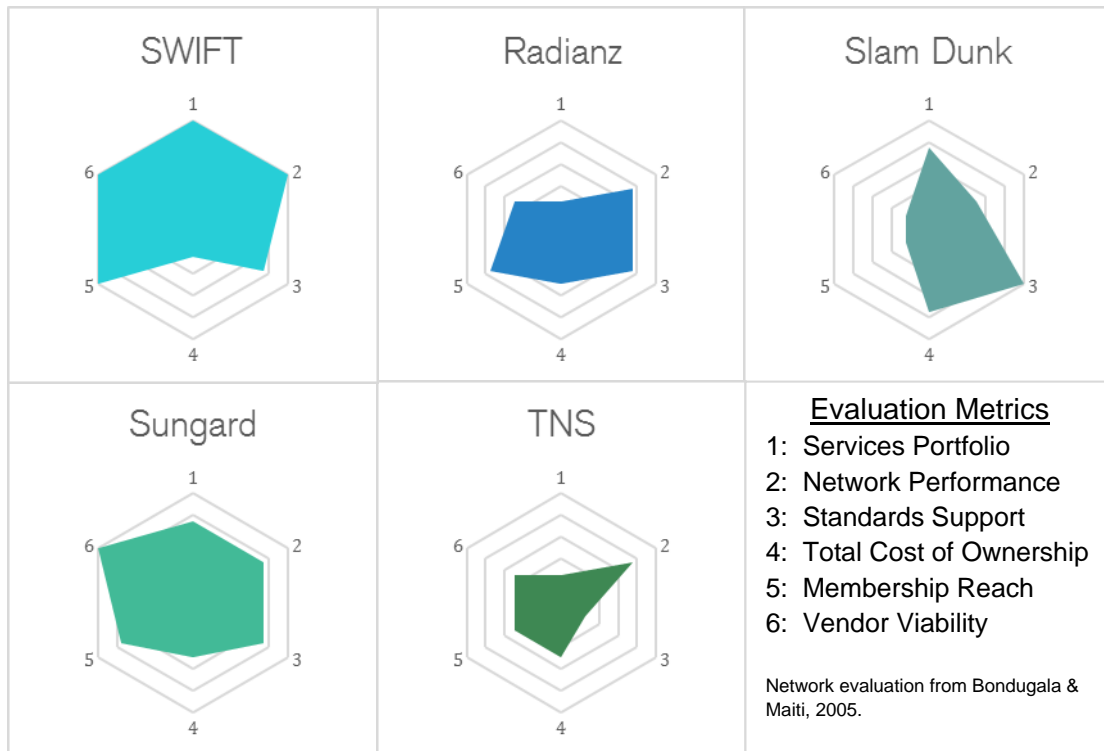
**Table 1: Benefits of SWIFT compared to Telex in the early years(Scott & Zachariadis, 2012)**

<b>Benefit</b>	<b>Description</b>
<b>Speed</b>	Priority message transfers could take well under one minute to reach their destination; however, the main advantage of SWIFT over its predecessors was the automation of standardized authentication and data entry processes that resulted in much of the delay in payments
<b>Costs</b>	SWIFT messages were believed to be considerably cheaper than traditional telex and telegraph messages. The estimated expense for sending a letter of credit by telex was on average US \$13 when a SWIFT message would cost about 50 cents
<b>Volume</b>	SWIFT network could manage a much larger number of transactions than Telex.
<b>Security</b>	The transition to SWIFT network allowed for additional levels of security in the coding and authentication of messages between banks
<b>Uniform Formats</b>	All the messages sent over the network had to adhere to the strict formats imposed by the system

Over 10,000 financial institutions and corporations in 212 countries use SWIFT to send 4.6 million FIN messages in 2012 (SWIFT, 2014a). FIN is SWIFT's central messaging service that is used by over 8,300 financial institutions worldwide. It ensures that the message is to SWIFT standard as well as monitoring the delivery of the message (SWIFT, 2014b). These millions of messages can be acted on with a collection of products and services provided by SWIFT: FIN Copy is used to copy information from certain messages to a third party before they are released; InterAct is used to send structured financial messages and short reports between institutions; FileAct sends large volumes of messages and long reports. These products help financial institutions send and receive messages more effectively (SWIFT, 2012).

SWIFT constantly pushes for innovation driven by the evolving needs of the banking industry. Each year, members of SWIFT meet to discuss the state of the society and its services at the *SWIFT International Banking Seminar*, or *SIBOS*. In the most recent SIBOS conference, SWIFT identified three areas of innovation: increasing revenue and excellence in the operation of the society, increasing the user volume of SWIFT services, and pushing for cloud and shared services to make banking and payments much easier and more user friendly (PlanetSWIFT, 2013). The society has also developed a roadmap for developments further in the future. For example, SWIFT2015 is a list of initiatives focusing on “deepening the core, expanding the core and enabling interoperability and Total Cost of Ownership (TCO) reduction as well as enabling transformation”(SWIFT, 2012). SWIFT also has a goal of “backward compatibility” so that when any new service is added it can seamlessly transition with older versions. This allows customers to upgrade their mission-critical systems without having to make major changes. Some of the important innovations of 2012 included easier access to SWIFT with a new cloud interface and the MyStandards web tool to manage messaging standards (SWIFT, 2012). The constant production of new goals for SWIFT at conferences like SIBOS proves the fluid nature of the society and its services. In developing its own internal financial messaging network, Credit Suisse has attempted to stay ahead of the curve of innovation set by SWIFT.

Figure 1: Comparison of SWIFT to similar messaging services.



SWIFT's rapid adoption by a large number of banking institutions was largely due to its widespread applicability and its advantages over competing systems (Figure 1). The figure illustrates the adherence to six evaluation metrics by five competing financial messaging schemas. The figure depicting SWIFT shows that it excels in the greatest number of evaluation metrics, implying that it is the most appropriate system for the exchange of financial information. It is noted however that SWIFT does lack in the area of Total Cost of Ownership. (Bondugala & Maiti, 2005). Before SWIFT was standardized, each region used its own proprietary communication standard. Due to the unification of a single messaging standard, all major banks have benefited from reduced costs and operational overhead. Nevertheless, institutions using SWIFT's network infrastructure still incur costs. Though unit costs per message are quite low, large institutions consistently handle message volumes of several million per day, resulting in charges that quickly escalate (Bah et. al, 2014).

Despite its popularity and industry acceptance, SWIFT also has its drawbacks. One noted shortcoming of SWIFT's network is that all transactions are stored in its two operation centers in



Europe and the USA for the preceding 124 days. This arrangement leads to a scandal known as the “SWIFT affair.” The SWIFT affair began after the terrorist attacks on September 11<sup>th</sup>, 2001. The US government officials subpoenaed SWIFT transactions to track terrorists through the Terrorist Finance Tracking Program. The US intelligence agencies required the inclusion of confidentiality clauses which allowed the data transfers to occur with neither the knowledge of EU banks nor the European data protection authorities. As a result, SWIFT was no longer compliant with EU data protection principles. In 2003, SWIFT representatives began monitoring the data collection processes to ensure proper SWIFT procedures were being followed. Although the United Nations released a report on these activities, the US government’s clandestine tracking of these data transfers was unknown to most of the EU until the New York Times broke the story in 2006. SWIFT continues to claim that the data collection was legal (Fuster, De Hert, & Gutwirth, 2008). This situation helped bring to light some of SWIFT’s major deficiencies, especially the limitations of relying on a separate entity, the SWIFT organization, for the storage of banking data.

## **1.2 Private swift Network (PsN)**

Credit Suisse’s Private SWIFT Network (PsN) is an attempt to combat the shortcomings of the centralized SWIFT network and realize the potential for new and more refined client services by developing a modern, private version of SWIFT. PsN still uses the SWIFT messaging standard, but its design as an internal system of Credit Suisse allows the bank to provide services and data to clients faster and more reliably than the original network (Bah et al., 2013; Bah, Küpfer, Wierdemann, & Drexelius, 2014).

### **1.2.1 PsN Overview**

Since PsN’s launch in 2006, the network has grown in capability and infrastructure to span many countries including Germany, the United Kingdom, Italy, Luxembourg, Hong Kong, Austria, and Singapore. Naturally, PsN is most heavily embedded in the banking infrastructure of Switzerland itself, where nearly 100% of Credit Suisse data are covered by the network (Bah et al., 2013, 2014).

Even though PsN is a Credit Suisse centric system, its global use has risen sharply since its introduction. Today, several hundred thousand messages are sent through the network daily. Credit Suisse expects a growth rate of 300% in the coming 3-5 years. Currently a substantial

majority of these messages are created by internal Credit Suisse usage, with around 20% of PsN traffic being generated through contact with external clients in 2013. The company is expecting this external usage metric to increase rapidly in the near future as services expand to more countries with a wider customer base (Bah et al., 2013, 2014).

Further, the introduction of a private network for interbank telecommunication has allowed Credit Suisse to develop new systems and services that rely on the technology. One of these services is PsN-light, a system that allows smaller companies and banks to access SWIFT-formatted data without expensive portfolio management software (PMS) and messaging systems. Instead of a full-featured data stream, PsN-light offers automatic conversion and delivery of needed data in the form of Microsoft Excel files. This operation can be scheduled, allowing small clients to benefit from the data delivery abilities of PsN, only needing Microsoft Office to operate. This kind of data manipulation would have been impossible on the SWIFT network, since banks could not process data quickly or inexpensively on the shared network (Bah et al., 2013).

As an international investment bank, it is essential for Credit Suisse to communicate with other banks and financial institutions rapidly. SWIFT regulates the messaging standard used by over 10,000 financial institutions around the world to communicate financial data and messages to each other. It provides the user with many services and products, such as FIN, Interact, and Fileact that allows them to transfer bank messages and reports internationally. Though unit costs per message are quite low, large institutions consistently handle message volumes of several million per day, resulting in charges that quickly escalate. PsN attempts to overcome the drawbacks inherent in the SWIFT network by providing a proprietary infrastructure for communication within Credit Suisse. With PsN, only messages sent to banks outside of Credit Suisse's infrastructure will need to be routed over the SWIFT network. Internal and inter-branch messages can be sent over the much more efficient PsN. These advances provide Credit Suisse to directly transfer their transaction savings right to their clients due to decreased messaging overhead that improves efficiency while lowering costs.

### **1.2.2 Client Types**

Any internal and external clients that require data from Credit Suisse will interface with PsN. The main categories of clients are external asset managers (EAMs), corporates and family

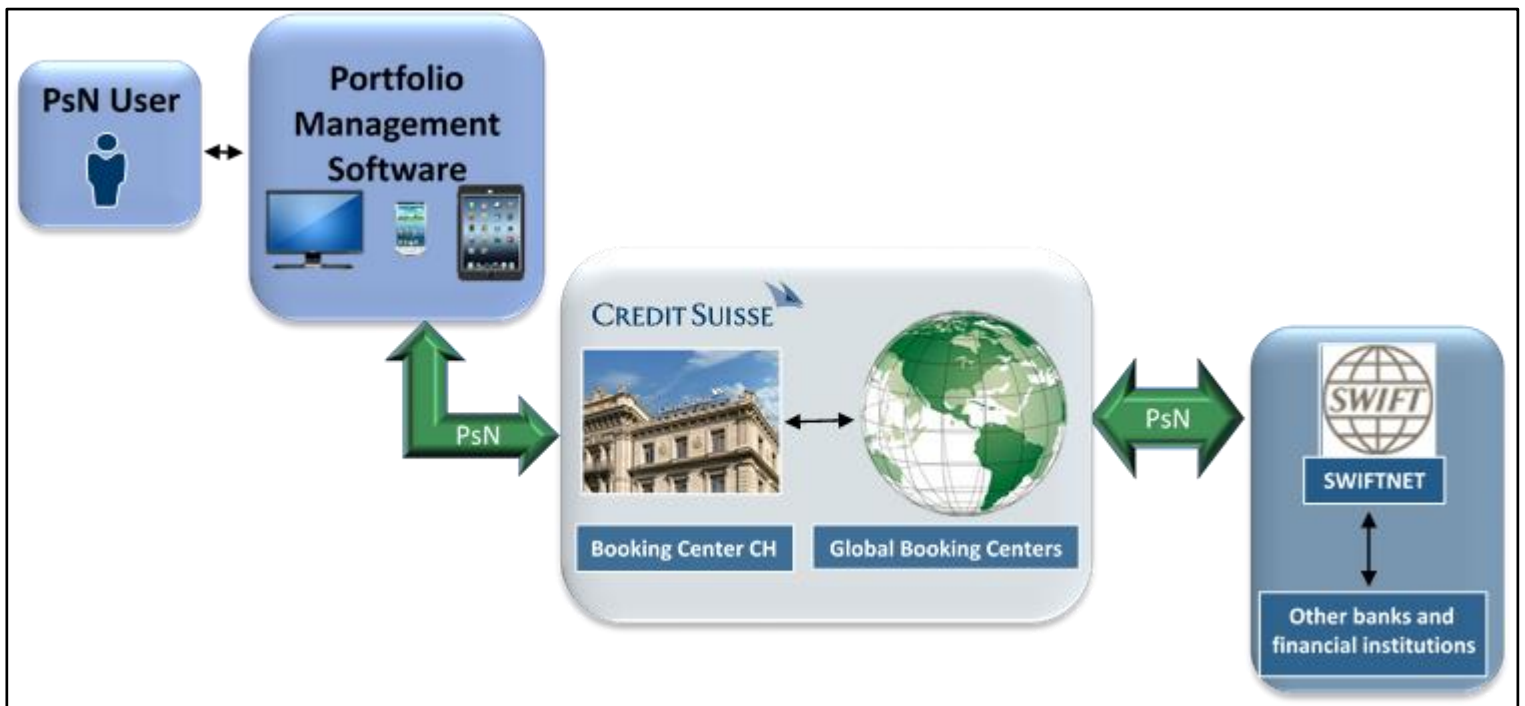
offices. According to Investopedia, the definition of an EAM is a manager that handles a client's personal and business investments (Investopedia, 2014a). Essentially, an EAM is the individual responsible for managing the investment portfolio of an individual or business. By using an EAM, the client off-loads the technical steps of managing their portfolio, instead directing the EAM with their investment philosophy and allowing the EAM to make financial decisions on their behalf. In order for the EAM to accurately perform their duties, they require information sent to them from the relevant banks. In Credit Suisse's case, this information will be transmitted through PsN. Another common client type is that of the family office. A family office is a private wealth management team that excels in managing the investments and assets of wealthy families. Depending on the needs and affluence of the family, a family office may serve multiple families at a time, or focus on the finance of a single family. Besides taking financial action for clients, they offer services such as budgeting, insurance and investment (Investopedia, 2014c). What family offices provide for families, corporates provide for corporations. Corporate finance is usually a department of a large company that dedicates its time supervising the finances of a company. These departments, known colloquially as corporates, serve to maximize the shareholder value through extensive planning and strategies. They manage capital investment decisions and banking of the company. They decide how to pay for certain investments through equity, debt or other financial instruments. They also manage current and long-term assets of the company, its liabilities and financial issues. In essence, corporates are responsible for the financial guidance of their parent corporation (Investopedia, 2014b).

### **1.3 Portfolio Management Software (PMS)**

Most Credit Suisse customers will come into contact with PsN through their use of Portfolio Management Software (PMS), which serves as the tool allowing investors and asset managers to administrate their finances. These software systems typically provide features for a range of management responsibilities. While many companies sell all-inclusive software that attempts to meet the majority of customers' uses, others attempt to tailor the software solution to the client. Features that are typically found in a PMS range from productivity enhancements (client contact information, report generation) to financial tools used to make and act on decisions regarding a financial portfolio (King, 2011b). The timely and effective management of large accounts requires data that is accurate and constantly updated. When PMSs require this

data from Credit Suisse, their requests are routed and completed by PsN. A modernized communication network such as PsN provides an immediate advantage for customers due to its speed and efficiency, and its reduced transaction cost due to the lack of SWIFT transaction fees also transfers to the customer (Bah et al., 2013, 2014). PsN comparatively does not charge transaction fees for the user; rather, Credit Suisse absorbs any overhead costs incurred when transmitting messages through PsN.

Figure 2: How financial messages are routed using PsN.



Portfolio management software (PMS) is used in various industries for tasks that increase efficiency, and automate repetitive tasks with the ultimate goal of improving performance within the business. King (2011b) distinguishes among eight functionality groups (Table 2). Adapting these functionality groups to parallel with the needs of the customer desires and system requirements is critical for ensuring that a newly instated PMS will be utilized to its maximum potential. Without laying the proper groundwork in understanding all of the software requirements, key elements may be overlooked leading to a system that may be undesirable to its users (King, 2011b).

Rebecca King's recommendations for maximizing software potential will be helpful for us in developing a strategy for recognizing key points from the interviews that we will conduct. We must ensure that we focus on the most important benefits of each system, and pair the results of our findings with the correct PMS for the client. For instance, if we gather that there is a lack of client service, having investment reporting system attachments has been reported to result in upwards of twenty-three percent increases in client services quality (King, 2011a). It is important to reiterate that the banking industry progresses at a rapid rate and it would be ignorant to not recognize that other competing banks are hard at work to enhance their own private networks. While there is a limited amount of publicly available information on the developments of competitor banks, it is important to take a glance at competitor advancements when they do get published.

Table 2: A breakdown of the eight general categories of PMS functionality. (King, 2011b).

<b>PMS Functionality</b>	<b>Description</b>
<b>Asset allocation/rebalancing</b>	Develop allocation models, generate lists that identify the transactions needed for portfolio rebalancing and define limits for notification when portfolios are unbalanced
<b>Capital gain/cost basis tracking loss and taxable income reporting</b>	Generate client-facing reports for year end capital gain/loss reporting along with taxable income
<b>Client billing/accounting</b>	Generate invoices and accounting reports identifying fees received and outstanding
<b>Client contact information compliance reporting</b>	Manage client records, accounts, and/or groups including contact information
<b>Data management</b>	Import data from internal files or download from your custodian and view client data
<b>Investment reporting for internal use</b>	Track investment vehicles and view data on various investments
<b>Investment reporting for clients</b>	Generate client-facing reports on their investment performance

## 1.4 Market Research

Financial messaging developers need to consider many different parts of the financial institution when developing a financial messaging system. When Bank of America was developing a new financial messaging system in 2003, they ensured that “the consumer bank, global and investment bank, and asset management groups all had a role in defining a common list of requirements” (Marlin, 2003). The Messaging and Collaboration Services team of Bank of America (the equivalent of the Global Financial Messaging Services at Credit Suisse) lead the project and efforts to leverage interdepartmental collaboration. The major issues addressed were usability and robustness. The team also wanted to be able to generate specialized messages on a per-department basis. These factors led Bank of America to implement Sigaba, a statement delivery system which was flexible, robust and able to be scaled to the level required (Marlin, 2003). Bank of America continued to develop new systems and in 2011, along with Microsoft, Citi and SWIFT, created the ISO 20022 Common Global Implementation (CGI). ISO 20022 is a standard that allows Extensible Markup Language (XML) messages, an easier and more powerful message type than previous standards. This CGI helps define a standard application of ISO 20022 over the SWIFT network by providing guidelines for the implementation of these standards (Microsoft, 2011).

The development and analysis of large business-to-business systems such as financial messaging systems also requires a great deal of insight into the needs of the market, which in this case is composed of EAMs, corporates and family offices. In determining market needs, it is very important to establish a relationship with the target customer. Known as “relationship marketing”, this process has many different dimensions (Theron & Terblanche, 2010). A review of the literature found four main qualities needed for a successful relationship: (1) customer trust (the belief in the reliability and integrity of the provider); (2) satisfaction (an overall assessment of the clients experience); (3) commitment (the continued investment in the relationship); and communication, the ability of information sharing. Surveys conducted on a variety of financial service providers found that competence, relationship benefits, bonding, customization, attractiveness of alternatives and shared value were significant to relationships in the financial services industry, ranked in order of importance. Both relationship benefits, having a provider that has a greater amount of benefits, and competence, the perceived technical and financial

knowledge had the highest levels of agreement at 27%. The four criteria from the literature review were not in the questionnaire, due to their previous establishment as important concepts. As a whole, these attributes establish long-term relationships with a client, and are very important to the financial services industry (Theron & Terblanche, 2010)

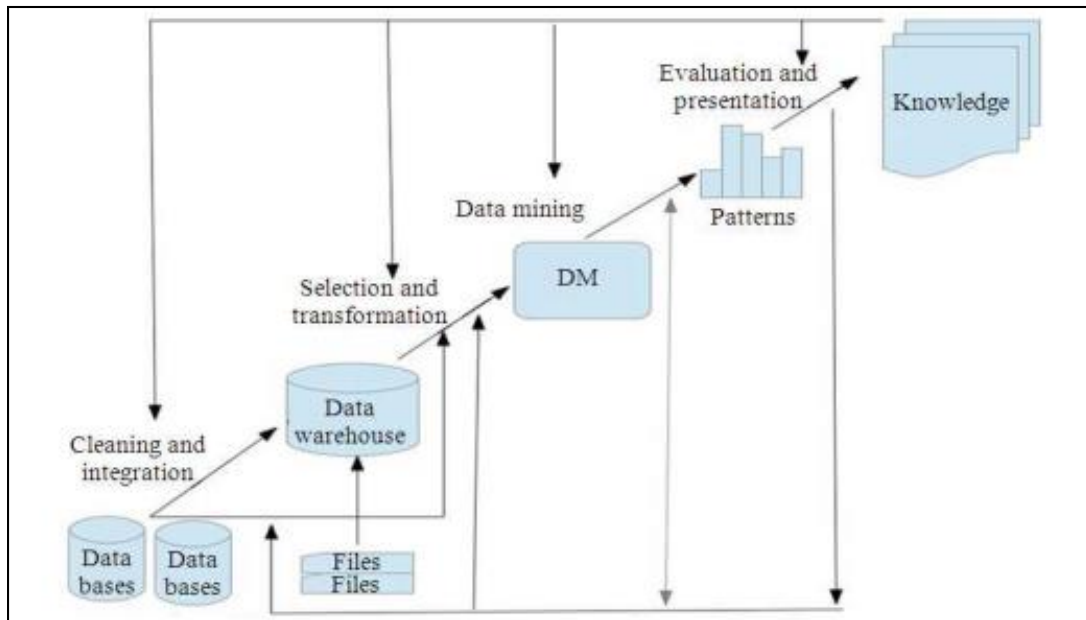
#### **1.4.1 Data Mining**

“Data is the most valuable asset, especially in financial industries”(Jayasree & Rethnamoney Vijayalakshmi Siva, 2013). As banks and other financial institutions have integrated technology into the way they do business, they have allowed themselves to be generators and collectors of large amounts of data pertaining to various areas of the business. The banking industry is realizing that these large stores of data have great potential to identify market trends, and can be manipulated to help produce insight that may offer competitive edge over competitors. Data mining, at its core, “is the process of extracting hidden, unknown, valid and actionable information from large databases and then using this information to make crucial business decisions” (Jayasree & Rethnamoney Vijayalakshmi Siva, 2013).

As one group of academics points out, data mining is the next advancement in the field of information technology (Han, Kamber, & Pei, 2012). Database system technology has been evolving since the first file-processing systems were developed in the 1960s. From here, great work was put into developing these early processing systems into more powerful database systems that would be capable of storing multitudes of information tables. Paired with this development in database systems were the first data analysis tools, as well efficient methods for sorting through and accessing desired data from these warehouses. In the 1980s, data warehousing made it possible to collect data from multiple heterogeneous data sources and condense them into a single data management facility. During the Internet boom of the 1990s, these data warehouses played a key role in being able to collect high data volumes, but created a “data rich but information poor situation”(Han et al., 2012). Companies are now working on data mining solutions to turn these vast data reserves into valuable knowledge that can help people see trends and make more informed decisions. A current data mining process flow in achieving knowledge discovery can be viewed in Figure 3 below.



Figure 3: Data mining in the process of knowledge discovery (Jayasree &amp; Rethnamoney Vijayalakshmi Siva, 2013)



There are several applications of data mining in various areas of the banking business. For instance, improvements are being made in risk management, or bank's ability to predict and minimize losses. Data mining has proven useful in quantifying the amount of risk during these transactions by analyzing a client against data collected on high risk tendency, default probability, and the financial instrument's overall rating and rate of recovery (Jayasree & Rethnamoney Vijayalakshmi Siva, 2013). Mining has also made an impact in the marketing of consumer banking products. By analyzing current customer data, banks are able to understand which products clients are most interested in, enabling the identification of qualities that may maximize profitability of products in the future. Perhaps the most important area of data mining in banking is in customer relationship management and can be applied to all three phases of the customer relationship cycle: customer acquisition, customer value increasing, and customer retention (Jayasree & Rethnamoney Vijayalakshmi Siva, 2013). Data analyzed in these areas can be beneficial in determining banking habits and preferences of current customers, such as how many customers prefer electronic banking to traditional banking. By understanding these data, banks can more effectively understand their clients and therefore make more informed changes to the business that will better suit their customers. To maintain competitiveness in the industry, Credit Suisse realizes the significance of data mining in improving the banking experience for

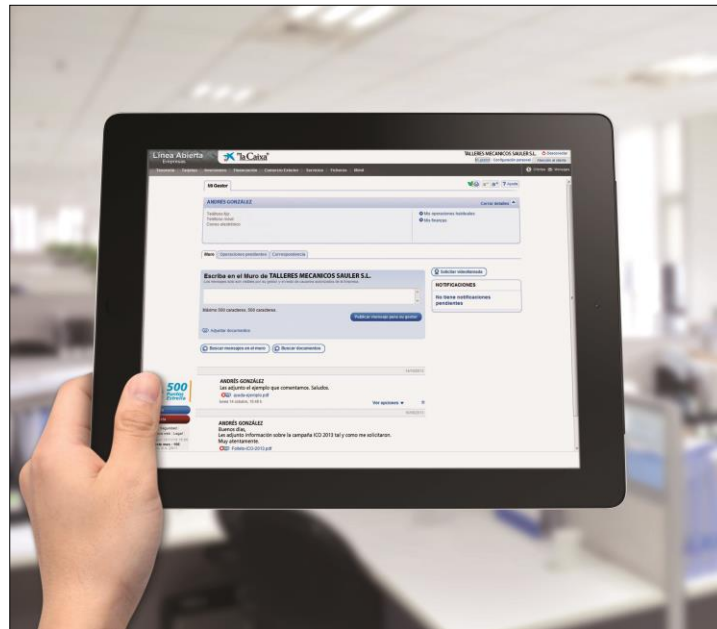
their client. With Credit Suisse's new initiative, understanding what functionality clients want in mobile banking platforms will be critical to the success of the offering. PsN will continue to play a key role as the distribution channel for these data, and as the hub through which these data can then be routed to databases and retrieved for data mining at a later time.

### **1.5 Digitization of Banking**

Although PsN was originally intended to be an internal network, it is now being considered to provide the data delivery solution for a new initiative. Its goal is to unify the currently disparate collection of tools and applications available to clients and their investment managers. In unifying the identity and functionality of their client-facing tools, Credit Suisse hopes to engage private banking clients with new front-end interfaces while improving the usability and organization of these applications. On an organizational level, this initiative will allow the various business groups responsible for supporting the client to more effectively collaborate. In these new front-facing interface solutions, clients will be able to access not only the functionality needed to manage their assets, but also real-time information and advice to inform their financial decisions, and allow discussions with experts, managers, peers and colleagues (Schwarz, 2013). This idea of integration of banking functions is seen throughout the recent literature, and several banks have begun this integration. In a 2012 article in *Private Wealth Management* Brendan Clarke, head of CapGemini's wealth management practice, asserts that "private banks increasingly spend on integrated advisory workstations, where in a single space advisers have customer relationship management and trade order management capabilities, client on-boarding technology and social media" (Trovato, 2012). These recent trends have driven Credit Suisse to recognize an opportunity for the development of a robust, client-facing system.

La Caixa, a major bank in Spain, won the Global Innovator category at the Accenture and Efma distribution and Marketing Innovation in Retail Financial Services award for its new private banking system, "The Wall" (Baldwin, 2013).

Figure 4: A tablet interface of La Caixa's "The Wall" (CaixaBank, 2013)

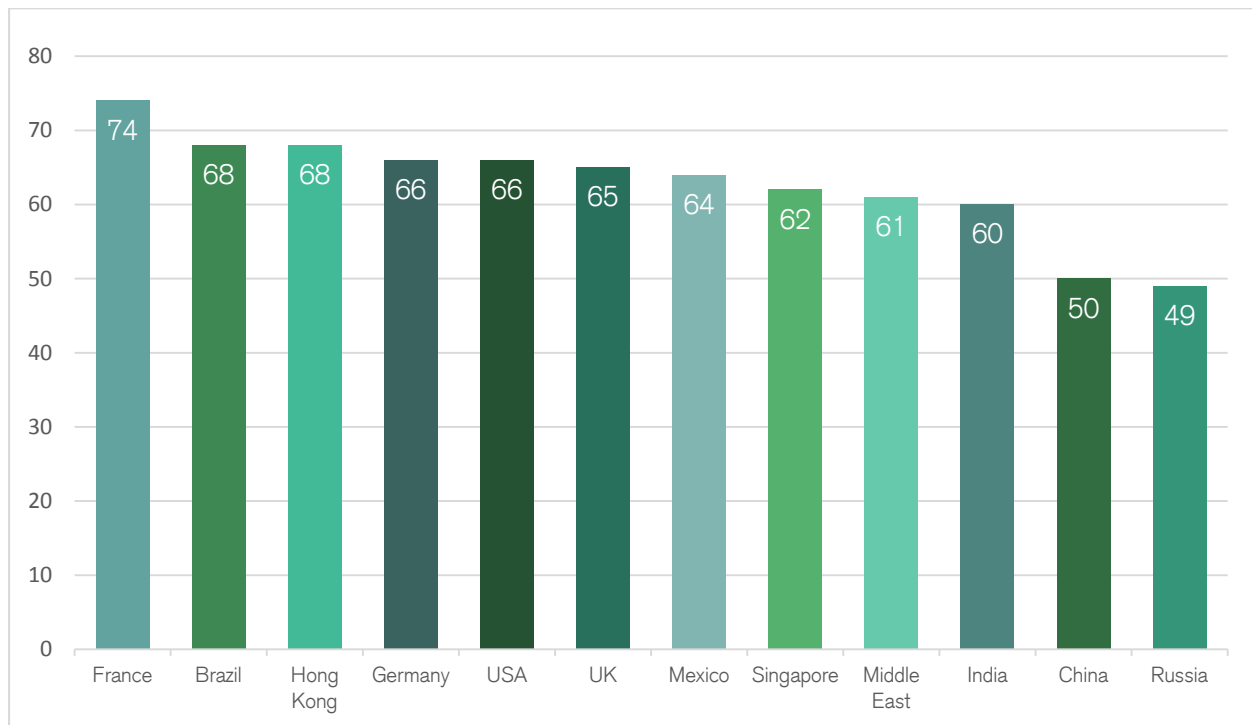


The Wall is a secure connection to La Caixa, similar to the Facebook “wall”, where clients and banking consultants can message or video conference confidentially (CaixaBank, 2013). Another initiative to further digital banking called “The Lab” by Allied Irish Banks (AIB) provides a physical space that promotes social media features and encourages customers to “learn about banking” with interactive displays and point-based online games. This branch, located in Dublin, provides digital-only transactions to encourage more customers to use digital banking. It includes face-to-face advice with video conferencing, demonstrations for mobile and online banking, and a self-service banking zone. This branch has increased customers’ use of AIB’s online banking by five percent. “The Wall” and “The Lab” mentioned above are just two examples of banks beginning to increase the number of connections with customers, with the goal of increasing customer contact. Higher frequency of customer contact generates more customer data, which can be used to better tailor services directly to the customer’s needs (Baldwin, 2013).

In today’s world, an increasing number of younger people are becoming wealthier. For example, the average age of ultra-high net-worth individuals (UHNWIs) is below 50 in China and Russia, as shown in Figure 5 (Forbes Insights, 2011). Today’s younger wealthy also engage more often in new communication technologies such as social media, which banks expect to

drive increasing development in the social media sector. Forty-seven percent of UHNWIs use Facebook, and 40% of UHNWI under the age of 50 “view social media as an important channel for communicating with their bank” (Lenzhofer, Reber, Diemers, & Kramer, 2013).

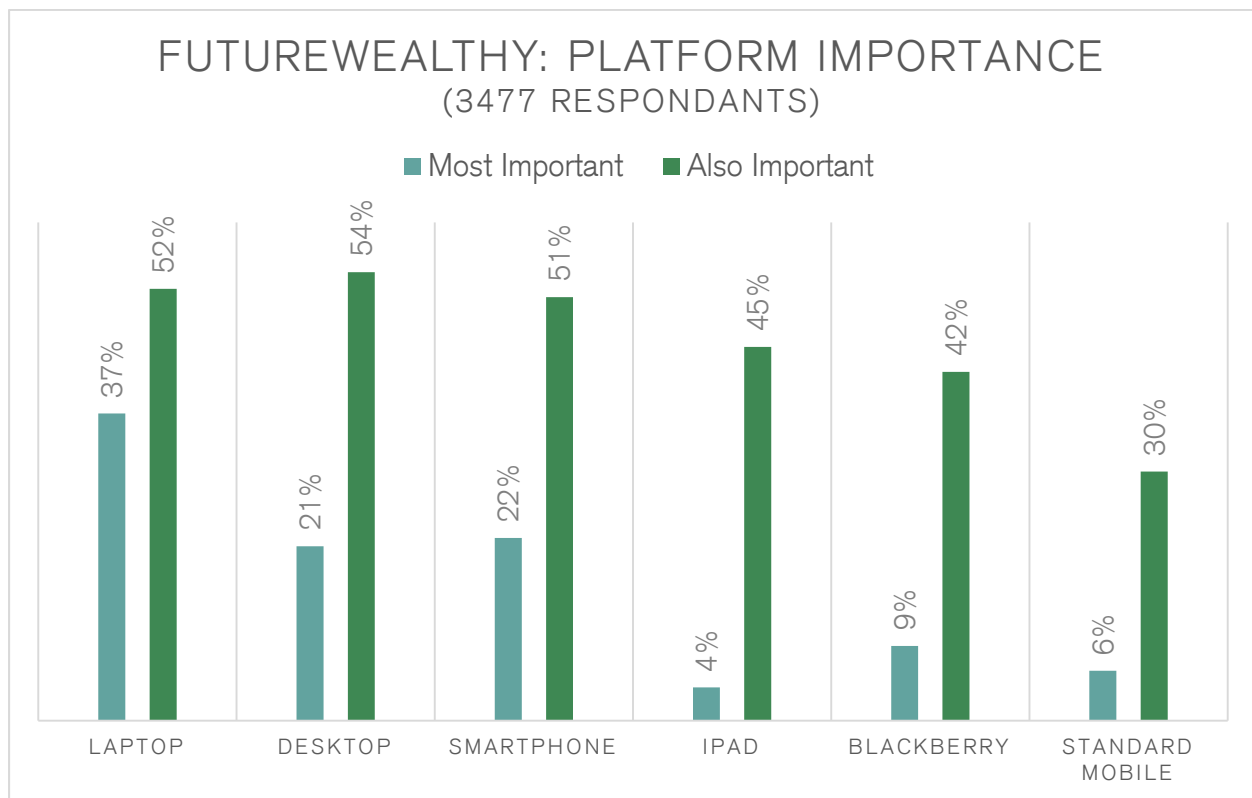
Figure 5: Average Age of Ultra High-Net-Worth Individuals by Country (Forbes, 2011)



In a survey of 3,477 “Futurewealthy” patrons worldwide – those on track to become very wealthy – only forty-nine percent of respondents stated that the current investment technologies are appropriate for their needs (Scorpio Partnership, 2013). This diminishes even further; only twenty-nine percent of European Futurewealthy clients felt that their investment technology was appropriate for demonstrating portfolio strategies. These Futurewealthy clients want their financial advisors to use intelligent, high quality and safe technologies to manage their wealth. When asked to select forms of communication they deemed important, Futurewealthy clients answered that they want to have communications through desktop computers (54%), laptops (52%), Smartphones (51%), iPads (45%), BlackBerrys (42%) and standard mobile phones (30%), as seen in Figure 6. When asked which of these devices was the most important, laptops were most frequently identified (37%), followed by smartphones (22%) and desktop computers (21%). Fifty percent of survey respondents used mobile smartphone apps to access their

finances, and this increased to seventy-four percent among those with wealth of over four million US dollars. Members of this wealth bracket – over four million US dollars – were the most “tech-savvy,” and ranked a firm’s social networking presence nearly as important as previous experience with the firm in advising investment decisions. This exemplifies how important technologies will be to the wealthy of the future, and why upgrading technology is crucial for any financial institutions success (Scorpio Partnership, 2013).

Figure 6: Digital devices used to connect with wealth managers (Scorpio Partnership, 2013)



Digital banking platforms are poised to become much more prevalent in a client’s daily life. Customers are engaging with banks via the Internet at rapidly increasing rates, both on personal computers and on mobile devices. As a result of changing technology, “the demand is strong for a well-designed and effective online banking platform that can be easily extended onto mobile devices and integrated with social media banking activities and other channels for seamless interactions” (Knapik, 2013). Such a platform is naturally only as effective as the data it receives. As a horizontally-integrated solution for the delivery of securities data to clients, PsN is a natural fit for the platform’s data channel. Through meeting with various Credit Suisse

personnel, clients and software vendors we determined on which topics PsN development should focus in the future. Communication between banks and their clients has been evolving to increase the speed and efficiency of sending financial messages. SWIFT transformed financial messaging by providing a unified standard and network for all financial institutions to use that had many advantages over Telex. However, banks such as Credit Suisse are now moving away from the SWIFT network and creating their own network, PsN, to allow them to customize the system and reduce costs. PsN still uses the SWIFT standard, but is instead an internal network owned by Credit Suisse. PsN has grown greatly since its development in 2006 and is continuing on a path of rapid expansion. To determine how this network should change in the future, we investigated the future of financial messaging directly from the people who use these systems.

## 2. Methodology

Credit Suisse's solution to aging financial messaging infrastructure is an internally developed messaging network they call PsN (Private swift Network). PsN serves to connect financial professionals to Credit Suisse's data and backend systems. The network has been in effect since 2006, and has been expanding rapidly since then. Credit Suisse wants to define the future of PsN in a way that will best satisfy the growing needs of their customer base and discover the future functionality of financial messaging networks.

Though it is designed to be a network for computer communication, PsN's architects must also consider how Credit Suisse's clients will use the network. We conducted a series of interviews with different clients, vendors and competitors of Credit Suisse to identify the needs of the financial community and determine the future path of PsN.

Most clients connect to financial data streams through portfolio management software (PMS). These systems are designed and sold by PMS vendors. Vendors are a vital focus when considering improvements to PsN, since their software is typically the only interaction an end user has with PsN.

### 2.1 General Approach

The primary goal of this project has been to assist Credit Suisse in identifying the best path forward for the development of PsN in order to meet the demands of its users and stay competitive in the future marketplace. This goal was achieved through the following four main objectives with corresponding sub-objectives.

1. Determine the current mid-term (1-2 years) and long-term (5+ years) client needs for investment business processing.
  - a. Understand the common use cases of clients in financial messaging and how well current solutions fill these cases.
  - b. Determine what upcoming trends in financial messaging exist, where the market is going and what institutions and vendors are doing to adapt to these trends.
  - c. How will the client needs change in the next 5 years?
2. Assess the future developments of PMS vendors
  - a. Which financial messaging standards do the major players support?

- b. What are the market share and trends of the identified tools in the EAM market?
3. Identify how other banks connect their clients to backend financial data processing networks.
  - a. Evaluate the maturity of PsN compared to similar systems implemented by competitors in the financial services market.
4. Determine the role of PsN in the unified business plan.
  - a. Understand connectivity needs of this initiative.
  - b. Evaluate existing connectivity channels.
  - c. Inform options for integration of PsN within this business plan.

Our approach to these objectives commenced with a review of relevant literature to understand the nature of these networks and methods used for their implementation and evaluation. These preliminary findings were largely drawn from professional journals and publications to inform a background on Credit Suisse clientele types as well as PMS. Once on site, we supplemented the information gathered from our literature review with information gathered in a series of semi-structured interviews with the key informants and stakeholders. In addition, we conducted a broader survey of clients and vendors. Finally, we interviewed SWIFT officials in Brussels by phone as well as local professionals and consultants who have come into contact with interbank telecommunications from an outside perspective (see Appendix E). The combination of information assembled from our background research, interviews, and surveys enabled us to identify the most valuable improvements needed to keep PsN competitive in the future.

Before conducting any interviews, all lines of questioning were first reviewed by Mr. Souleymane Bah of Credit Suisse, our sponsor liaison, for critique and approval. Supporting Mr. Bah in this review were his surrounding colleagues (see Acknowledgments). After filtering these initial questions through our immediate Credit Suisse contacts, we then pre-tested our questions with a small sampling of clients internal to Credit Suisse. We used the pre-testing process to ensure our questions were sufficient to gain valuable data. This process of refinement of our interview techniques ensured that we maximize the value of our time with the remaining internal Credit Suisse clients, external Credit Suisse clients, software vendors and competitors. All interviews were conducted face-to-face wherever possible, or by phone when necessary.



Interviews were not recorded since it was feared this might limit the candor of the interviewees. Instead, at least one member of our team served as a note-taker while another team member posed the questions to the interviewee. In all interview scenarios, we were sure to respect the confidentiality of our sponsor and the anonymity of the interviewee if and when requested (See Preambles, Appendix B-E). We divided our interview approach into five sectors, which more appropriately addressed the categories of interviewees we encountered. These included questions for PMS vendors, Credit Suisse competitors, SWIFT officials, professionals in the fields of finance and information technology, and a panel of selected clients, both within Credit Suisse and in the global market. Furthermore, to ensure that we were able to gain the maximum amount of data possible from each of our contacts, we added an additional layer of refinement to our questioning lines including a process of supplementing specialized questions in the area of the interviewee's expertise.

A timeline of our workflow can be found in Appendix F; this timeline was developed over the term of the project, and in its current form represents the time spent on each portion of our research. Though we initially planned to develop a technology acceptance model for any changes brought to Credit Suisse, this portion of our proposal was decided to be out of scope.

## **2.2 Internal and External Clients**

Another objective of this project is to assess mid and long-term client needs to help determine the future functionality of PsN. What clients need is very important to the direction Credit Suisse would like to take PsN. To achieve this objective, we needed to interview and survey several types of clients as seen in Table 3. Clients are divided based on their expectation of reliability, resilience, ease of use, flexibility and volume of messages (see Appendix F). Smaller companies tend to have low expectations of reliability and flexibility but high expectations of resilience and ease of use. However, very large companies have high expectations of reliability, resilience and flexibility with low expectations with ease of use (Wierdemann, 2014).

Table 3: Categorization of PsN Users by Size (Wierdemann, 2014)

Customer Class	S	M	L	XL	XXL
Expected reliability of channel	Low	Medium	High	Very high	Very high
Expected resilience of channel	High	High	High	Very high	Very high
Expected ease of use (Support capabilities)	High	High	Medium	Medium	Low
Expected flexibility to re-use information	Low	Medium	Medium	High	High
Expected volume of channel (Msg. / d)	<200	<1000	<5000	<25000 and / or Transactions	25000+ and / or Transactions

Credit Suisse provided us with contact information for both internal and external clients of PsN. External clients' anonymity was respected by using Credit Suisse as a proxy for the distribution of the survey. Interviewees within Credit Suisse and the financial industry were interviewed face-to-face with semi-structured questions. In each interview, certain high-value questions were always addressed but follow-up questions varied based on the background of the interviewee (See Appendix B for relevant interview instruments).

### 2.3 Vendors

Credit Suisse furnished us with a list of specific PMS vendors whose software utilizes PsN. Since these vendors provide the connection for many clients to PsN, they are a vital resource for determining the future goals of the messaging network. To understand how these vendors currently view PsN, we established a baseline understanding of their experience with the

network. From interviews with PMS vendors, we conducted an assessment of the most requested features and improvements. More importantly, we assessed vendors' beliefs on the future of financial messaging and how PsN could grow into this future state.

We identified relevant vendors with the help of Evan Tomlin and received contact information from him to connect to these vendors. Background research on these vendors was performed largely through professional literature and vendor websites. We initially reached out via email to a number of the identified PMS vendors and tried to request interviews, since many of them are headquartered in Switzerland. However, due to the closed nature of the financial industry, we quickly realized that the most efficient way to get in contact with these vendors would be through our connections at Credit Suisse.

We developed a preliminary set of interview questions (Appendix C), based on our review of the literature and conversations with Mr. Bah and his colleagues. The questions were intended to elucidate what functionality PMS vendors consider to be missing from their products' connectivity with PsN. At the same time we investigated vendors' long-term goals for the future of PMS platforms, which provided us another channel of data to identify additional developments in PsN.

In gathering data from vendors, we attempted to contextualize their experiences with PsN. Depending on the functionality of their software; different vendors may have very different needs from Credit Suisse's backend network. To encourage participation from vendors, we focused our interview questions on high-level topics, staying away from highly technical descriptions of their product, which could have infringed upon proprietary information. Vendors were also permitted to review relevant sections of our report before the conclusion of the project, and the data was anonymized at their request (See Preamble in Appendix C).

## **2.4 Competing Banks**

Another way to evaluate the maturity of PsN is to compare it to competitors' solutions. According to Hoovers, Credit Suisse's top competitors are UBS, Deutsche Bank, and Citigroup. Others consist of JP Morgan Chase, ING, and TD Bank (Huchzermeyer, 2014).

In our review of the literature we found no sources that detail the internal network systems of Credit Suisse's competitors. Credit Suisse as well as some competitors provide a limited amount of information on their websites about some of these systems. For example, UBS offers a

connectivity tool called KeyLink, which is a tool used for professional clients that “allows you to initiate and confirm a broad range of bank transactions across various booking centers via a single system, as well as obtain individual reports” (UBS, 2013c). KeyLink connects to a SWIFT interface so that it is compatible with other banking systems, allowing interbank communication.

Another program that UBS offers is UBS Connect. UBS Connect is an e-banking program that allows external asset managers access to the UBS interface in order for the EAMs to manage their customer’s portfolios as well as track deposits, transactions, and account information. The advantage of UBS Connect is that all information relevant to an EAM is linked on the same profile. It also processes orders and performs calculations to assist EAMs in optimizing their portfolio management (UBS, 2013b).

UBS KeyTrader is a program that UBS offers that allows professionals to link to “trading rooms of UBS Investment Bank” (UBS, 2013a). KeyTrader allows for “straight-through-trading,” which means that clients can trade without a broker or EAM. The program allows for “real-time market information from SWX and SWX Europe,”(UBS, 2013a), and shows the client details of his previous trades, pending trades, investment strategies, and more. The program also allows a connection to the Financial Information eXchange (FIX) and SWIFT interfaces that “ensures quick and accurate feedback on the status of an order, from its entry to the market to the confirmation of its execution,” (UBS, 2013a).

Reviewing all of the programs that UBS offers, UBS Connect and KeyLink are most comparable to PsN. While these platforms are similar in purpose to PsN, their differences in approaching the task of investment business processing may inform new avenues of development in PsN.

In light of the lack of relevant literature, we relied on interviews with employees and spokespeople at these businesses to gain a better knowledge of the technical landscape in this area. As we had to sign a NDA for information from Credit Suisse, we were aware that we would most likely be unable to get many technical details from these competitors.

To begin our investigation into competitor systems, we interviewed Professor Art Gerstenfeld, director of the Wall Street Project Center at WPI. Professor Gerstenfeld put us in contact with colleagues at JP Morgan Chase, as well as Barclays to begin a conversation about

comparable systems. Despite early indications of these contacts' interest in our project, neither elected to help with our research, likely due to competitive concerns.

Through our connection with Swissnex Boston, we were able to arrange an interview with the Swiss private bank, Bank Lombard Odier. This interview of managing partner Christophe Hentsch and IT development head Alexandre Hayoz elucidated the state of private banking data delivery both between banks and to the end client, as well as opinions as to the future of these systems. Further, Messrs. Hentsch and Hayoz showcased a client-facing portfolio management system application (app) currently in development for the Apple iPad®. In addition to an explanation of the target functionality, the data delivery and processing systems required for the app were also discussed.

By understanding the maturity of PsN through analysis of its strengths and weaknesses, recommendations were made to further advance PsN and help maintain a high quality product that continues to exceed the expectations of clients and the offerings of competing banks.

## **2.5 Data Analysis**

Once we collected data through these methods, we completed an assessment of the future of financial messaging and the role of PsN for Credit Suisse moving forward. This assessment was presented to Credit Suisse, where internal developers will take it under consideration when planning upgrades to PsN.

Our interview questioning focused on the interviewee's experience with this technology and their opinions on its future developments. Due to the qualitative nature of many of our interview questions, we distilled a majority opinion from the collection of responses. Codifying these responses first required a review of our entire dataset, to determine the variability of responses. Though quantification is not directly applicable to opinion-based questions, we were able to judge the level of consensus of the financial community based on this variability. Questions regarding experience with relevant systems were more highly quantifiable; we could easily produce a summary of interviewees' lengths of experience with PsN and SWIFT, for example.

In the delivery of our final recommendations, Credit Suisse supplied a metric for the evaluation of implementing technologies such as PsN. As can be seen in Table 4 below, there are

five main categories of importance when evaluating new technologies. These categories are reliability, resilience, simplicity, flexibility, speed, and security.

Table 4: Categories for Evaluation of Technologies

Reliability	The ability of an apparatus, machine, or system to consistently perform its intended or required function or mission, on demand and without degradation or failure. In the context of PsN it means the proven delivery of information to the chosen counterparty in a defined time slot.
Resilience	Ability of an equipment, machine, or system to absorb the impact of the failure of one or more components or a significant disturbance in its environment and to still continue to provide an acceptable level of service. In the context of PsN it means the delivery of information, if single components of the processing chain fail.
Simplicity	Simplicity is the state or quality of being simple. It usually relates to the burden which a thing puts on someone trying to explain or understand it. Something which is easy to understand or explain is simple, in contrast to something complicated. In the context of PsN this included required support capabilities on customer side, costs for implementation, likelihood for misconfiguration, complexity of the resulting infrastructure.
Flexibility	There are three conceptual senses of flexibility in Information Technologies (IT): flexibility in functionality, flexibility in use, and flexibility in modification. Flexibility in functionality and modification address the response of an IT to incremental change or variability. Flexibility in use addresses incremental change, but also the ability to encompass new relationships and opportunities; characteristics of revolutionary change. In the context of PsN the breadth of information compared to the customers' requirements is meant. Hence, external market standards are on the lower end, as the number of attributes per message is defined based on the standard, not individual requirements.
Speed	Bandwidth describes the maximum data transfer rate of a network or Internet connection. It measures how much data can be sent over a specific connection in a given amount of time. Engineers use data rate rather than speed, but speed seems more meaningful. Many of us tend to think that the number of bits getting somewhere over a period of time is their speed of travel. In the context of PsN it means how much data in total can be transferred and how many individual information packages can be delivered.
Security	In the computer industry, the term security -- or the phrase computer security -- refers to techniques for ensuring that data stored in a computer cannot be read or compromised by any individuals without authorization. Most computer security measures involve data encryption and passwords. In the context of PsN this dimension describes how costly the implementation of security techniques would be to achieve the legally required level of security in the context of banking.

With any potential software incorporation, the software must be proven reliable in terms of latency in information delivery. In addition to this reliability, it is important that any new software is resilient enough to endure any system malfunctions that may occur with PsN or the software itself. This included examining any safety features built in to the software to ensure that the system maintains a baseline level of service even in times of strain or malfunction. Software flexibility (Table 4) was a key factor in our technology acceptance model. The software will need to be able to integrate into the pre-existing PsN system, but it must be ensured that the software will have the ability to easily accept incremental changes that may be needed in the future. Finally, due to the nature of the financial messages being transmitted, any software that we may suggest needs to hold system security and speed paramount. With the drastic increase in message volume being transferred over PsN, it is important that developers favor system additions that will be able to operate at the current speed of PsN with the ability to be upgraded. Likewise, new software must be able to hold the same security standards as implemented throughout the rest of PsN.

A timeline of our workflow can be found in Appendix F; this timeline was developed over the term of the project, and in its current form represents the time spent on each portion of our research. Though we initially planned to develop a technology acceptance model for any changes brought to Credit Suisse, this portion of our proposal was decided to be out of scope. Through the processes outlined in this methodology, we uncovered a number of interesting trends, which were distillable to specific conclusions and recommendations.

### 3. Findings

We have conducted multiple interviews and distributed numerous questionnaires. We conducted interviews with external and internal clients, vendors, SWIFT officials, and competing banks. We contacted a total of 49 individuals. Of these, 33 agreed to follow-up interviews. Table 5 shows the distribution of individuals by organizational category. To preserve confidentiality, we cannot reveal the identities of our respondents. Based on these interviews, we were able to identify a number of industry trends as well as client expectations that indicate strategies Credit Suisse may pursue in the future. We anticipate that in the future Credit Suisse will need to focus increasingly on the support of mobile platforms, full adoption of new SWIFT standards, integration into the new unified business plan with heightened data analytics and data mining, and opportunities for increased efficiency on an organizational level.

Table 5: Breakdown of research contacts.

<b>Category</b>	<b>Initial Contacts</b>	<b>Follow-up Interviews (Surveys)</b>	<b>% Questioned</b>
Professionals	12	3 (1)	33%
Software Vendors	11	7	64%
Credit Suisse	11	9	82%
Competitors	5	3	60%
EAMs	10	2 (8)	100%
<b>Total</b>	<b>49</b>	<b>25 (9)</b>	<b>67%</b>

While most of our information came from interviews, we received completed questionnaires from eight EAMs of Credit Suisse. These gave us substantive information about EAMs' understanding of financial messaging as well as client demographics and recommendations for future improvements.



We attended the Credit Suisse EAM Technology Fair at SIX Conference Point in Zürich on April 10<sup>th</sup>. At the fair we were able to interview software vendors, as listed in Table 5. The software vendors gave us insight into their needs from Credit Suisse, the future of their clients' needs, comparison of PsN with other bank's offerings, as well as trends in platform use. Most vendors recognized the demand for mobile devices such as the iPad; a trend that Credit Suisse plans to address in its new business unification initiative.

We interviewed representatives from the large private bank, Lombard Odier, as well as the public bank UBS. However, most other competing banks were reluctant to speak to us, due to the highly competitive nature of the financial industry. The information from these interviews corroborated trends we identified from our internal Credit Suisse interviews: the implementation of messaging standards are highly fragmented and future development of a unified format is unlikely.

Finally, many of our interviews at Credit Suisse indicated opportunities for structural and procedural changes in the organization itself. Few employees noted difficulties in bringing ideas to fruition, the existence of legacy technology in critical systems, and other issues related to the structure of organization and accountability.

### **3.1 PsN Client Need**

To determine the current mid-term (1-2 years) and long-term (5+years) client needs for investment business processing, we performed several interviews internally at Credit Suisse and sent out a questionnaire to external clients. We conducted the internal interviews with both technical staff as well as more business-oriented employees who work directly with clients. Collectively, this information gave us great insight not only into how financial messaging works, but also what can be done in the future to improve this process. This information is critical in providing a cutting edge product that will continue to satisfy the needs of the client base. The PsN client needs can be broken down into the two major categories: (1) overlying PsN network necessities and (2) developments desired for the functionality of PsN Light.

One of the recurring themes we encountered with internal Credit Suisse employees was that Credit Suisse booking centers around the world lack a uniform level of maturity by region. Clients who interact with multiple booking centers worldwide prefer each booking center to have the same level of data granularity, so that each client would have the capability to seamlessly set

up any currently available message type transaction with any recipient, regardless of booking center. For instance, the software vendor PATRONAS raised concerns that PsN lacked the ability to send certain message types, which they claim are already available from competitors' data channel offerings.

There are equally as many opportunities to expand the functionality of PsN Light for Credit Suisse clients who prefer to utilize this CSV based format over SWIFT for their financial transactions. Two EAMs from Falcon Private Wealth, a firm that uses PsN Light to connect their clients' financial data, contributed varying evaluations regarding the functionality of the data channel. Initially, the EAMs were very forthright in saying that they believed PsN Light provided thorough documentation and easily usable CSV format. However, the EAMs did have one major criticism of the data channel, which is the lack of a validation or checker file built into the program. To understand the importance of validation files, it is important to first understand the relationship between PsN Light and another piece of Credit Suisse software called EAM Net.

EAM Net is a financial analysis tool used by asset managers where they can manage their clients in one system. It provides a platform where EAMs can evaluate their client's account on an individual basis or while grouped with similar clients. EAM Net is also a tool that can be used to settle stock market trades and conduct bulk orders (Credit Suisse, 2014). However, EAM Net is only a front-facing analysis network and requires PsN Light as a data channel, which runs parallel to EAM Net. While Credit Suisse has built many checks into EAM Net to insure EAMs comply with regulatory standards, the professionals from Falcon Private Wealth pointed out that there is a lack of validation between these two different systems. In the current state, if an EAM is trying to onboard new clients into their monthly fees file, which may contain hundreds of lines of code, there is no way to ensure that all of the additional lines of code were correctly transposed from EAM Net to the CSV file for delivery. We discussed this issue with a Credit Suisse employee responsible for overseeing the development of PsN Light. This problem has been recognized, but program developers fear that this level of cross software validation between EAM Net and PsN Light may make the data processing procedure too complicated. Credit Suisse developers may be more wary about implementing such additional features into PsN Light, which was developed on the principle of being a simplistic, streamlined alternative to PsN for

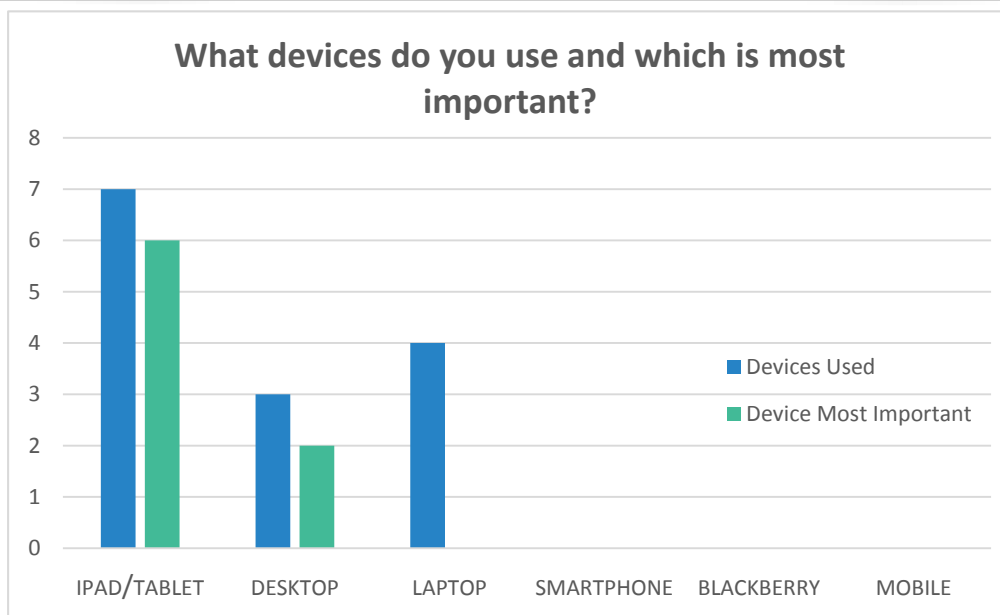
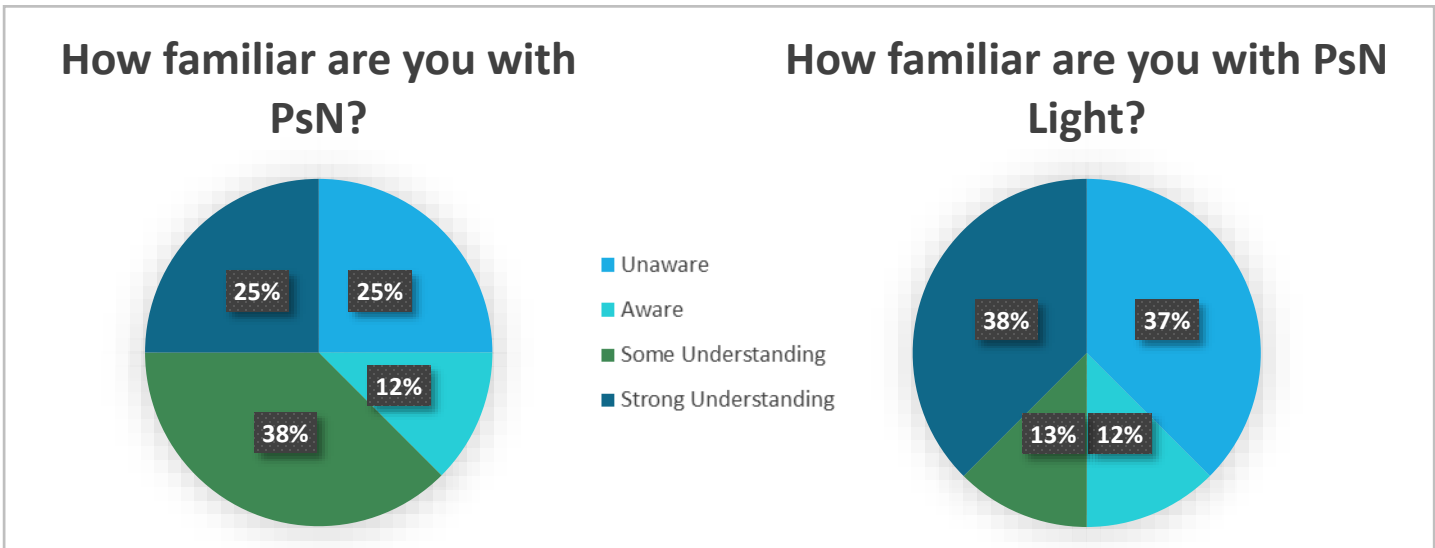
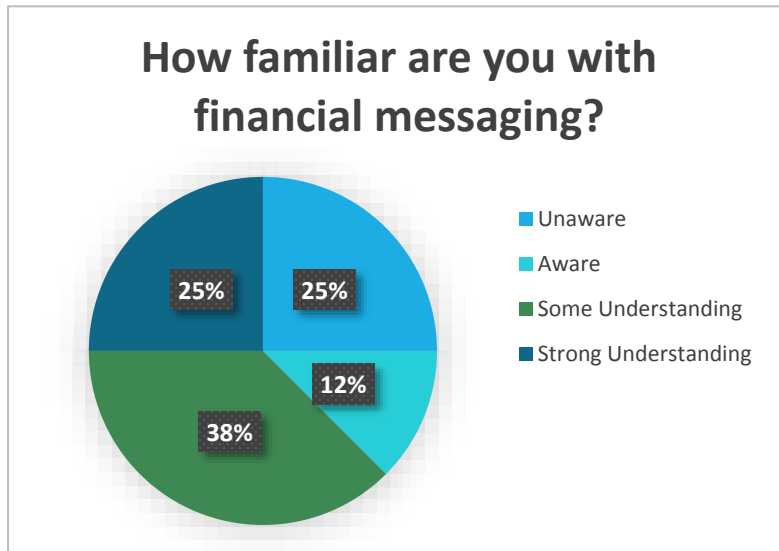
smaller clients. Interestingly enough, a SWIFT official in Belgium had a different perspective on a similar problem that they are trying to fix within SWIFT.

Representatives at SWIFT, the financial messaging cooperative responsible for the network on which Credit Suisse models PsN, reported that they are currently working on improving their data delivery safety checks. SWIFT has placed a great deal of value on writing checker files that not only ensure that message syntax is correct, but that also validate that each message is in the appropriate 'market practice' format. General sentiment from Credit Suisse EAM clients and the SWIFT official with whom we have spoken are favorable of the idea of increased validation built into data delivery networks. It may be beneficial for Credit Suisse to consider strengthening the functionality PsN Light by implementing additional checker files for the validation of correct data alignment between PsN Light and EAM Net.

### **3.1.1 External Client Questionnaire**

We received very interesting questionnaire responses from eight EAMs, half of which use PsN, while the other half use PsN Light. The questionnaire (see Appendix B) contained both multiple-choice and short-answer questions. The results of the multiple-choice questions (summarized in Figure 7) indicate that there is a wide variance in the levels of familiarity with technical subjects among EAMs. Twenty-five percent were unaware of financial messaging in general and PsN in particular; 37% were unaware of PsN Light. Additionally, EAMs indicated that iPads or tablets are becoming the most important and preferred platform for connecting to clients. This contrast with Scorpio Partnership's 2013 Futurewealthy study (see Section 1.5 above), which found that while wealthy investors identified the iPad as useful, few named it their most important platform. In addition to the multiple-choice questions, the questionnaire also included short-answer questions, focused on gaining input into future developments and improvements to PsN.

Figure 7: Responses to Multiple-Choice Questions in EAM Questionnaire



A major trend we found in the short answer portion of the surveys was a request for more control of data delivery. Multiple respondents stated that they would like to have the ability to choose what data types are delivered through PsN and PsN Light. This currently can only be done by calling a banking representative. EAMs would like to have the ability to change this through an electronic dashboard.

Through our distributed client questionnaires to eight EAMs, we have been able to validate that PsN clients enjoy the extensive data that is presented through PsN Light: it is evident that an adequate amount of data is currently being provided to the client. However, on several occasions we received comments about client difficulties with the presentation of the data itself. Clients would like the opportunity to work with a more user-friendly interface, primarily one that would condense the dozens of *Microsoft Excel*® data files into one understandable document. We also had the opportunity to speak with representatives of Keyon, a software vendor company that connects to PsN Light currently with analytical software called True Broker®. This software has the ability to send and receive CSV files via PsN Light as well as process these types of data. Interestingly enough, Keyon is also working on a software plug-in for PsN Light called True Advice®, which may be a solution to some of the reported client concerns about receiving data in an understandable display. The solution Keyon is developing will take the current PsN Light data and convert it into a more user-friendly PDF format with value added graphical representations. This Keyon software may be a potential avenue for providing clients with more enriched data that will be faster to comprehend and simpler to navigate than the current state in which clients need to sort through a multitude of CSV files.

As technology platforms advance, there is always a need for more data, more quickly, and more efficiently at a greater granularity. A significant portion of our research and interviews emphasize the growing importance of mobile platforms. In the EAM questionnaire that we conducted, six of eight EAMs that filled out the questionnaire wanted private banking on an iPad or mobile platform. Additionally, EZE Software stated that approximately 70% of their clients were interested in their iPad app. From our interview with Bank Lombard Odier, we learned the bank is implementing an iPad app that is being offered to their clients to aid in portfolio management, a project inspired by client demand. This transition to mobile platforms can be

integrated into the new business unification initiative. As evidenced by our data, the tablet platform may be a strong option as front-end interface.

### 3.2 Vendor Need

After attending the Credit Suisse EAM Technology Fair, we gathered valuable contacts and information from several PMS vendors, listed in Table 6 below. These vendors spoke to us about their back-end connection to Credit Suisse as well as other banks. We found that while standardization of the delivery of data to vendors would streamline the process for the vendors, banks are not willing to collaborate on such a standard. However, collaboration does occur when messaging is inter-bank, which can be seen in the SWIFT standards.

Table 6: Software vendors contacted at the EAM Technology Fair

Software Vendor	Software
Expersoft	PM1
VWD Group	vwd portfolio manager
Allocare	AMS
Advent	Geneva/Advent Portfolio Exchange
EZE Software	Tradar PMS
PATRONAS	Opus

The newest SWIFT standard, ISO 20022, is an open standard with XML capabilities. ISO 20022 has many benefits due to its increased human readability and simpler development due to widely available XML parsing libraries. The standard is administered by SWIFT but can be modified by others as well. This allows the standard to be used for securities as well as payments and other financial products. Although internally some employees are very concerned about the increase in message size due to the change to the more robust XML, multiple sources

told us that XML can be compressed into more manageable sizes if needed for transmission. According to an employee of SWIFT, there are about seventy implementations of SWIFT in various banks and financial institutions around the world (Figure 8), the development of which can be viewed in SWIFT's iPad application, "ISO 20022 Adoption mApp". As Figure 8 shows, nearly every market region is developing some implementation of ISO 20022 with the majority of the development happening in Europe. Asia Pacific (APAC), an important emerging market according to nearly every interviewee, also has several developments in ISO 20022. This shows that ISO 20022 is continuing to become more widespread, and will need to be implemented by Credit Suisse in the near future.

Figure 8: Map of global implementation of ISO 20022 (Standards Forum, 2013)



In addition to the opinions on the changes within the SWIFT standards, there is also a debate between SWIFT standards and FIX. Today, FIX is typically used for front office trading while SWIFT is for post-trade information. FIX is significantly faster than SWIFT, and can be used for real-time data, while SWIFT is more descriptive for record-keeping. Despite these

traditional roles, PATRONAS revealed that FIX is adding additional message fields to become more descriptive, while retaining its speed. FIX also allows for a more easily created connection, because neither party needs to pay the large overhead fees that are incurred when on the SWIFT network. This allows the vendor to make connections to clients faster. PATRONAS would like to see PsN move away from SWIFT, and allow FIX messages through PsN. It has also been suggested by a Credit Suisse employee that FIX could be used in the APAC market, giving an even stronger need for PsN to allow FIX messages as well as SWIFT messages.

When vendors are connecting to PsN, they are also connecting to data channels of several other banks. Each bank has its own interface with the software, requiring vendors to create over a dozen separate solutions to connect to different banks in order to provide a unified user interface. While most find this lack of standardization frustrating and call the system “fragmented,” others are using this as a selling point, stating that their software will connect to any bank regardless of standard. This lack of standardization would be difficult to overcome, due to its requirement of inter-bank cooperation in what can be considered competitive space, as seen during interviews within Credit Suisse and Bank Lombard Odier. Both banks addressed these problems but neither believed that change would occur due to a reluctance to allow other banks to have the ability to read their files, creating this competitive space.

### **3.3 Competitor Comparison**

We conducted interviews with competing banks to determine the maturity of PsN in the wider marketplace. We were able to gain contacts at four competing banks, though only two responded for interviews. During the planning of this project, we expected to have limited access to competing banks due to the highly competitive and confidential nature of the financial industry. However, we interviewed representatives from Bank Lombard Odier and UBS and received information about competing banks from software vendors.

One software vendor, Allocare, provided us with an overview of custodian bank interfaces. This document (reproduced in Figure 9) compares the data delivery channels of twelve competing banks. The column of check-marks indicates fulfilled functionality by each bank's offering. This shows that while Credit Suisse provides its clients nearly all the functionalities Allocare desires, some other banks purportedly provide additional functionality, such as access to and analysis of market data, investment data and portfolio data. Credit Suisse



asserts that PsN does in fact offer market and investment data, though this is not reflected in Allocare’s document. This may imply a miscommunication between Credit Suisse and some of its vendors.

Figure 9: Allocare's overview of banks' messaging interfaces (Allocare AMS, 2014).

**ALLOCARE AMS** **Overview Custodian Bank Interfaces (1/2)**

Group	Type	UAL	PicLink	BärLink	CS PSN	LODH	Sarasin	SG PB	Cornèr	JPM	State Street
<b>Format</b>		Swift	fixed	csv	Swift	csv	xml	GDF	GDF	csv	fixed
<b>Trades</b>	▪ Normal Trades (buy/sell)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	▪ Subscription	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	▪ Futures (buy/sell open/close, Variation margins)	✓	✓	✓	✓	✓		✓	✓		✓
	▪ Traded Options (open/close)	✓	✓	✓	✓	✓	✓	✓	✓		✓
	▪ Fund Trades (buy/sell/prepayment/subscription)	✓	✓	✓	✓			✓	✓		
<b>Treasury</b>	▪ FX Trades: Spot, Forward, and Swaps	✓	✓	✓	✓	✓	partly	✓	✓	partly	✓
	▪ Call Deposits	✓	✓	✓	✓	✓	✓	✓	✓		
	▪ Fixed Deposits	✓	✓	✓	✓	✓	✓	✓	✓		
	▪ Increase / Decrease Calls	✓	✓	✓	✓	✓		✓	✓		
	▪ Increase / Decrease Fixed Deposits	✓	✓	✓	✓	✓		✓	✓		
	▪ Interest	✓	✓	✓	✓	✓	✓	✓	✓		
<b>Deliveries</b>	▪ Receipt / Delivery Free	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	▪ Receipt / Delivery against Payment	✓	✓	✓	✓	✓		✓	✓	✓	✓
<b>Corporate Actions</b>	▪ Dividends (Cash, Stock, etc.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	▪ Interest (Coupons)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	▪ Maturities (Regular, Call)	✓	✓	✓	✓	✓		✓	✓	✓	✓
	▪ Splits / Reverse Splits	✓	✓	✓	✓	✓		✓	✓	✓	
	▪ Exchanges/Conversion	✓	✓	✓	✓	✓		✓	✓	✓	
	▪ Exercise/Assignment	✓	✓	✓	✓	✓		✓	✓		
<b>Cash</b>	▪ Capital Decrease/Increase	✓	✓	✓	✓			✓	✓		
<b>Cash</b>	▪ Cash Account Movements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Reconciliation</b>	▪ Position Reconciliation (only on request)	(✓)	(✓)	(✓)	(✓)	(✓)		(✓)	(✓)		
<b>Market Data</b>	▪ Prices / FX rates	✓	✓	✓				✓	✓		
<b>Investment Data</b>	▪ Description, Identifier, Price Type, Inv. Type, Currency, Country, Risk Domicile, Features, Underlying, Interest Definitions, Denomination	✓	✓					✓	✓		
<b>Portfolio Data</b>	▪ Name, Ref Ccy, Accounts, Custody Account, ...	✓							✓		

While the financial messaging systems of Bank Lombard Odier and Credit Suisse provide similar functionality, Bank Lombard Odier is currently releasing a new, interactive iPad application. This app, which provides a client with a multitude of different ways to visualize their financial data, also has the ability to easily contact the client’s relationship manager for further financial decision making. Bank Lombard Odier’s iPad app offers access only to financial and performance data. It does not offer trading because their clients have not demanded such functionality. This app has the kind of interface that Credit Suisse’s developers might try to emulate when designing their mobile platforms, as its design and functionality are full-featured. In addition, Bank Lombard Odier created a new web interface to match the iPad

app to give clients a unified experience when using multiple platforms. This unification is something that Credit Suisse is moving toward with its new business integration initiative.

Based on our interviews, it appears that UBS and Credit Suisse face similar technological challenges. When speaking to a UBS employee, we found that the private banking and wealth management (PB&WM) divisions of large banks tend to be less technologically progressive than other sectors, such as investment banking. This creates situations where the IT systems of PB&WM divisions can be over thirty years old, leaving the majority of staff unfamiliar with what can be business-critical systems. For example, both UBS and Credit Suisse have sections of their core systems written in COBOL, a language that according to both Credit Suisse and UBS contacts is largely obsolete. It is both difficult and expensive to build new systems, so these systems stay in place and are amended and supplemented as needed. Revamping the entire infrastructure of a messaging system is currently too expensive to gain approval, but all banks need to ensure they keep the knowledge of how these systems work to keep them running smoothly until the systems can be upgraded or replaced.

### **3.4 Integration into Unified Business Plan**

When we arrived at Credit Suisse in March, we discovered that PsN had recently been reorganized as part of a new, larger initiative. This new initiative plans to unify several applications within Credit Suisse. The role of PsN within this larger department still needs to be determined. The technical staff of PsN asserts that PsN is the highest quality of data within Credit Suisse and should be the only data channel used in the new initiative.

Another connection into the new initiative could be PsN Light. PsN Light and its new interface True Advice<sup>®</sup> from Keyon could provide clients with additional functionality: a clear visualization of their data as an integrated part of this new initiative. For example, the new interface could include a function to generate a PDF report for a particular client. The PDF report generated by True Advice<sup>®</sup> displays a current position with several graphs and can be modified to display certain colors or include a company logo. This application could be unified into the new initiative to allow EAMs to print simple PDFs of their data to show their clients. As several of our responding EAMs identified paper as their go-to portfolio management tool, this functionality would please clients while more robust digital solutions are being developed as part of this new initiative.

An additional aspect of possible integration of PsN into this new initiative is its potential for data mining. Credit Suisse sits on a large reserve of underutilized data that can be mined for value added offerings that could drive client growth. As a data channel, PsN provides a large amount of information from all business sectors. This data can be analyzed for business intelligence: a concept that has been increasingly adopted by industry in recent years. International Data Corp. forecasts that “by 2015, the global market for big data technology and services will have swelled to \$16.9 billion (U.S.) from just \$3.2 billion in 2010” (Rockel, 2012). This shows that “big data” and data mining are growing rapidly, and that data mining the PsN channel should be utilized within this new initiative.

By intelligently analyzing the data in the PsN channel and implementing it into an interface, insights such as global payments flow and securities trends can be made available to clients, allowing clients to make smarter investment decisions within the market. After processing the data from the PsN channel and discovering trends, these patterns can be presented to the client. A great example the implementation of such analytics is Thompson Reuters’ *Eikon*<sup>TM</sup>, an all-in-one information gathering software interface that can allow clients to make smarter decisions in the market. As *Eikon*<sup>TM</sup> already performs analytics on Credit Suisse data, Credit Suisse has the opportunity to perform some similar analytics itself, cutting out the middle-man and adding value to the data provided to clients.

SWIFT, the company PsN tries to mimic, is currently utilizing data mining for business intelligence, which are then used for several purposes. For example, SWIFT uses data mining to ensure that all transactions are compliant with current international sanctions and regulations. This specific functionality is not necessary for PsN, but additional business insights can be found with a similar processing of information.

Despite these clear trends, data mining is a large subject that is out of the scope of our areas of study and of our project. Specific applications of data mining were not a topic that we could fully understand and implement in the time available. Nevertheless, the subject of data mining opportunities can be used as a future IQP or an MQP, where data mining could be the sole focus.

### 3.5 Organizational Change

Working for Credit Suisse as a research group opened up many opportunities for our team to interact with professionals from all facets of the financial industry. While investigating possible avenues of improvement for future PsN functionality, our research has led us to meet with experts in private banking, retail banking, wealth management, IT development, project management and software vendors. All of these sources provided us with a great wealth of information about various aspects of the business as well as an interesting cross sectional view of the industry as a whole. Throughout this project, it was a unique opportunity to hear from these different sources and develop an understanding of variances in the financial industry as well as the position of Credit Suisse in this landscape.

In the financial industry, new technological developments are generally advanced by investment banking due to the sector's extreme emphasis on minimizing time-to-market. While some of these advancements trickle-down to the slower-paced private banking & wealth management industries, this process generally takes years. With banks having branches for both investment and private banking, there is the potential for a greater exchange of ideas that may help quicken the pace of technological development in fields such as PB&WM.

As a business grows, it is often difficult to keep all technological systems up-to-date and modernized. In interviews with large financial institutions, such as Credit Suisse and UBS, we have found that obsolete technology is quite prevalent even in business-critical systems. The data mainframes of these institutions were developed over thirty years ago in what are now outdated computing languages such as COBOL with which engineers are no longer familiar. Coupled with the consistent demand for new front-end client products, a disparity has developed between the updating of essential backend mainframes and the profitable front-end products that drive the business. While these companies have been able to operate smoothly, there are some individuals in the financial industry that worry there will come a time when these mainframes may critically fail.

While interviewing thirty-three individuals over the last several weeks, we encountered many unique ideas about where business professionals think PsN and the future of financial messaging are headed. Some internal employees spoke to us about the red tape that is often involved in the tedious process of rolling out modifications to a large IT system. On several

occasions, these employees were confident in telling us that they could accomplish certain goals pertaining to PsN, but either did not have project funding or support from the business side which stymied the development of the project. One such initiative that could help foster some of these ideas could be something similar to Google's "twenty percent time." The basic premise of the initiative is that Google allows its employees to work on Google related personal projects for twenty percent of their time at work, or about one day per work week (Mediratta, 2007).

Unfortunately, many companies cannot afford to have their employees working away from top priority projects for one day a week. However, Credit Suisse may find some benefit in allowing their engineers more space and opportunity to freely work on projects related to their business segment. Additionally, some of the employees we spoke to felt that objectives from upper management were not always well explained, occasionally conflicting with what they believed to best benefit the customer. Providing the IT department more opportunities to express their ideas to upper management could create a more effective communication system, promoting both developers' understanding of business goals and heightened dialogue of ideas between developers and management. This two-way communication system is needed in any company to maximize the investment of employees in product development.

Furthermore, it appears that there may be some disconnect between the implemented functionality of PsN and the functionality as perceived by vendors. This point was discovered upon reviewing the Allocare Interface Overview document (Figure 9, above) with employees at Credit Suisse. During this review, Credit Suisse employees noticed that the document displayed missing functionality in PsN, despite some these functions being fully implemented. At this juncture, it is apparent that there has been a communication breakdown between Credit Suisse and software vendors. This could be a miscommunication internally at Credit Suisse, or in the communication with the vendor. Additionally, the software vendor PATRONAS raised concerns that PsN lacks the ability to send certain message types, which they claim are already available on competitors' data channel offerings. Furthermore, PATRONAS complained that development time for new functionality from Credit Suisse was very long, up to eight months, whereas similar functionality has been implemented by other companies such as Bloomberg in as little as two weeks. Internal interviews at Credit Suisse, however, reveal a different perspective. While our small sample of interviewees may not represent the entirety of the IT department, they evidently

believe that PsN is the best quality horizontally integrated data stream currently available within Credit Suisse. These officials spoke very highly of the network and did not identify any notable shortcomings. Again, this may illustrate a disconnect between what Credit Suisse believes they are offering in PsN, and what the vendors believe they are receiving.

From the interviews we conducted with internal clients, vendors, SWIFT officials, and competing banks, as well as the questionnaires sent to EAMs, we identified several possible developments for PsN and Credit Suisse as a whole, such as adding functionalities to PsN, upgrading to ISO 20022, investigating further data analytics, incorporating PsN into new business unification initiative, and considering potential organizational changes. From these findings and results, we were able to distill a set of conclusions and recommendations that we present in the following chapter.

## 4. Conclusions & Recommendations

The primary goal of this project has been to assist Credit Suisse in identifying the best path forward for the development of PsN in order to meet the demands of its users and stay competitive in the future marketplace. Based on feedback from a sample of PsN users, including EAMs and vendors, we were able to develop a list of recommendations that we believe will help Credit Suisse improve the functionality and efficiency of PsN in the future.

### Conclusion 1: Upgrades to PsN

There are two primary recommendations specifically regarding PsN upgrades we believe Credit Suisse should look into for further considerations. These are (1) working to upgrade all booking centers to the same level of data granularity, (2) the potential integration of a validation file for PsN Light between PsN Light and EAM Net, and (3) heightened user control of data delivered.

Clients desire that each booking center have the same level of data granularity, allowing the capability to seamlessly set up any currently available message type transaction with any client in the world. Currently, Credit Suisse has global booking centers on different levels of maturity which can limit a client's ability to conduct certain message transactions via PsN such as APAC, which is still a developing market.

Generated as a side offering to PsN for smaller clients and EAMs who have much smaller financial messaging demands than their corporate office counterparts, PsN Light has proven to be a useful tool that has gained the approval of many of its users. However, one criticism of PsN Light that surfaced was the lack of a validation file built into software. In the current state, if an EAM is trying to onboard new clients into their monthly fees file, which may contain hundreds of lines of code, there is no way to ensure that all of the additional lines of code were correctly transposed from EAM Net to the CSV file for delivery.

A major trend we found in the short answer portion of the external client questionnaires was a request for more control of data delivery. Multiple respondents stated that they would like to have the ability to choose what data types are delivered through PsN and PsN Light. This currently can only be done by calling a banking representative. EAMs would like to have the ability to change this through an electronic dashboard.

**Recommendation 1.1: Data Granularity**

**We recommend that Credit Suisse ensure that all booking centers be brought to the same level of data granularity within their messages.** Large concerns have been raised within Credit Suisse on this matter, and it appears that many internal employees are very aware of the importance of elevating the booking centers to the same threshold. More importantly, external users of PsN are realizing the restraints that this lack of uniform booking center maturity creates and have expressed their concerns.

**Recommendation 1.2: Validation File**

**We recommend that Credit Suisse incorporate a data validation method for PsN Light.** Implementing such a robust feature into PsN Light may be seen as problematic due to the fact that PsN Light was developed on the principle of being a simplistic, streamlined software alternative to PsN for smaller clients. However, this development appears to be desired by current clients, and may be worth implementing if it can be found that this problem is widespread enough among EAMs to add this layer of validation.

**Recommendation 1.3: Control of Data Delivery**

**We recommend that Credit Suisse creates an electronic dashboard that allows clients to control their data delivery.** This dashboard can replace the current solution of calling a bank representative and make the possible opportunities for data delivery more apparent to the clients.

**Conclusion 2: Implementation of Standards**

After speaking with standards experts at Credit Suisse and SWIFT, as well as looking at the locations of current implementations of ISO 20022, we determined that the global market is moving toward implementing ISO 20022. ISO 20022 is accepted and often preferred by vendors due to the XML format's large industry acceptance and availability of tools for its development. In addition, there is also a push toward incorporating the FIX standard into post-trade and PsN. FIX is a faster messaging system that has the potential for more post-trade field development, and could be more useful to both vendors and certain markets, such as APAC.

**Recommendation 2.1: ISO 20022**

**We recommend that Credit Suisse update their infrastructure to allow for the delivery of ISO 20022 through PsN from ISO 20022, despite larger file size.** Message parsers



will also need to be updated to accept ISO 20022's use of XML schema. These upgrades will be needed in the next few years to keep up with the current adoption of ISO 20022.

### **Recommendation 2.2: FIX**

**We recommend that Credit Suisse offer FIX messages through the PsN channel.**

While changing the software and infrastructure to allow for ISO 20022, FIX could be included as well. This would give an opportunity for real time data as well as faster processing with simpler messages. FIX also allows for connections to clients to be created faster and more efficiently avoiding the overhead of SWIFT.

### **Conclusion 3: Incorporation into Unified Business Plan**

According to multiple Credit Suisse employees, PsN is the only fully horizontally integrated data channel across all businesses. As PsN is unified with other applications in this new initiative, there are many possibilities for how it could be incorporated. PsN is a channel with very high quality raw data that could be used in many different ways to support a front-facing interface. Regardless of the functionalities developed for this new initiative, back-end data delivery from PsN will be a necessary component to allow for clients to be able to access information. PsN Light may also prove a valuable addition to the interface's list of features.

### **Recommendation 3.1: PsN**

**We recommend that PsN be incorporated into the new initiative as the data delivery channel.** PsN is the best choice as a fully horizontally integrated data delivery channel for the success of this new initiative.

### **Recommendation 3.2: PsN Light**

**We recommend that PsN Light be incorporated as a data processing and visualization offering into the new unified business plan.** Specifically, the True Advice<sup>®</sup> PDF generator could be an ability of this initiative that allows EAMs to create simple reports to print out for clients. As a streamlined integrated solution, this new initiative could replace the need for PsN Light. However, if it does not integrate this type of functionality, PsN Light should remain a separate application for smaller clients and middle-office calculations.

### **Conclusion 4: Big Data**

With recent trends in data mining and data enrichment, and with higher projected trends according to International Data Corp, data mining and data enrichment should be looked at

intensely for developing future initiatives (Rockel, 2012). These recommendations can help clients make faster and smarter decisions within the market. Credit Suisse sits on a large reserve of underutilized data that can be mined for value-added offerings. As a data channel, PsN provides a large amount of information from all business sectors. A great example of a data mining process flow is SWIFT's implemented business intelligence processing on its own network. Credit Suisse could do something similar, since PsN was designed as a parallel to SWIFT's proprietary network.

Where data mining can reveal trends valuable to Credit Suisse, further manipulation of data before its delivery to the client – data enrichment – can allow for clients to make faster and smarter decisions within the market. This would increase the value of the data provided through PsN while providing an in-house alternative to expensive third-party solutions.

#### **Recommendation 4.1: Data Mining**

**We recommend that Credit Suisse explore the use of data mining for future initiative implementation.** This topic could be investigated further and in a more technical fashion by either Credit Suisse themselves or a future WPI student group.

#### **Recommendation 4.2: Data Enrichment**

**We recommend that Credit Suisse investigate further avenues for enriching their own data from PsN and integrate this enriched data into the new unified business development.** Enriched data can reveal trends and provide market insight to empower clients.

#### **Conclusion 5: Organizational Change**

After working at Credit Suisse for seven weeks, we found several overall trends at the organizational level. After interviewing employees from several different business segments, we found that many feel that a greater communication between business groups is needed. In addition, greater understanding of PsN as a whole is necessary for it to be maintained in the future. Further maintenance should include eventual upgrades of core systems that are over thirty years old. We also found that the investment banking sector is a good source of upgraded technology, as they are often much more progressive with technology change.

As very few employees understand the entire technical process of PsN, more training is needed to ensure engineers fully comprehend the system for which they are developing. The core systems that currently run Credit Suisse financial messaging, as well as others, are often written

in COBOL, a language which is largely obsolete. This means that very few employees can read or write in this language.

In the financial industry, new technological developments are generally advanced by investment banking due to the sector's extreme emphasis on minimizing time-to-market. While some of these advancements trickle-down to the slower-paced PB&WM industries, this process generally takes years. With banks having branches for both investment and private banking, there is an opportunity for a greater exchange of ideas that may help quicken the pace of technological development in fields such as PB&WM.

Finally, there appears that there may be some disconnect between the implemented functionality of PsN and the functionality perceived by vendors. This was found during our discussion with Allocare, when their list of data channel functionalities (Figure 9) did not match what Credit Suisse currently offers through PsN.

#### **Recommendation 5.1: Understanding of PsN**

**We recommend that Credit Suisse increase understanding of PsN within Credit Suisse.** Either these systems need to be upgraded to a more modern language, or Credit Suisse needs to retain employees with a working knowledge of legacy programming languages.

#### **Recommendation 5.2: Cross-Business Collaboration**

**We recommend that Credit Suisse explore the incorporation of information from investment banking into the private banking and wealth management sector.**

#### **Recommendation 5.3: Vendor Miscommunication**

**We recommend that Credit Suisse investigate possible communication lapses between the bank and vendors.** This could be a miscommunication internally at Credit Suisse, or in the communication with the vendor.

#### **Final Remarks**

Financial telecommunication governs the exchange of information between the computer systems of banks, their clients and other financial institutions. The purpose of this project was to inform a major Swiss bank, Credit Suisse, of market trends and future potential in the sector of financial messaging systems. By interviewing internal and external clients of Credit Suisse, financial software vendors, and competing banks, we identified potential future improvements to Credit Suisse's current financial messaging system. Such results we found from our interviews

were: adding functionalities to PsN, upgrading to ISO 20022, heightened data analytics, incorporating PsN into the new unification initiative, and considering organizational change. Besides being utilized as an internal report for Credit Suisse officials, this project can provide deeper understanding of PsN's role within Credit Suisse to any of the clients, vendors, or other financial institutions who may be interested. In conducting this study, we discovered not only interesting trends in financial messaging that inform future developments for Credit Suisse, but also the impact of large IT development projects on an organization and the problems inherent with balancing business sense and technological advancement. Given our lack of experience in the areas of finance and computer science we may have missed certain technical aspects, but we hope that our outsider status may have brought other valuable perspectives. In the future, we see opportunities for teams of WPI students to further delve into the intersection of IT systems and finance in an MQP. MQP opportunities may cover the implementation of topics addressed in our report - such as data mining - or even tangential subjects such as front office trading. Whatever the subject of any future projects, we are sure that Credit Suisse will be as hospitable and helpful in the future as they have been during our study.

## References

- Bah, S., Küpfer, A., Wierdemann, D., & Drexelius, K. (2013). PsN Overview and Project Proposal: Credit Suisse.
- Bah, S., Küpfer, A., Wierdemann, D., & Drexelius, K. (2014). [Private swift Network (PsN) Overview and Project Proposal].
- Baldwin, C. (2013). European banks innovate to forge closer ties with customers online. *Computer Weekly*, 4-5.
- Bondugula, K. C., & Maiti, A. (2005). SWIFT: Can This Elephant Dance? *Journal of Internet Banking and Commerce*, 10(1).
- CaixaBank. (2013). CaixaBank launches “Wall” 2.0, aimed at driving growth in business banking.
- Credit Suisse. (2014). Credit Suisse EAM Technology - The High-End Platform for Independent Asset Managers. from [https://www.credit-suisse.com/externalassetmanagers/en/technologie/onlineloesungen/index\\_3.jsp](https://www.credit-suisse.com/externalassetmanagers/en/technologie/onlineloesungen/index_3.jsp)
- Credit Suisse Group AG. (2011). Credit Suisse Statement on Sustainability. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/responsibility/doc/sustainability\\_statement\\_en.pdf](https://www.credit-suisse.com/responsibility/doc/sustainability_statement_en.pdf)
- Credit Suisse Group AG. (2013a). Company Profile 2012. Retrieved Jan 21, 2014
- Credit Suisse Group AG. (2013b). Organizational Guidelines and Regulations of Credit Suisse Group AG and of Credit Suisse AG. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/governance/doc/organizational\\_guidelines\\_and\\_regulations\\_en.pdf](https://www.credit-suisse.com/governance/doc/organizational_guidelines_and_regulations_en.pdf)
- Credit Suisse Group AG. (2013c). Shareholder Structure. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/governance/en/shareholders\\_structure.jsp](https://www.credit-suisse.com/governance/en/shareholders_structure.jsp)
- Credit Suisse Group AG. (2014a). Credit Suisse At a Glance. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/who\\_we\\_are/en/at\\_a\\_glance.jsp](https://www.credit-suisse.com/who_we_are/en/at_a_glance.jsp)
- Credit Suisse Group AG. (2014b). Innovation in the Service of Clients. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/who\\_we\\_are/en/history\\_innovation.jsp](https://www.credit-suisse.com/who_we_are/en/history_innovation.jsp)
- Credit Suisse Group AG. (2014c). Milestones in the Company's History. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/who\\_we\\_are/en/history\\_milestones.jsp](https://www.credit-suisse.com/who_we_are/en/history_milestones.jsp)
- Credit Suisse Group AG. (2014d). Our Strategy. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/who\\_we\\_are/en/strategy.jsp](https://www.credit-suisse.com/who_we_are/en/strategy.jsp)
- Credit Suisse Group AG. (2014e). Public Policy-Sustainability. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/ch/en/about-us/who-we-are/public-policy/sustainability.html#tab\\_1](https://www.credit-suisse.com/ch/en/about-us/who-we-are/public-policy/sustainability.html#tab_1)
- Credit Suisse Group AG. (2014f). Shared Services. Retrieved Jan 21, 2014, from [https://www.credit-suisse.com/who\\_we\\_are/en/shared\\_services.jsp](https://www.credit-suisse.com/who_we_are/en/shared_services.jsp)
- Forbes Insights. (2011). Driving Global Wealth: Mapping ultra high net worth individuals around the globe. In Societe Generale Private Banking (Ed.).
- Han, J., Kamber, M., & Pei, J. (2012). *Data mining: concepts and techniques, third edition*. Waltham, Mass: Morgan Kaufmann Publishers.
- Huchzermeyer, L. (2014). Credit Suisse Group AG. from Hoovers <http://subscriber.hoovers.com/H/company360/overview.html?companyId=4079400000000>
- IBM. (2004). SWIFT Message block structure. Retrieved 2/1/2014, 2014, from [http://pic.dhe.ibm.com/infocenter/wbihelp/v6rxmx/index.jsp?topic=%2Fcom.ibm.wbia\\_adapter.s.doc%2Fdoc%2Fswift%2Fswift72.htm](http://pic.dhe.ibm.com/infocenter/wbihelp/v6rxmx/index.jsp?topic=%2Fcom.ibm.wbia_adapter.s.doc%2Fdoc%2Fswift%2Fswift72.htm)
- Investopedia. (2014a). Asset Management. Retrieved Feb 15, 2014, from <http://www.investopedia.com/terms/a/assetmanagement.asp>

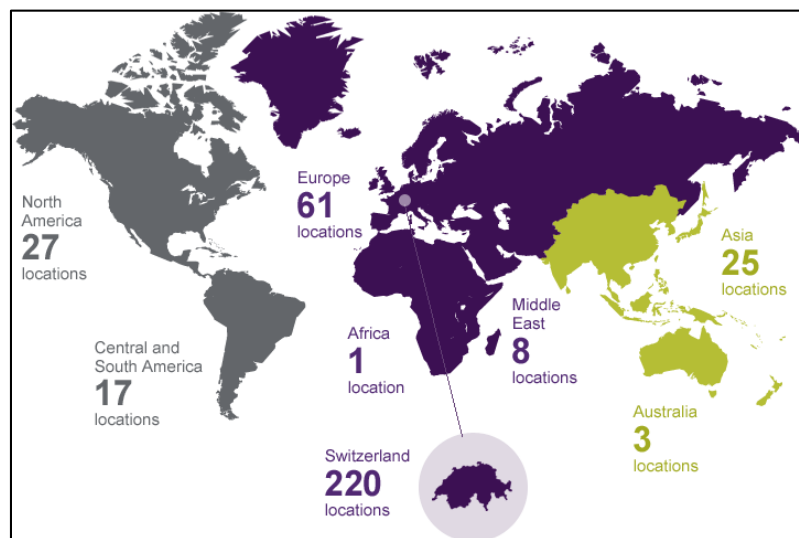
- Investopedia. (2014b). Corporate Finance. Retrieved Feb 15, 2014, from <http://www.investopedia.com/terms/c/corporatefinance.asp>
- Investopedia. (2014c). Family Offices. Retrieved Feb 16, 2014, from 1. <http://www.investopedia.com/terms/f/family-offices.asp>
- Jayasree, V., & Rethnamoney Vijayalakshmi Siva, B. (2013). A REVIEW ON DATA MINING IN BANKING SECTOR. *American journal of applied sciences*, 10(10), 1160.
- King, R. (2011a). 3 Tips for Maximizing Your Portfolio Management Software. *Journal of Financial Planning*(Mar/Apr 2011), 12-13.
- King, R. (2011b). Create a Portfolio Management Software Adoption Plan. *Journal of Financial Planning*(Jan/Feb2011), 24-26.
- Knapik, J. (2013). Ovum Decision Matrix: Selecting a Next-Generation Banking Digital Channel Platform. <http://www.oracle.com/us/corporate/analystreports/ovum-banking-matrix-2081885.pdf>
- Langley, A. (2002). Credit Suisse To Prop Up Insurer Unit. Retrieved Jan 21, 2014, from <http://www.nytimes.com/2002/10/03/business/credit-suisse-to-prop-up-insurer-unit.html>
- Lenzhofer, A., Reber, C., Diemers, D., & Kramer, S. (2013). Taking Wealth Management Digital: Booz & Company Inc.
- Lucchetti, A., & Solomon, J. (2009). Credit Suisse's Secret Deals. Retrieved Jan 21, 2014, from <http://online.wsj.com/news/articles/SB10001424052748704541004574600032631634884>
- Marlin, S. (2003). BofA to install secure messaging system. *Bank Systems & Technology*, 40(1), 34.
- Mediratta, B. (2007). The Google Way: Give Engineers Room. Retrieved April 22, 2014, from [http://www.nytimes.com/2007/10/21/jobs/21pre.html?\\_r=0](http://www.nytimes.com/2007/10/21/jobs/21pre.html?_r=0)
- Microsoft. (2011). Microsoft Drives ISO-XML Messaging Development Initiative With Bank of America, Merrill Lynch, Citi and SWIFT. Retrieved Feb 16, 2014, from <http://www.microsoft.com/en-us/news/press/2011/sep11/09-19msbamlcitixmlpr.aspx>
- PlanetSWIFT (Producer). (2013). SWIFT at Sibos- what's up in 2013. Retrieved from <http://www.youtube.com/watch?v=0-Z9hyfpYDw>
- Rockel, N. (2012, 2012/09/13/). Big data, big opportunities, Article, *Globe & Mail (Toronto, Canada)*, p. B8. Retrieved from [http://ic.galegroup.com.ezproxy.wpi.edu/ic/bic1/NewsDetailsPage/NewsDetailsWindow?failOverType=&query=&prodId=BIC1&windowstate=normal&contentModules=&mode=view&displayGroupName=News&limiter=&currPage=&disableHighlighting=false&displayGroups=&sortBy=&search\\_within\\_results=&p=BIC1&action=e&catId=&activityType=&scanId=&documentId=GALE%7CA302172140&source=Bookmark&u=mlyn\\_c\\_worpoly&jsid=67750fb124133ef90026fbb15aa58a7e](http://ic.galegroup.com.ezproxy.wpi.edu/ic/bic1/NewsDetailsPage/NewsDetailsWindow?failOverType=&query=&prodId=BIC1&windowstate=normal&contentModules=&mode=view&displayGroupName=News&limiter=&currPage=&disableHighlighting=false&displayGroups=&sortBy=&search_within_results=&p=BIC1&action=e&catId=&activityType=&scanId=&documentId=GALE%7CA302172140&source=Bookmark&u=mlyn_c_worpoly&jsid=67750fb124133ef90026fbb15aa58a7e)
- Schwarz, U. (2013). Banker's Business. In K. Schaad (Ed.): Credit Suisse.
- Scorpio Partnership. (2013). Futurewealth Report Part 3: Helpful Investment Technologies: SEI.
- Scott, S. V., & Zachariadis, M. (2012). Origins and development of SWIFT, 1973–2009. *Business History*, 54(3), 462-482. doi: 10.1080/00076791.2011.638502
- Standards Forum. (2013). ISO 20022 adoption mApp. Mobile application software
- SWIFT. (2012). 2012 Annual Review. (Journal, Electronic). <http://wpi.summon.serialssolutions.com/2.0.0/link/0/eLvHCXMwY2BQMEzSDI3TbEAXU6YDIxf80SzFCPLNEtTY1Mzk9TUJJQbIpBKczchBqbUPFEGKtFXEGcP3fKcZHjoGEa8obGJKegkLTEGFmCvOBUAbLEXNg>
- SWIFT. (2014a). Company Information. Retrieved Feb 1, 2014, from [http://www.swift.com/about\\_swift/company\\_information/company\\_information?lang=](http://www.swift.com/about_swift/company_information/company_information?lang=)

- SWIFT. (2014b). FIN. Retrieved Feb 10, 2104, from [http://www.swift.com/solutions/messaging/messaging\\_products/fin.page](http://www.swift.com/solutions/messaging/messaging_products/fin.page)
- Theron, E., & Terblanche, N. S. (2010). Dimensions of relationship marketing in business-to-business financial services. *International Journal of Market Research*, 52(3), 383-402.
- Trovato, E. (2012, 2012/02/01/). Features: Cover story - Automation and the human touch. *Professional Wealth Management*.
- UBS. (2013a). KeyTrader. Retrieved Feb 11, 2014, from [http://www.ubs.com/ch/en/online-services/experts\\_solutions/keytrader.html](http://www.ubs.com/ch/en/online-services/experts_solutions/keytrader.html)
- UBS. (2013b). UBS Connect: Solutions for Professional Users. from [http://www.ubs.com/ch/en/online-services/experts\\_solutions/connect.html](http://www.ubs.com/ch/en/online-services/experts_solutions/connect.html)
- UBS. (2013c). UBS Keylink: The global e-banking solution for professional clients. from [http://www.ubs.com/ch/en/online-services/experts\\_solutions/keylink.html](http://www.ubs.com/ch/en/online-services/experts_solutions/keylink.html)
- Wierdemann, D. (2014). PsN - Channels Workshop for PsN-Channel Definition: Credit Suisse.

## Appendix A-Sponsor Description

Credit Suisse is a publicly traded private banking, wealth management and investment banking company that was founded in 1856 in Zurich, Switzerland. Since then it has grown immensely with 46,400 employees in 530 offices in over 50 countries (Figure 10). Though Credit Suisse is highly influential in the global financial market, the company still exhibits qualities and values intrinsic to Swiss life, such as a constant focus on sustainability and innovation in everyday activities.

Figure 10: Global Presence (Credit Suisse Group AG, 2014b)



Alfred Escher was a politician, businessman, and pioneer who founded Credit Suisse (“Schweizerische Kreditanstalt”) on July 5, 1856. He founded the bank to finance the new railroad system, as well as to industrialize Switzerland. Initially, the stock was valued at almost three million francs, but in just 3 days the stock increased to 218 million francs. Over the last century and a half, the company completed many important mergers and acquisitions that fueled its continued growth (Credit Suisse Group AG, 2014c).

Since its beginnings, Credit Suisse has striven for innovation. In 1951, Credit Suisse was the first large Swiss bank to create a direct telex connection with New York. Throughout the 20<sup>th</sup> century Credit Suisse continued to integrate the latest technology in its operations and became the first Swiss bank to establish a drive-in banking system in 1961, a telephone banking service in 1993 and internet banking in 1997. While the company’s success has depended on the effective integration of technology to improve efficiency and quality of service, Credit Suisse has



also succeeded through careful project management, effective marketing, and a strong social commitment (Credit Suisse Group AG, 2014b).

Credit Suisse is a global bank that is divided into two sectors: the investment banking division, and the private banking and wealth management division. The Investment Banking Division primarily collaborates with larger companies on global investment ventures while the Private Banking and Wealth Management Division specializes in “the Swiss corporate and retail banking businesses and the global asset management business”(Credit Suisse Group AG, 2013b). Through these two streams of service, Credit Suisse has developed a plan of financial “bancassurance” – a fully featured model through which all of one’s banking needs can be met (Langley, 2002).

The Private Banking and Wealth Management Division specializes in onshore markets that develop quickly. It also contains a special unit for very wealthy individuals known as the ultra-high-net-worth individual client segment (UHNWI). On the investment banking side, Credit Suisse attempts to offer to their clients a package of services that is more robust than their immediate competition, including various equity, fixed income, and other advisory products (Credit Suisse Group AG, 2014d).

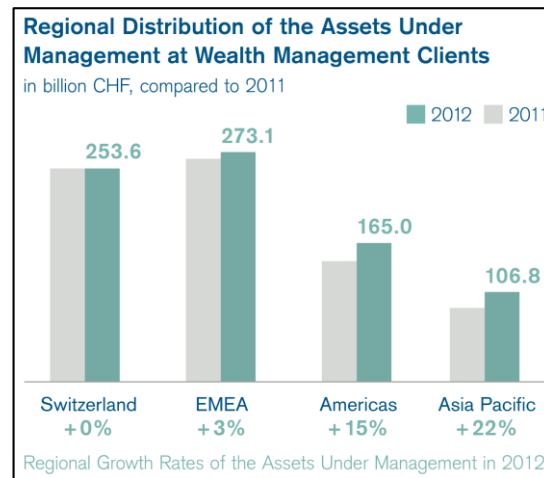
To help sustain and foster the growth the two banking sides of the business, Credit Suisse has a third, internal business division called Shared Services. The objective of Shared Services is to provide services such as Finance, Operations, and IT to help maintain high quality and performance within the other two divisions. Additionally, Shared Services acts as a mediator for cross-divisional ventures taken on by Credit Suisse and moderates the revenue generated by these collaborations (Credit Suisse Group AG, 2014f).

Credit Suisse conducts most of its business as an investment bank, meaning that it owns and sells stocks and debt in a large number of industry and financial companies around the world. From 2012 to 2013, Credit Suisse created 1.3 billion Francs of income for shareholders, relying on a portfolio of assets amounting to over 900 trillion francs in total. The company's largest holdings mostly span the industries of finance, energy and technology. This approach is notably different from other banks of similar scale which tend to take more conservative positions on technology and other young markets. Google, IBM, Exxon and UBS are among the largest stakes held by Credit Suisse. Qatar Holding LLC is the largest single shareholder in

Credit Suisse with 21% of total company shares and 17% of Credit Suisse shareholders reside or are registered companies in Switzerland (Credit Suisse Group AG, 2013c). Despite their large international footprint, Credit Suisse also attempts to keep a large portion of their assets under domestic control (Figure 11).

After the 2008 world financial crisis, the company resolved to set a stronger financial

Figure 11: Regional Distribution of Credit Suisse Assets, 2011



position in the future and restructured by merging two divisions within the investment banking branch. For their efforts, the Wall Street Journal noted that Credit Suisse had handled the financial crisis better than many competitors (Lucchetti & Solomon, 2009).

Credit Suisse emphasizes environmental sustainability in its operations and activities. In 2006 Credit Suisse became the first major company in Switzerland to be greenhouse gas neutral, and extended this neutrality to their operations worldwide in 2010 (Credit Suisse Group AG, 2014a). In 1997 they were the world's first bank to be certified in ISO 14001, an environmental management guide, and were recertified in 2012. In addition, Credit Suisse owns Uetlihof 2, the largest building in Switzerland built to the Minergie P environmental standard. This building's heating energy consumption is ten times lower than similar buildings built 30 years ago. Credit Suisse is also listed on the Dow Jones Sustainability Europe Index, Dow Jones Sustainability World Index and the FTSE4Good Indexes for their success in sustainability (Credit Suisse Group AG, 2014e)

To maintain their environmental sustainability practices, Credit Suisse employs a four-pillar strategy of optimizing operations, capital expenditure, substitution and compensation. They

use alternative energy sources (such as wind power, hydropower and solar energy) whenever available. Credit Suisse is also constantly optimizing operations to reduce their energy consumption and reduce greenhouse gas (GHG) and other emissions, and purchases high-quality emission reduction certificates to offset emissions that cannot be reduced by other means (Credit Suisse Group AG, 2014e). Their statement on sustainability states that they strive to include sustainability in their strategic policies and look at the long-term environmental and social sustainability of their decisions (Credit Suisse Group AG, 2011).

These efforts have made Credit Suisse a highly successful company, benefiting their shareholders, clients, and employees. The company's history of innovation continues to be upheld today, with its focus on sustainability and new Information Technology systems.

## Appendix B – Interview Instruments for Clientele

### Preamble: Internal Credit Suisse Clients

We are a team of students from Worcester Polytechnic Institute, in Massachusetts, USA, conducting research on banking in Switzerland as part of our degree requirements. We are working with Credit Suisse to determine how Private swift Network may be improved to even better serve its clients. During this interview, we will ask questions that draw from your experience at Credit Suisse. We have all signed the relevant Non-Disclosure Agreements, so you may be assured that any proprietary information discussed in this interview will not be shared outside the company. We would like your permission to use direct quotes from this interview in our report; we will maintain your confidentiality through the use of pseudonyms and the removal of identifying information if desired. At the conclusion of our project in May, we will submit a final report for review to Mr. Souleymane Bah, our sponsor liaison. Once he has assured us that no proprietary or otherwise restricted information is present in the report, our university will publish the report in the public domain.

### External Client Questionnaire

We are working to determine how Private swift Network may be improved to better serve clients.

We will maintain your confidentiality through full anonymity.

Thank you very much for your time. Your response is very valuable to our research.

1. What client type are you?

EAM

Family Office

Corporate

Institutional

Individual

Other

2. What is your age bracket?

18-29

30-49

50-69

70+

3. How familiar are you with financial messaging?  
Unaware      Aware      Some Understanding      Strong Understanding
4. How familiar are you with PsN?  
Unaware      Aware      Some Understanding      Strong Understanding
- a. How satisfied are you with the current level of functionality offered by PsN?  
Strongly Dissatisfied      Dissatisfied      Neutral      Satisfied      Strongly Satisfied
- b. What features do you think are PsN's greatest strengths? [ Short Answer ]
- c. What additional functionality would you like to see integrated in the future? [Short Answer]
5. How familiar are you with PsN Light?  
Unaware      Aware      Some Understanding      Strong Understanding
- a. How satisfied are you with the current level of functionality offered by PsN Light?  
Strongly Dissatisfied      Dissatisfied      Neutral      Satisfied      Strongly Satisfied
- b. For what purpose do you typically use PsN Light? [Short Answer]
- c. What features do you think are PsN's greatest strengths? [ Short Answer ]
- d. What additional functionality would you like to see integrated in the future? [Short Answer]
6. What portfolio management software do you use most often to connect to your financial data? [Short Answer]
7. Have you ever connected to your financial data through a bank other than Credit Suisse? [Y/N]
- a. If so, how have your experiences compared to that with Credit Suisse? [Short Answer]
8. What functionalities would you like to see in financial messaging in the future? [Short Answer]
9. When it comes to communicating to your clients about their investments, which of the following devices are important? [Multiple Choices]  
Laptop      Desktop      iPad/Tablet      Smartphone      Blackberry      Mobile
10. Of the previous devices, which is most important? [Multiple Choices]  
Laptop      Desktop      iPad/Tablet      Smartphone      Blackberry      Mobile

Thank you very much for your time. Your responses will be very beneficial to our research.

## Appendix C – Interview Instruments for Software Vendors

### Preamble: Software Vendors

We are a team of students from Worcester Polytechnic Institute, in Massachusetts, USA, conducting research on banking in Switzerland as part of our degree requirements. We are collaborating with Credit Suisse to determine how their Private swift Network may be improved to even better serve its clients. During this interview, we will ask questions that draw from your experience in the field. We would like your permission to use direct quotes from this interview in our report; we will maintain your confidentiality through the use of pseudonyms and the removal of identifying information if desired. Additionally, we will offer you the right to review any sections of our report containing information from this interview. At the conclusion of our project in May, our university will publish the report in the public domain.

### Vendor Interview Questions

- What is your position here, and what responsibilities does this entail?
  - What main projects or topics of interest do you work on?
- What software do you apply to Credit Suisse's financial messaging network, PsN?
- What functionality do you currently use from PsN?
  - What would you like to change or enhance in the current PsN solution?
  - Do you use any additional tools besides PsN due to missing functionality in PsN?
    - If so, what are they?
  - Based on current client trends, what functionality do you think will need to be added in the future?
- What is currently on the roadmap for your software? Are there major plans for features requiring new functionality from PsN?
- What financial messaging standards do you currently support?
  - What standards do you believe you will implement in the future?
- How does PsN compare to other private networks with which you have integrated?

## Appendix D – Interview Instruments for Competing Banks

### Preamble: Competing Banks

We are a team of students from Worcester Polytechnic Institute, in Massachusetts, USA, conducting research on banking in Switzerland as part of our degree requirements. We are working to complete a report on how banks communicate financial messages with each other and clients. In this interview, we will ask you questions that draw from your experience in the financial sector. We would like your permission to use direct quotes from this interview in our report; we will maintain your confidentiality through the use of pseudonyms and the removal of identifying information if desired. Additionally, we will offer you the right to review any sections of our report containing information from this interview. We are being hosted here in Switzerland by Credit Suisse, though our final report will be published in the public domain.

### Competitor Interview Questions

- What is your position here, and what responsibilities does this entail?
  - What main projects or topics of interest do you work on?
- What is your approach to internal financial messaging?
  - Do you utilize a private messaging network, or do you use existing networks offerings like that of SWIFT?
- What tools and services do you offer to connect clients to the data they need?
  - How client-facing are these tools and services?
- Based on the trends in client need where do you see the state of financial messaging networks in 1-2 years? 5+ years?
- How client directed was the mobile banking platform?
  - How do you get client feedback?
    - What functionality did clients want?
  - How is this system fed by back-end data channels?
  - Is the app push or pull?
    - What key features does the app offer?
      - How are you able to convince clients this is secure?

## **Appendix E – Interview Instruments for SWIFT and Academics**

### **Preamble: SWIFT and Academics**

We are a team of students from Worcester Polytechnic Institute, in Massachusetts, USA, conducting research on banking in Switzerland as part of our degree requirements. We are working to complete a report on how banks communicate financial messages with each other and clients. In this interview, we will ask you questions that draw from your experience in the financial sector. We would like your permission to use direct quotes from this interview in our report; we will maintain your confidentiality through the use of pseudonyms and the removal of identifying information if desired. Additionally, we will offer you the right to review any sections of our report containing information from this interview. We are being hosted here in Switzerland by Credit Suisse, though our final report will be published in the public domain.

### **SWIFT and Academics Interview Questions**

- What is your position here, and what responsibilities does this entail?
  - What main projects or topics of interest do you work on?
- What is your opinion of private financial messaging networks used internally by financial institutions?
  - How prevalent are these systems?
  - How have these systems impacted SWIFT over the years?
  - What are the functional differences between proprietary internal systems and SWIFT's network?
- How readily is ISO 20022 being adopted?
  - What are the developmental challenges of implementing an XML-based standard?
- What functionalities do you believe will be included in financial messaging systems in the future?
  - What functionalities could become obsolete?



## Appendix F – Timeline of Tasks

Timeline	Week 1							Week 2							Week 3							Week 4							Week 5							Week 6							Week 7																																																																																			
	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S																																																																													
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SWIFT Interviews								█																																																																																																																						
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	March														April														May																																																																																																	
<b>Assignment Due Dates</b>	Project Meeting							Revised Goals and Objectives							Project Meeting							Assessment of Lit Review							Project Meeting							Revised Intro & Methods							Project Meeting							Final Lit Review & References							Project Meeting							Interim Presentation for WP1 Prelim. Findings, Conclusions							Project Meeting							Draft Report							Draft Abstract & Summary							Final Presentation Rehearsals							Final Presentations							Final Presentations							Final Report							Final Submission						

## Glossary

- APAC-Asia-Pacific
- CGI – Common Global Implementation
- CSV – Comma Separated Values
- COBOL –COmmon Business-Oriented Language
- B2B – Business to Business
- B2C – Business to Client
- EAM – External Asset Manager
- FIX – Financial Information eXchange
- ISO – International Standards Organization
- PB&WM- Private Banking and Wealth Management
- PMS - Portfolio Management System
- PsN – Private swift Network
- SIBOS – SWIFT International Banking Operations Seminar
- SWIFT – Society for Worldwide Interbank Financial Telecommunications
- TELEX – Teleprinter exchange networks
- TCO – Total Cost of Ownership
- TNB – Trans-National Bank
- UHNWI – Ultra High Net Worth Individual
- XML – Extensible Markup Language