SAP Systems Integration at Vattenfall Nordic
by
SAP NetWeaver PI

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Master Thesis[1]

[1] This thesis corresponds to 20 weeks of full-time work for each of the author

Abstract

Thesis work presented in this paper is a 20 weeks full-time work of a master student at The Royal Institute of Technology (KTH) under the supervision of Gustaf Juell-Skielse from KTH and Arash Rassoulpour and Alaa Karam from Vattenfall AB. The main area of investigation is SAP Netweaver PI and its usability in enterprise SOA landscape.

Today in the energy market, corporations are trying to achieve well integrated, smoothly working IT systems to support their business operations. Moreover, they are looking to reduce IT costs, make IT systems independent from vendors and increase the agility and efficiency. With the introduction of Enterprise Service Architecture (ESA), which is in fact the acronym of Enterprise Service-Oriented Architecture (SOA), IT will transform from an operational concern to a strategic weapon for large energy companies. But the humbling challenge is that, how to use this keen edged knife without hurting ourselves?

The European energy market is currently subject to the political regulations of ”Unbundling” and ”Consolidation” which require the physical division of sales and distribution systems while on the same time increase the need for systems integration. Since SAP NetWeaver PI is SAP’s system integration platform and prerequisite for some SAP application, a research must be done in order to examine how successful SAP NetWeaver PI is in real life. SAP’s and SAP NetWeaver PI’s background are analyzed. Lastly, all the final results are summarized in conclusion and discussion parts.

Key words

SAP; SAP NetWeaver PI; Systems Integration; Process Integration; Enterprise SOA

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We made it...

1. Introduction

Many things have been said about ERP systems and their functionalities, but not lot researchers made real life experiments. *In theory, there is no difference between theory and practice. But, in practice, there is (Jan L. A. van de Snepscheut (1953-1994).)* That's why a real life research about how ERP systems integrated to each other and what are the limitations of this interoperability must be analyzed.

Enterprise Resource Planning (ERP) systems are large, company wide softwares and have lots of different functionalities. Such as, supply chain management, financials, HR and so on. But all of these separate parts of ERP systems must work together to fulfill companies business operations. In a company, which ERP systems are perfectly installed and integrated to each other, a manager opens a single ERP application to find data about any aspect of the business, from HR to financials or from sales to distribution. But unfortunately, we are not there yet, at least most of the companies aren't. An example of this is that; "*there still tends to be a lot of disparate components that are either homegrown or older packages*" says Forrester analyst Paul Hamerman.

At Vattenfall, Business Services Nordic (VBSN) has a responsibility to establish and maintain their clients ERP systems integration. Current integration landscape is quite complex and uses different methods and technologies. Some connections are established by point-to-point, internally developed methods or third party integration platforms, such as Microsoft BizTalk. Such complicated integration methods make maintenance and support difficult and decrease the interoperability of ERP systems. That's why a unique integration platform would be beneficial in terms of maintenance and interoperability as well as increased business agility.

Vattenfall Nordic defined an integration strategy 4 years ago and selected Microsoft BizTalk as an integration platform. But, since then lots of things changed in the market and now SAP has one of the most powerful integration platforms called, SAP NetWeaver

Process Integration (SAP NetWeaver PI). Moreover, if a company uses large number of SAP instances, why not to use an integration platform from the same vendor?

The aim of this study is therefore to examine the possibility of using SAP NetWeaver PI as one common integration platform at Vattenfall Nordic. The main research question will consequently be:

Should Vattenfall Nordic use SAP NetWeaver PI as one and only integration platform or not? If yes, where and how to start using SAP PI?

Vattenfall Business Services Nordic (VBSN) is seen as an internal, shared services department, which takes care of integration issues. Also, VBSN has high importance for Vattenfall at group level in terms of ability to solve complex systems integration problems. Therefore the investigations should result in improved performance not just locally but in an enterprise level.

1.1 Problem

Vattenfall AB has lots of SAP installations both in Nordic and other offices at Europe. To get the maximum value out of SAP investments, other IT systems and SAP systems must be connected to each other. Both the company’s business strategies and the market regulations force Vattenfall to re-arrange their IT strategies. Moreover in this new IT landscape integration plays a key role. Since Vattenfall has broad range of SAP instances installed, an integration solution from the same vendor could be beneficial for them. But, the question is that; should Vattenfall use SAP NetWeaver PI or continue to stay at Microsoft BizTalk? If the research recommends them to use SAP PI, how and where to start using it in their current IT landscape?

1.2 Goal

The result of this research must help large corporations and future researches to have understanding of systems integration as an enabler of SOA and how SAP NetWeaver PI can play a role in this picture. Also, finding critical success factors for a successful SAP PI installation and innovative SOA are also goals of this thesis among others.

1.3 Vattenfall Nordic AB

Vattenfall Business Services Nordic AB (VBSN) is a shared services department under the Vattenfall Nordic business group. Main duties of VBSN are that, providing support to other Vattenfall departments for their business operations, taking care of ERP systems and integration. VBSN is not for profit, it is a shared services department, which means all income comes from other departments and money must be used to serve IT to those business units.

As a result of group level decision, VBSN is using Microsoft BizTalk as an integration platform. But, today Vattenfall AB is a heavy user of SAP and has large number of SAP installations. Since SAP NetWeaver PI is an internal system from SAP, Vattenfall Business Services Nordic wants to make a research if they should use SAP NetWeaver PI instead of BizTalk or not?

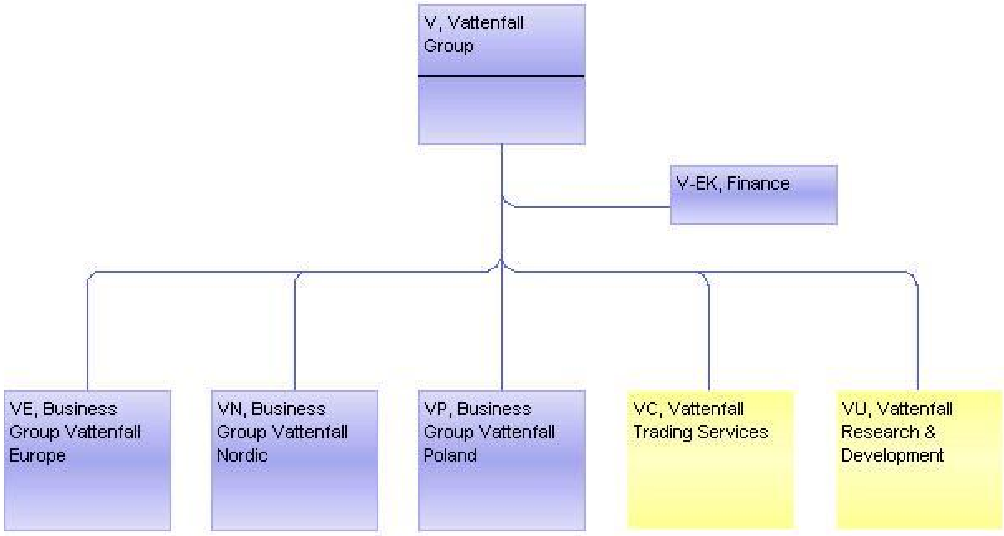

Figure 1: Vattenfall Group level organizational structure

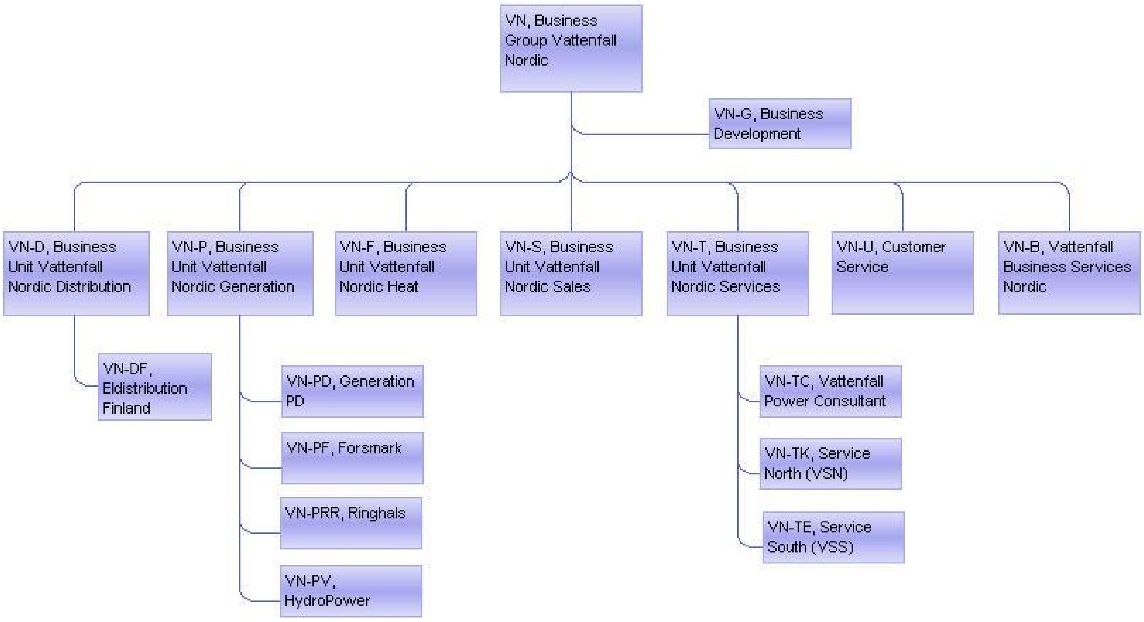

Figure 2: Vattenfall Nordic organizational structure

Detailed info about Vattenfall Group and their market can be found in background part**.**

1.4 Purpose

Large corporations spend millions of dollars for their IT systems and SAP plays a key role in this picture. Organic growth, mergers and acquisitions cause companies to continuously add new systems to their IT arsenal. But this situation forces companies to have high ability of systems integration and Vattenfall is not an exception. Even if the company made an integration platform decision they still need to understand SAP NetWeaver PI. So the intended benefits of the research are that, investigate how important the SAP NetWeaver PI for systems integration and how to get maximum benefit out of SAP investment by using SAP NetWeaver PI. Intended beneficiaries are large energy companies, SAP integration teams, systems architects, CTOs, SAP customers and future researchers.

1.5 Delimitation

Research for integration platforms does not aim to analyze all the possible integration methods or technologies available in market. The biggest investigation area is how to use SAP NetWeaver PI at case study company while they are already using Microsoft BizTalk as their main integration platform. Because of the fact that the company is a heavy SAP user, a research must be done to understand the integration platform from the same vendor. On the contrary; detailed, technical research about Microsoft BizTalk is not in the scope of this work. However a high level comparison is done to find the best practices about SAP NetWeaver PI and MS BizTalk.

Decision making process for this study has many interconnected variables that have to be limited to get a viable result at the end. This delimitation was decided because of the vast amount of information available for vendors and their integration technologies. However, a detailed benchmarking of different vendors could be of interest for future research.

1.6 Disposition

This report is divided into five main chapters; introduction, background, result, discussion and conclusion. First chapter describes problem, goals of this study, purpose and scientific methods that have been used in this research. In background part, Nordic energy market, Vattenfall, SAP NetWeaver PI, Microsoft BizTalk, SOA and integration platforms are described briefly. Based on the information about future Nordic energy market, SAP PI background and Vattenfall's application landscape, a hypothesis is built by the researcher. In the results part, outputs of stakeholder interviews, meetings with third party groups like SAP, Microsoft, Consultancy companies, and other energy companies are examined along with Vattenfall Nordic integration strategy. In discussion section, results of the research about SAP PI is analyzed and discussed by using TALC model. Moreover, critical success factors are introduced and suggestions are made to have a successful integration implementation. The final chapter concludes the result of research and gives recommendations about future work.

1.7 Method

Data used in this master thesis has been gathered both from primary and secondary resources. As Repstad[2] (1993) explains the difference between primary and secondary data; primary source of data are closer to the main source than secondary source of data. So they are counted as highly reliable data. On the other hand, Repstad strongly mentioned that secondary data is necessary because it provides the researcher with the required background and domain knowledge needed to be successful at academic researches. Referring to the graph below, research process used in this master thesis can be seen.

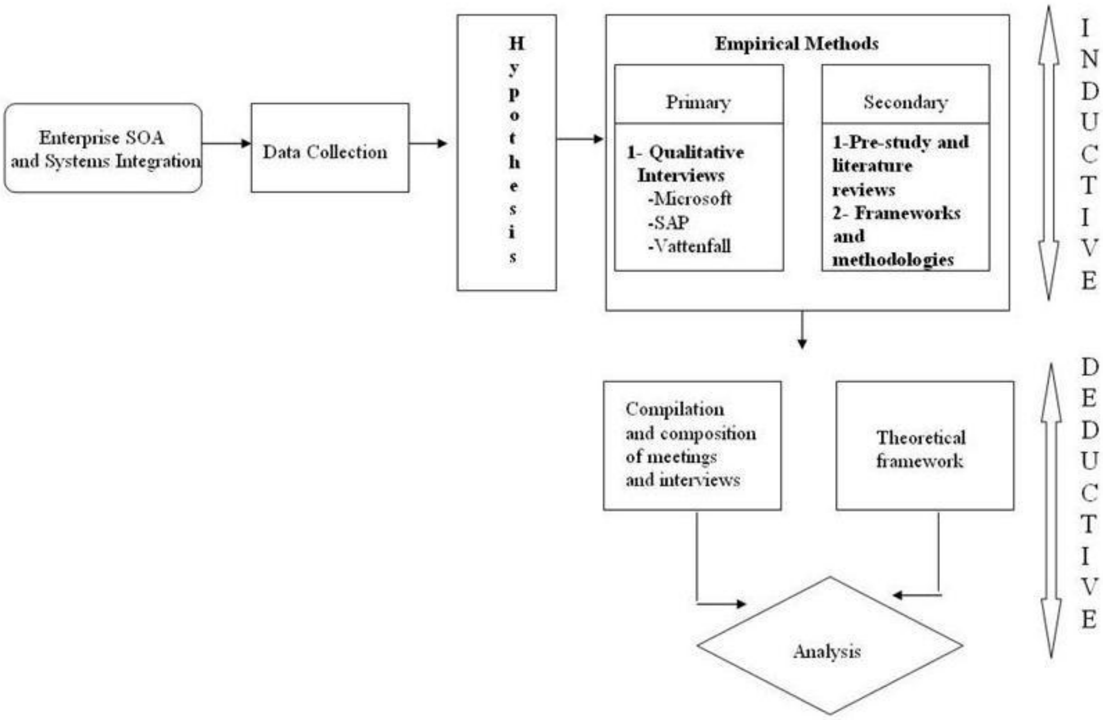

Figure 3: Schematic picture of research methodology

[2] Repstad, P. (1993). Närhet och distans – Kvalitativa metoder I samhällsvetenskap. Lund: Studentlitteratur.

Since entire research is based on data collection from primary and secondary sources, it was one of the essential parts of work. The data employed in this study has originated from both primary and secondary sources of data. In the following sections the scientific approaches adopted when collecting the data will be presented, in concert with the techniques applied for compiling and analyzing the data. Research starts by using inductive methods because the literature also demonstrates that *inductive methods encourage researchers to adopt a deep approach to learning (Ramsden 2003; Norman and Schmidt 1992; Coles 1985) and that the challenges provided by inductive methods serve as precursors to intellectual development (Felder and Brent 2004[3])*. Since the researcher had no previous knowledge about SAP PI and systems integration this kind of scientific method was the best option to start with. Secondly, the researcher built hypothesis based on the date gathered by inductive methods, such as interviews and literature reviews. At the third part of the research deductive method is used to move on to a more specific conclusion. Also, hypothesis built at second part of the research has been evaluated. Deductive method, which is used at third part of this research can be described as *"drawing conclusions by applying rules or principles; logically moving from a general rule or principle to a specific solution" (Woolfolk, 2001, p. 286)[4]*

1.7.1 Pre-Study

In order to build up a framework of what SAP PI, SOA, systems integration are, the research started with the reviewing previous works and academic literature as well as searches on internet. To have deeper understanding of SAP, SOA and systems integration domains, large amount of data has been collected from academic articles, e-books, physical books, KTH library, Handelshögskolan library, Lund University Library and internet. On top of that, interviews with consultants and IT managers from Microsoft, SAP, Gartner, EON[5], Colada AB[6] and Vattenfall AB have been done to get the deeper understanding of research topics. At the beginning of the research keywords while using

[3] http://www4.ncsu.edu/unity/lockers/users/f/felder/public/Papers/Inductive(JCST).pdf last accessed 30 March 2009
[4] Woolfolk, Anita. 8th ed. *Educational Psychology*.Boston: Allyn and Bacon, 2001
[5] http://en.wikipedia.org/wiki/E.ON last accessed 23 April 2009
[6] http://www.colada.se/ last accessed 29 April 2009

pre-study, were quite broad and general. But during the progress of the research they started to be more specific and focused more in to the specific research domain.

1.7.2 Interviews

To collect the empirical data, several different methods were introduced. One approach being considered was to primarily use the case studies from different sectors and companies. Because of the varying level of information from different sectors or companies would be confusing, this method has not been used for all of the companies. Instead direct conversations within the case study company, Vattenfall Nordic AB, and another energy company EON, are used to gather information for foundation of research. In addition to this pre-studies and literature reviews are used as secondary source of information. This method is also argued by Repstad[7] (1993) in a way that combining primary and secondary sources of data can be helpful to produce innovative and neoteric knowledge.

1.7.3 Hypothesis Building and Testing

As Udo Kelle (1995) argued that *qualitative researchers who work with large amounts of unstructured textual data, like interviews, field protocols or personal documents, regularly face serious data management problems*. To avoid such kinds of problems and limit the research topic in order to achieve a viable result, one of the best ways is to start with a hypothesis after the initial research and test the hypothesis at discussion and conclusion parts.

1.7.4 Analysis

Empirical data can be summarized as almost 20 hours of recorded materials, 60 pages of meeting reports and 30 pages of typed notes from the interviews, meetings and teleconferences. According to Merriam (1998) it is crucial in qualitative research to analyze the findings continuously. Similarly, the researcher fallowed this suggestion by having weekly meetings with academic supervisor and industry supervisor. By having regular meetings, the researcher has also started his analysis and hypothesis building

[7] Repstad, P. (1993). Närhet och distans – Kvalitativa metoder I samhällsvetenskap. Lund: Studentlitteratur.

based on what his supervisors said. At the end, the researcher analyzed his hypothesis and make final comments.

2. Background

2.1 Vattenfall AB Background

Vattenfall AB is Europe's fifth largest generator of electricity and the largest producer of heat[8]. Vattenfall's vision is to be a leading European energy company, and the main products are electricity and heat. Vattenfall operates in all parts of the electricity value chain: generation, transmission, distribution and sales. Vattenfall also generates, distributes and sells heat, and conducts energy trading and lignite mining. Operations today are conducted in Sweden, Denmark, Finland, Germany and Poland. The Group has slightly more than 32,000 employees[9], and the Parent Company, Vattenfall AB, is 100%–owned by the Swedish state.

Vattenfall is using SAP systems as their main ERP solutions for many long years and these systems have huge amount of information about almost every thing related with Vattenfall and its business.

2.2 Vattenfall's markets

Company operates mainly in Nordic, Germany and Poland. Vattenfall produces a bit more than 20% of the electricity that is used in the Nordic countries[10]. Nuclear and hydropower are the primary sources of electricity for Vattenfall. Electricity is sold to slightly more than 1 million customers in the Nordic countries[11]. On the other hand, Vattenfall is also a major producer of heat, mainly based on biofuels, and sells district heating. Besides that, on February 23, 2009 Vattenfall group announced that they are

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8 http://www.vattenfall.com/www/vf_com/vf_com/Gemeinsame_Inhalte/DOCUMENT/360168vatt/5965811xou/623030keyx/816179fact/P02.pdf last accessed 21 March 2009

9 http://www.vattenfall.com/www/vf_com/vf_com/365787ourxc/365819keyxf/index.jsp last accessed 21 March 2009

10 http://www.vattenfall.com/www/vf_com/vf_com/365787ourxc/365819keyxf/index.jsp last accessed 21 March 2009

11 http://en.wikipedia.org/wiki/Vattenfall last accessed 21 March 2009

buying Nuon[12], which is a Dutch utility company that produces, sells and delivers electricity, gas, heat and additional services. By buying Nuon, Vattenfall's business goal is to become one of the largest energy companies in Europe. Vattenfall also conducts consulting and contracting activities, mainly in the energy sector.

2.3 Future of Nordic Energy Market

The issue of creating common Nordic end-user market for electricity is of large importance. The Energy Markets Inspectorate[13] (EI) is working with this issue within NordREG[14], a cooperative organization for Nordic regulatory authorities in the energy field in Scandinavia.

Most of the management team in Vattenfall believes that the Nordic electricity market will be consolidated in the future. The next step will be consolidation of European electricity market. Giving an example, a person who lives in Sweden will be able to buy electricity from a Finnish company or a person from Finland will be able to change his/her electricity provider to a Danish or Swedish one.

Future common market approach forces Vattenfall to connect all of its local offices in different countries. In addition to this, a high degree of flexibility within these countries' IT systems and ability to connect external parties are crucial for the future success of Vattenfall.

While a consolidation is required, at the same time a separation is an obligation from market regulators. This is about disconnecting sales and distribution. This means for Vattenfall is that, two separate physical installations of ERP systems, one for sales and another for distribution or an authentication mechanism within the same ERP systems to distinguish sales and distribution data. As a summary, while market will be consolidated, a split will be occurring in another dimension. This is a clear example of how market

[12] http://en.wikipedia.org/wiki/Nuon_(company) last accessed 21 March 2009
[13] http://www.energimarknadsinspektionen.se/Energy-Markets-Inspectorate/ last accessed 21 March 2009
[14] https://www.nordicenergyregulators.org/ last accessed 21 March 2009

regulations affect energy companies and force them to change their IT strategies. Due to this reason, agility is crucial for the competitiveness and market leadership.

2.4 Unbundling

As of July 2007, European electricity and gas market were opened up for high competition. The main reason for doing this was that, to create dynamic and highly competitive electricity and gas market resulting in much lower prices for end users. Also, this new regulation was the latest milestone of electricity and gas market liberalization.

Currently, The European Commission (EC) rule enforces legal unbundling[15] *between the transmission networks (electrical grids and gas pipelines) and the unregulated activities (generation, wholesale market operations, trading and retail).*

Since Vattenfall is one of the biggest players in the Nordic energy market, it is for sure that market regulations will have huge impact on Vattenfall's business and consequently on IT strategy. One of the obvious effects is that, Vattenfall have to separate the sales and distribution data. This can be done in two different ways. Either physical separation of MySAP ISU or an authentication mechanism within the same SAP system is required. When the unbundling happened, there will be a large need of SAP systems integration. Even if we are talking about a separation, there are still lots of parties involved in electricity market and there needs to be changed lots of data.

2.5 Background of SOA

Service Oriented Architecture (SOA) offers approaches for systems development and integration where systems group around their business processes and able to provide

[15] Legal unbundling means that the entities have to be separated in order to avoid any cross subsidies between regulated activities and unregulated activities. The regulated entities have also to ensure a non-discriminatory treatment of all market players and their tariffs are reviewed and approved by the regulator. However, regulated and unregulated units can belong to the same company. Usually, the regulated activities have been established as subsidiaries of the vertically integrated utilities.

these processes as interoperable services. In addition to this, ability to exchange data with one another as they participate in business processes has a great importance for SAO methodology. Also, service orientation aims at a loose coupling of services with operating systems, programming languages and different technologies.

SAO can be analyzed from business perspective and technical perspective. From business perspective, SOA is said to improve agility, allow flexibility and rapid adoption of IT systems to changing business demands. On the other hand, technical perspective emphasizes the model of the actual structure of the architecture. "*A service-oriented architecture provides the flexibility to treat elements of business processes and the underlying IT infrastructure as secure, standardized components (services) that can be reused and combined to address changing business priorities. (Bieberstein et. al., 2006, p. 4)*". On the other hand, this description looks SOA methodology from business point of view. "*An application architecture in which all functions or services are defined using a description language and have callable interfaces that are called to perform business processes. Each interaction is independent of each and every other interaction and the interconnect protocols of the communicating devices. Because interfaces are platform independent, a client can use the service from any device using any operating system in any language. (Bieberstein et. al., 2006, p. 4-5)"*

2.6 Background of ERP systems and SAP

As Li Fang and Sylvia Patrecia (2005)[16] described previously, *ERP systems link together an organization's strategy, structure, and business processes with the IT system.* An ERP system can have variety of different responsibilities such as supply chain management, manufacturing, plant maintenance, financials, project management, human resources and customer relationship management. Today most of the modern ERP systems designed to support SOA architecture, a landscape towards integrated systems and web services-based business activities. A common database and a modular software design are just few key aspects of these new ERP systems. The reason behind a common database is to allow

[16] http://www.essays.se/essay/cbbfa90858/ last accessed 21 March 2009

every department of a company to use and store data when ever they need. In addition to this, systems governance, flexibility and agility are crucial success factors among others. Some of the key points behind modular system design are; business units can select modules they need, mix them if they need and publish new modules for common use within company to improve business performance.

One of the most successful ERP systems providers in the market today is SAP. SAP is generally used to call both the name of the company and the ERP system from company. SAP AG is the largest European software enterprise and the fourth largest in the world, with headquarters in Walldorf, Germany[17] [1]. It is best known for its SAP Enterprise Resource Planning (ERP) software. SAP focuses on six industry sectors: process industries, discrete industries, consumer industries, service industries, financial services, and public services [2]. It offers more than 25 industry solution portfolios for large enterprises [3] and more than 550 micro-vertical solutions for midsize companies and small businesses [4].

For the last few years SAP is hardly pushing to SOA architectural approach. SAP's goal is to increases flexibility, adaptability, openness and agility. SAP wants to help companies reuse software components and not have to rely as much on in-house enterprise resource planning technologies. According to a press fact sheet from SAP, "*SAP is the only enterprise applications software vendor that is both building service-orientation directly into its solutions and providing a technology platform (SAP NetWeaver) and guidance to support companies in the development of their own service-oriented architectures spanning both SAP and non-SAP solutions*[18]"

Ideally, systems within a company are integrated both internally and with external business partners. SAP's middleware product, which is used to integrate systems to each other, is called SAP NetWeaver Process Integration (SAP PI). This product formerly known as SAP Exchange Infrastructure (SAP XI). SAP PI is used for integration of

[17] http://en.wikipedia.org/wiki/SAP_AG last accessed 21 March 2009
[18] http://www.sap.com/about/newsroom/index.epx last accessed 21 March 2009

different versions of SAP and non-SAP systems implemented on different platforms. The latest version of SAP NetWeaver Process Integration (SAP PI) 7.1 is one of the key building blocks of enterprise SOA architecture provided by SAP and has a crucial mission in SAP's ESOA landscape.

2.7 What is an integration platform?

Today in the market every organization has found lots of compelling reasons to integrate their IT systems. Some of the companies have realized that sharing order and shipment information in real time or enabling high degree of information reusability can give them a competitive advantage. Of course lots of others have come up with equally compelling diverse reasons or scenarios. For example for a company in energy market, like Vattenfall, there exist lots of external parties involving in different part of the business. In such a huge sector companies need to share business critical information both internally and externally. To do that, companies use integration platforms. Most common characteristics of integration platforms are; supporting the systems that were not designed to work together and accommodate verious data types that may be dissimilar or incompatible. Last but not least, they support the way the business operates, not the other way around.

If an enterprise can succesfully integrate their IT systems, this can reward the organization with significant cost, resource, and time savings. In addition to this, integration allows information to operate better and smarter, increase the speed of business agility, and facilitating seamless information processing. Although a large number of integration solutions, methods are available in the market today, most common ones are;

- SAP Process Integration (SAP PI - SAP XI)
- Microsoft BizTalk[19]
- Web methods[20]
- IBM MQSeries/WebSphere[21]

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[19] http://www.microsoft.com/biztalk/en/us/default.aspx last accessed 29 March 2009
[20] http://en.wikipedia.org/wiki/WebMethods_Integration_Server last accessed 29 March 2009

- Mercator[22]
- Oracle fusion[23]
- Point-to-Point integration

2.7.1 Why an integration platform?

A good answer to this question is to make an analysis of integration landscape that exists in most IT departments today. An interface that is used to connect different systems is generally peer-to-peer, custom-coded, and expensive to maintain. Moreover, if one were to ask, "Where can I find information about a particular interface" the answer would be generally hazy at best: some document in some dusty folder on some forgotten shelf, somewhere in the mind of the developer or it would be a few lines of comment at the front of a custom program. Obviously, this is not a good situation to be in for an integration department in a company. A basic mathematical calculation clearly shows the drawback of point-to-point integration method or internally developed solutions.

If the economic implication of this approach is examined, it will be clearly seen that when the numbers of connected parties increased, the integration system will be much more complicated and disorganized.

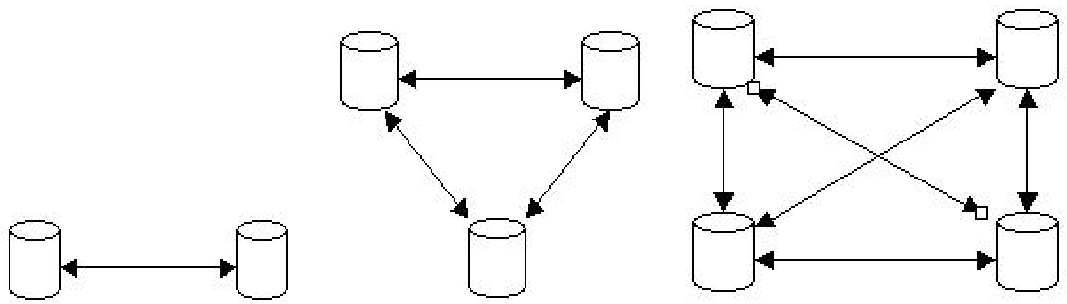

Figure 4: Point-to-Point connection

Every time a single node is added to the system, more then one connection must be build in order to communicate with all the other parties. When the numbers of nodes increased so the numbers of new links required will increase dramatically. More clearly, connecting every node to all other nodes will require P*(P-1)/2 physical connection and P*(P-1) new

[21] http://www-01.ibm.com/software/integration/wmq/ last accessed 29 March 2009
[22] http://h71028.www7.hp.com/enterprise/cache/4270-0-0-225-121.html last accessed 29 March 2009
[23] http://en.wikipedia.org/wiki/Oracle_Fusion_Middleware last accessed 29 March 2009

interfaces, where P is the total number of nodes. So, it is quite obvious that for large companies point-point connection is not the best alternative.

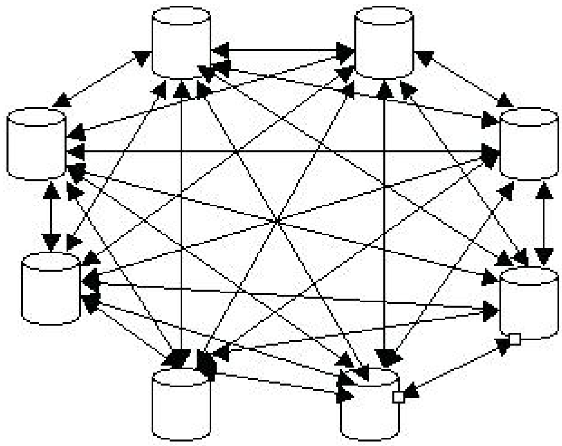

Figure 5: Complexity of Point-to-Point Connections

There are several different kinds of consolidation, from one single integration platform with common management, to separate integration platforms, utilizing different technologies and completely independent management. From a strict financial perspective it is probable most economic with a long driven consolidation and standardization.

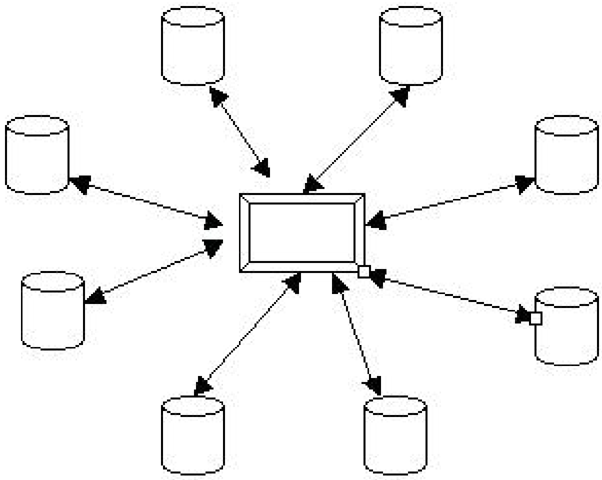

Figure 6: Simplicity of Using an Integration Platform

Business drivers for integration platforms are:

- Using an integration platform enables a high degree of re-use, which is not available to point-point-solutions.
- A homogenous technology platform will reduce testing costs when integration platform is changed, e.g. version upgrades.
- A higher service level since service hours can be distributed over a larger staff.
- Economy of scale in terms of; staff costs, hardware and software support cost, etc.
- Statistical performance leverage. The available resources can be more evenly distributed over load peaks and result in an overall better performance.
- Enabling a higher level of competence within employees. Less need for external expertise, since the critical mass for specialization can be reached internally.

However, there will always be practical reasons that hinder the highest levels of consolidation. There should not be any negative impact on the delivered service.

Examples of what hinders consolidation of integration platforms are:

- For a large company like Vattenfall, different business flows for every department.
- Legal constraints. There are national laws, which stop the free transfer and storage of data.
- IT security issues, such as mandatory network segmentation in order to protect sensitive data to be transported on network, which are considered less safe.

2.7.2 SAP NetWeaver PI (XI)

SAP NetWeaver Process Integration (SAP PI) is SAP's enterprise application integration (EAI) software, a component of the NetWeaver product group used to facilitate the exchange of information among a company's internal software and systems and those of external parties[24]. SAP Process Integration (SAP PI) formerly known as SAP Exchange Infrastructure (SAP XI) is an integration platform to provide a central point of integration

[24] http://en.wikipedia.org/wiki/SAP_Exchange_Infrastructure last accessed 30 March 2009

for all systems. SAP PI, a powerful middleware by SAP, provides seamless end-to-end integration between SAP and Non-SAP applications.

SAP PI supports B2B (Business to Business) as well as A2A (Application to Application) exchanges, supports Synchronous and Asynchronous message exchange and includes a built in engine for designing and executing Integration Processes. SAP PI integration perspective for various types of integrations will be analyzed but before that a high level architectural overview of SAP PI must be analyzed.

SAP PI is the central point of other NetWeaver components and plays an important role for SAP's SAO strategy. SAP PI is in the market for almost 6 years now and has about 2500 active users. One interesting fact about SAP PI is that; about 99% of its users are SAP customers.

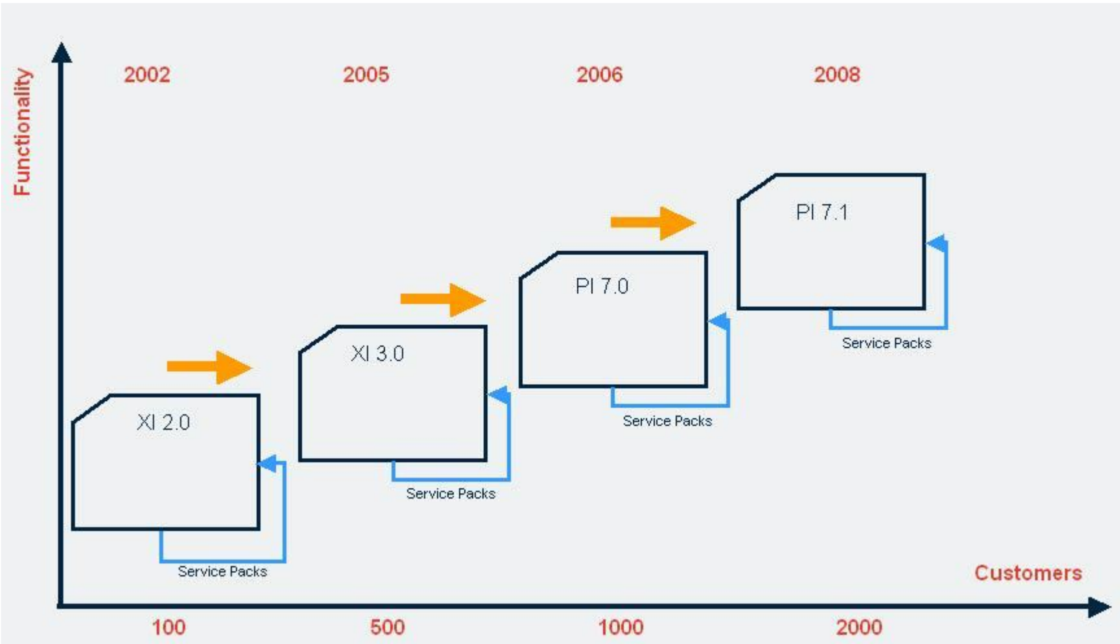

Figure 7: History of SAP NetWeaver PI

SAP NetWeaver Process Integration (SAP NetWeaver PI) is SAP's implementation of SOA Middleware. SAP NetWeaver PI provides the SOA foundation capabilities. Using SAP NetWeaver PI, customers can leverage enterprise services delivered by SAP and also enable their existing investments in third-party and legacy applications by integrating them into their landscape and also service enabling the functions delivered in these applications.

PI is well suited to connect SAP instances with each other. SAP PI provides an integrated workflow engine that allows defining adapters to non-XML protocols and mappings to convert data content from source to target format. Besides these XI-PI components are required parts of some NetWeaver products and has to be used for some SAP-to-SAP connections.

In addition to this, SAP PI is coming together with a lot of pre-built integration scenarios, which can easily be modified and used in specific cases. This makes it appealing for SAP users, because pre-built content help users to decrease development time and costs also increase efficiency and interoperability.

PI is also handy for particularly SAP-to-NonSAP interfaces where users can import standard integration content. Also PI has got sophisticated open standard adapter framework, which is very easy to implement, and custom logic can be implemented using adapter module programming.

NetWeaver is SAP's latest application platform suite and the foundation for all future SAP applications. As companies add new SAP applications or upgrades to mySAP ERP, the core components of NetWeaver will somehow be there. For example; Enterprise Portal, Process Integration, Master Data Management, Business Process Management, Business Intelligence. This means SAP PI will be part of SAP investments and it will already be there. Another important fact is that if a company purchases SAP applications such as, Customer Relationship Management, Supply Chain Management, Product Lifecycle Management SAP PI will automatically become the standard integration platform from R/3 and other applications to these new modules. Because all of these solutions are built on top of the NetWeaver platform and PI is the integration part of NetWeaver platform suite. So, all of the mySAP licensees have access to this tool set waiting unused on the shelf, if they decide not to use PI.

2.7.3 Microsoft BizTalk

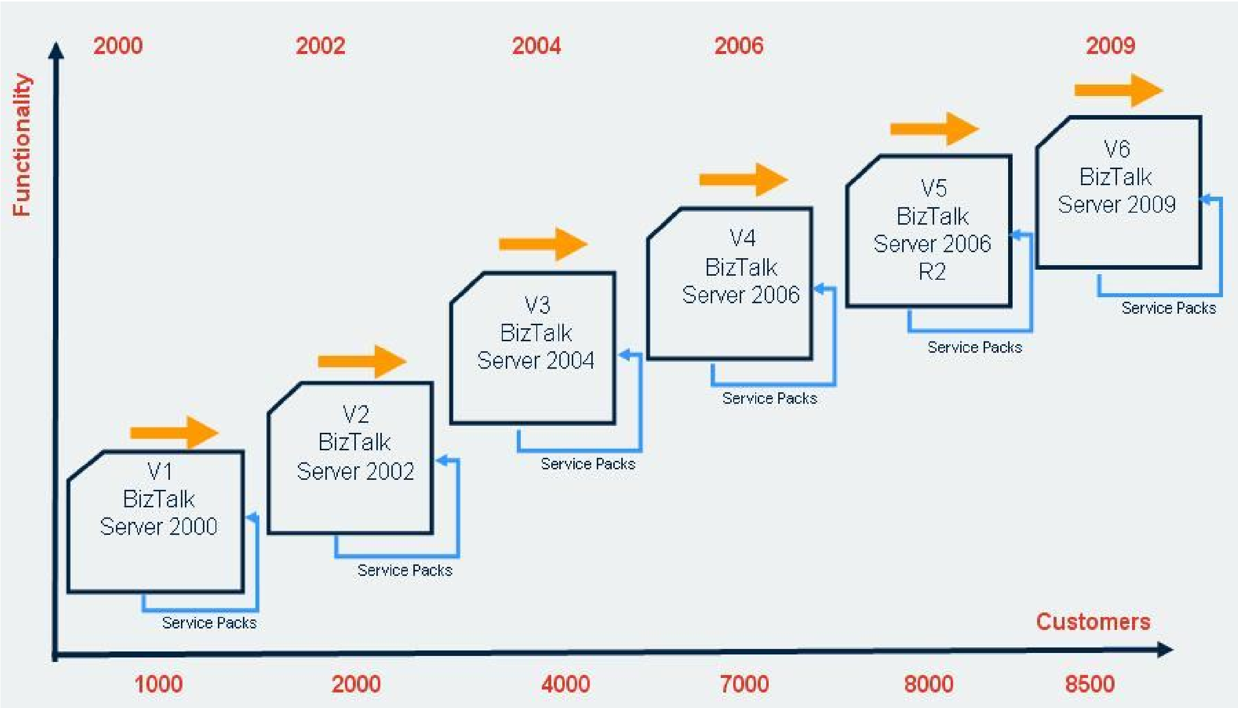

Figure 8: History of Microsoft BizTalk

BizTalk server is an integration and connectivity solution from Microsoft. Product is quite mature after its sixth release and BizTalk 2009 is the latest version. BizTalk 2006 R2 was an update release to BizTalk Server 2006 that includes some new and updated features that enhance the capabilities of BizTalk server and it is one of the most common integration products in the market. By the latest version, there will be an addition to integration capability, a rules engine, EDI connectivity, business activity monitoring (BAM) and RFID capabilities. By BizTalk server 2009, product has updated platform support, developer & team productivity enhancements, SOA and web services improvements and new functionalities at business-to-business integration. According to Microsoft, 90% of the fortune Global 100 use BizTalk[25]. It is a clear sign that product is in the mainstream market and suitable for almost all of the integration scenarios.

[25] http://go.microsoft.com/?linkid=9658773 last accessed 29 April 2009

Product is a business process management (BPM) server that lets users to automate and optimize their business processes. This features also includes strong, familiar tools to design, develop, deploy, and manage those processes.

While planning for the integration scenario, BizTalk takes care about tasks like gathering information, defining naming conventions, planning team development, setting up and working with source control.

The goal of BizTalk Server 2009 is to help organizations create automated business processes that span diverse applications and platforms. Along with its core messaging and orchestration capabilities, the product includes a BRE for working with complex business rules and BAM to let information workers track running processes. Additional components, such as EDI support, the RFID server, SOA infrastructure support, and Enterprise Single Sign-On, address other related challenges. From its initial roots in EAI and B2B integration, BizTalk Server has grown into a foundation for BPM. As the change to a service-oriented world rolls on, BizTalk Server 2009 will continue to play an important part in automating business processes in a diverse world. (David Chappell, 2009)

2.8 Tools and Frameworks to be used

In this part, tools and frameworks to be used in the research will be introduced.

2.8.1 Stakeholder Analysis Tool

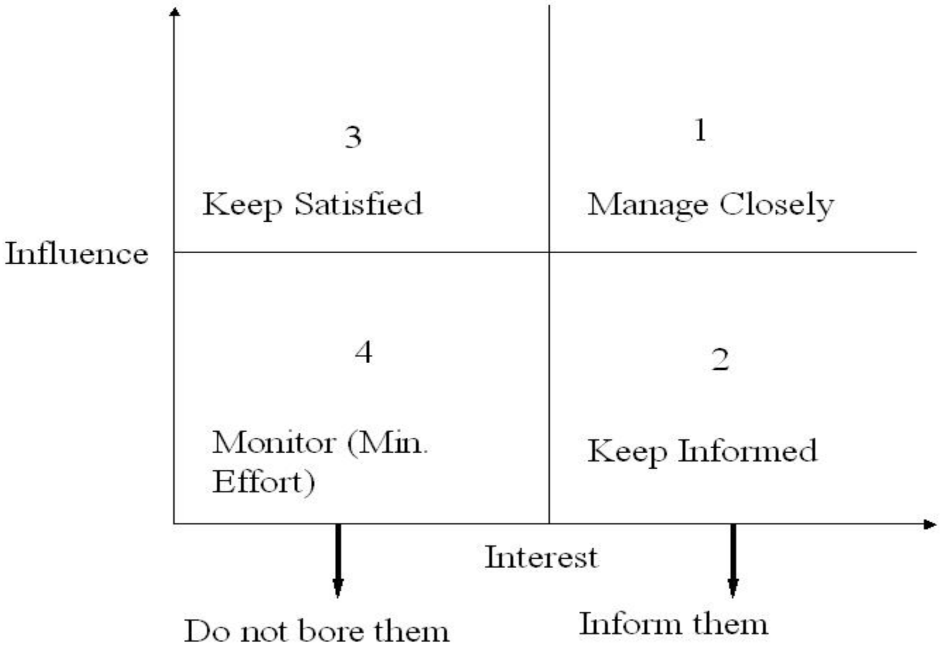

Figure 9: Stakeholder Analysis Tool

This tool will be used to group stakeholder into their interest and influence (power) to having SAP PI at Vattenfall. Based on the individual meetings with ever stakeholder, their interest will be analyzed. From their positions and power to the final decision will be analyzed to decide their level of influence among with the results of individual meetings.

Group 1 (Manage Closely)

Stakeholders, who are on the top right corner, appearing to have a high degree of influence on the project and also they are highly important for its success. This implies that good working relationships must be constructed with these stakeholders, to ensure an effective coalition of support for the project.

Group 2 (Keep Informed)

Stakeholders, who are on the bottom right corner, have importance to the success of the project, but with low influence. This implies that they will require special initiatives if their interests are to be protected. For some cases, they will not be able to change the final decision but their expectations must be met.

Group 3 (Keep Satisfied)

These are stakeholders with high influence, who can therefore affect the project outcomes, but whose interests are not necessarily aligned with the overall goals of the project. They might be financial administrators, who can exercise considerable discretion over funding disbursements. This conclusion implies that these stakeholders may be a source of significant risk, and they will need careful monitoring and management.

Group 4 (Monitor, minimum effort)

The stakeholders in this box, with low influence on, or importance to the project objectives, may require limited monitoring or evaluation, but are of low priority when taking final decision.

2.8.2 SOA Maturity Model

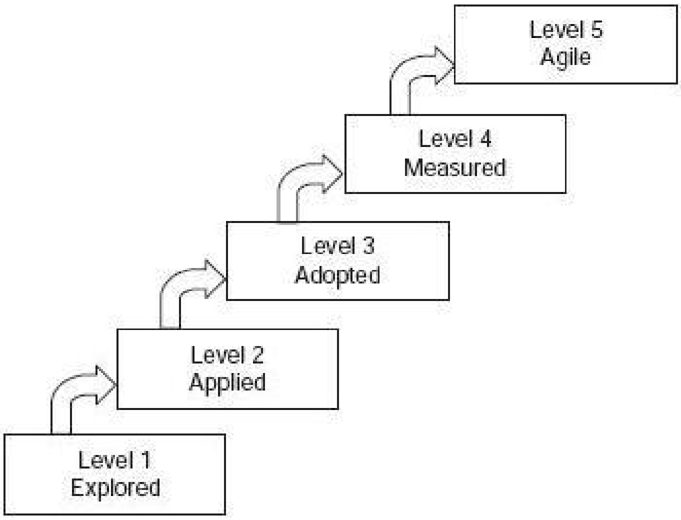

Figure 10: SOA Maturity Model Tool

The SOA maturity model developed by EDS (an enterprise services business unit within HP) and Oracle is depicted in Figure above. The model defines criteria to assess the degree to which an enterprise has realized the potential of SOA and associated disciplines. SOA maturity model used in this research provides guidance for planning to an agile organization and a basis for objective evaluation of this foggy progress. Model is also a process improvement methodology that provides enterprises with the core factors for effective process development. In addition to these, model can also be used to guide process improvement across a project, a division, or an entire organization

The SOA maturity model will be used to assess the current situation of SOA adoption of Vattenfall. The model is used as a way to evaluate the as-is state and develop a transition plan to lead to the to-be state. An enterprise achieves a maturity level when it has substantially achieved the capabilities identified for that segment. In fact the level of return on investment (ROI) is lower for transformations undertaken at lower levels of maturity model graph, but the risks are higher if an undertaking is too ambitious and not realistic for the current level of maturity. Details how to design an enterprise architecture that takes full advantage of SOA has been described by Fred A. Cummins in his book, “Building The Agile Enterprise: With SOA, BPM and MPM”. Each of the maturity levels stages that have been used in this research are discussed briefly here (from: Building the Agile Enterprise with SOA, BPM and MPM by Fred A. Cummins):

1- Explored: An organization is aware of SOA and may be studying the potential impact or doing some proof-of-concept development.

Fred A. Cummins stated that, this is current "status quo" levels of most enterprises. Typically the SOA awareness is in the IT organization (in other words, it is awareness of SOA technology). If other organizations are aware of SOA, they most likely view it as another wave of technology. The business side of the enterprise is more likely to be focused on BPM and proves improvements where automation of business process is viewed as a technique to be considered, but the focus is on the operation of the business.

A proof-of-concept development should be selected to demonstrate the business potential and organizational capability to consolidate and integrate a capability. In most cases, this will be driven by IT and will focus on consolidation of applications, but the business value and organizational implications of the consolidation should be highlighted. This includes economies of scale, consistency, and accountability as well as commitment to delivery of services in compliance with formal specifications.

2. Applied: Top management is committed to SOA, the organization has developed a basic capability to design and implement service units, and selected shared services are being used (bottom-up). The maturity model does not distinguish between a service as value delivered and a service as an organizational responsible for the supporting capability.

At this level SOA has become recognized as an important approach to improvement of operating costs, product quality, and agility of the enterprise. It may still be viewed as primarily an adoption of new technology, but there is a realization that it must be driven by top management to achieve strategic value and avoid suboptimal solutions. There is an understanding that SOA and BPM are complementary views of an enterprise architecture, and that service units are shared business capabilities managed by business organizations. There is an initial commitment to an SOA infrastructure and enterprise standards. Development of service units is essentially bottom-up, based on business value, and should be guided by an industry best-practices framework perspective.

3. Adopted: The organization has an SOA infrastructure and is committed to standards. There is a system of governance to plan and manage transformation of the organization and to manage the definition and implementation of service units. (top-down)

At this level, the transformation has shifted from being driven bottom-up to top-down. Definition of services units is driven but top-down analysis and design by a business architecture activity, and transformation is driven from an enterprise level. Priorities and fundings for IT budget and transformation initiatives are managed at an enterprise level. Service costs are captured, and a charge-back mechanism has been defined to support evaluation of the full cost of services. The enterprise is not yet fully service oriented but development of new applications is in a service-oriented context. Data exchange for established service is consistent with an enterprise logical data model.

4. Measured: Service units are monitored and measured for cost, timeliness, quality and availability and refined for enterprise optimization; in other words, Level 4 capabilities are value chain driven. The contributions of services to the value chain can be reported and analyzed.

The enterprise is sufficiently service oriented that the value chains can be evaluated as compositions of service. The cots, quality, and timeliness of a value chain are reported and can be traced to the individual service units that contribute value. The organization structure reflects alignment of goals, incentives and economies of scale in the management of service unit resources. Service performance monitored in real time and performance is evaluated against formal service unit performance specifications.

Disruptive events, both internal and external, are captured and directed to appropriate service units for resolution

5. Agile: The organization has a continues change culture and business process to adapt the enterprise in response to disruptive events. The enterprise sense disruptive events and when required, responds to them by reconfiguring relationships between existing service units, with minimal need for capacity enhancement or development of new services.

The governance structure ensures that the enterprise is doing the right thing and doing it well. The enterprise accepts change as a way of life. Continues strategic planning is responsive to change and drives strategic changes to the enterprise. There is rapid response to disruptive events through business process based on comprehensive risk management and an understanding of the enterprise ecosystem. Service unit managers work to continuously improve their services based on needs of services users and enterprise objectives. Service units are sharable building blocks that enable rapid configuration, evaluation, and implementation of a product life-cycle model to address new business opportunities. (From: Building the Agile Enterprise with SOA, BPM and MPM by Fred A. Cummins)

2.8.3 Technology Adoption Life Cycle (TALC)

TALC model gives clear guidance on how to create market for a discontinuous innovation, which force a significant change of behaviour by the customer. Changing integration platform in a huge company is also a destructive change from the already established competence, strategy and investment point of view. The basic flaw in the model is that implies a smooth and continuous progression across segments over the life of a product. The high-tech marketing guru Moore (*Reference: Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream Customers – by Geoffrey Moore, Regis McKenna*) offers time-tested insights into the problems and dangers facing growing high-tech companies and products, and a blueprint for survival. This classic text, first published in 1991, is widely accepted as “the bible for bringing cutting-edge products to progressively larger markets.”

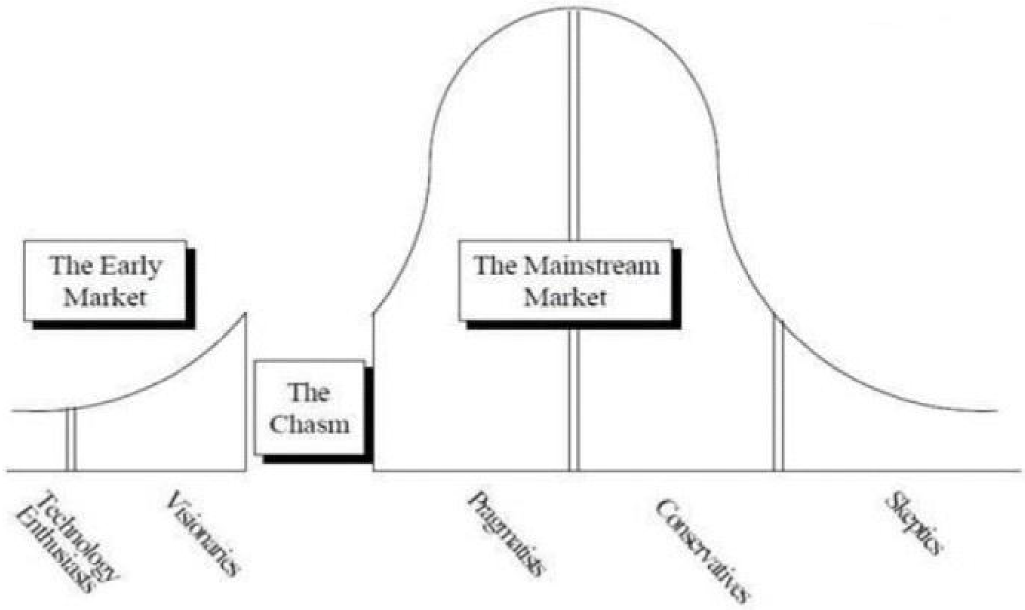

Figure 11: Technology Adoption Life Cycle Tool

Moore says that in fact, there are cracks in the curve, between each phase of the cycle, representing a disassociation between any two groups; that is, "the difficulty any group will have in accepting a new product if it is presented the same way as it was to the group to its immediate left". There can be small size crack between each step and also inside every segment. But, the largest crack, so large it can be considered as a chasm, is between the Early Adopters and the Early Majority. Most of the high tech ventures or products fail trying to make it across this chasm.

In fact this tool is widely used by companies to evaluate the market segments and position themselves. But in the research, by looking at this picture from customers' point of view, positioning of SAP PI and BizTalk into the TALC will be done to show the differences. Characteristics of the each market segment are;

Innovator = Technology enthusiasts.

- Pursues new technology aggressively, often for its own sake.
- Will overlook all kinds of short falls in the deliverable.
- Easiest buying population to satisfy: want the truth, access to top technical support, first to get hands on new stuff, and want low cost (cheap).
- Gatekeepers to the life cycle and they like being "cool".
- If they hate it implies trouble.

Early Adapter = Visionaries

- Not technologists but appreciate the benefits of new technology. However, need more help than Innovators.
- Believe in competitive advantage via discontinuous innovation – use technology to leapfrog competition.
- Bring money to table but demand modifications.
- The least price sensitive of any user category.
- Easy to sell and very hard to please.
- Want to see "productized" technology.
- Always in a rush but contract closure is next to impossible. Each additional visionary has a unique dream and makes unique demands for customization, which in turn overtaxes an already burdened development group.
- Optimum solution is to identify a single compelling application and focus entirely on that solution.

- This is the sector where a competitor first materializes and you better be across the chasm by then.

Early Majority = Pragmatists

- Similar to Early Adapters but far more practical and pragmatic. Aversion to risk, wants a proven solution.
- Insist on seeing well-established references of other Early Majority users.
- Not intimidated by technology, but will not pursue technology for technology's sake.
- Believe in evolution not revolution.
- Use marketplace wisdom to see what's valuable and then be a fast follower.
- Want to improve organizational effectiveness.
- Prefer to buy from market leaders.

Late Majority = Conservatives

- Similar to Early Majority.
- They are not confident in their ability to handle a technology product.
- Switch only when technology fully debugged.
- Delay may cause them to lose out in long run.

Laggard = Skeptics

- Want nothing to do with technology and not worth the trouble to try to convert.
- Refuse to adopt; works only when technology "fails"
- Tend to "fight the use of new technology."

2.9 Problem Background

Vattenfall Nordic is getting bigger and bigger by mergers and acquisitions as well as organic growth. An increase on business means an increase on IT. Despite the fact that Vattenfall has offices around Nordic countries such as, Finland, Denmark and Sweden, they need a huge degree of interoperability between each other and for some cases act like a one common company. In this context, systems integration is one of the critical requirements of this interoperability and also one of the biggest parts of IT budget. On the other hand, cost reduction through standardization is an obvious goal for Vattenfall. Keeping in mind that, the costs for application integration can be decreased dramatically through a higher level of standardization and consolidation, so a common integration platform for Vattenfall Nordic will be a critical business enabler.

The current integration platform based on Microsoft BizTalk has not been fully established in all parts of Vattenfall Nordic. Further, during the last several years it has surfaced requirements for more independent local integration platforms in different parts of the Vattenfall organization. This is mostly driven from security reasons and market regulations. For example, some offices in different countries used other integration platforms; SAP PI in Finland, BizTalk in Sweden and Denmark and combination of both in Germany. But, in the Nordic integration strategy, it is suggested that an optimal level of consolidation would be; separate instances with identical platform configuration, utilizing a common application management and common routines, roles and administration. Current integration platforms used in different countries can be seen from the graph below.

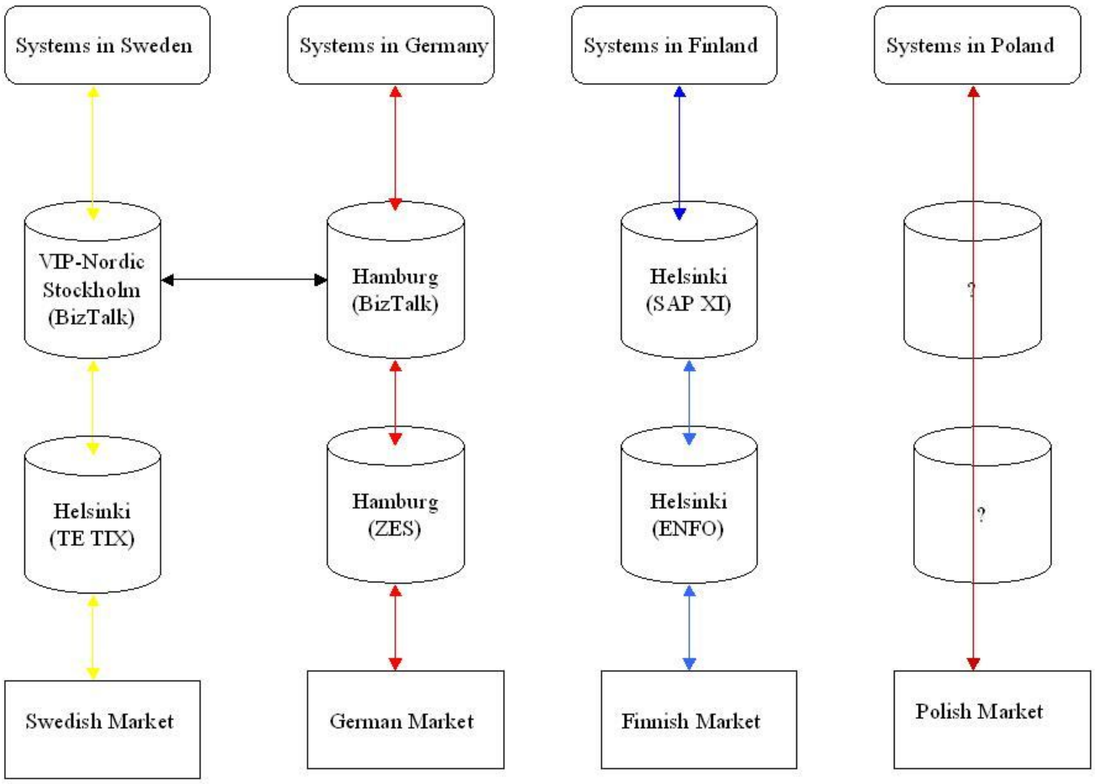

Figure 12: Group Level View of Current Integration Platforms at Vattenfall

After all, the purpose of this research is to investigate the opportunity for VIP-Nordic to use SAP PI as another weapon in their arsenal or use only one integration platform from one vendor- SAP PI or Microsoft BizTalk-. Since Vattenfall is a heavy SAP user, a research must be done to understand the product and its features.

2.10 Hypothesis

Considering the fact that Vattenfall has a large SAP shop it looks like a good idea to use an integration platform from the same vendor. Referring to the section 2.2, 2.3 and 2.4 all these chapters force company to re-shape their IT strategies. While we are talking about a consolidation at the Future of Nordic energy market, we are also talking about a separation in another dimension at unbundling section. As a result of these three sections, the researcher builds a hypothesis that there will be more SAP systems and it is a good idea to use SAP PI as main integration platform at Vattenfall.

3. Results

In this section empirical findings from project stakeholders meetings at Vattenfall Sweden will be represented. A summary of information collected from interviews and a summary of questionnaire will be presented. Finally a SOA maturity model will be applied to Vattenfall Sweden and as-is architecture will be analyzed through it.

3.1 Stakeholder Meetings' Results

The results below are summary of interviews conducted at Vattenfall Sweden, SAP, Microsoft, Gartner and Colada as well as e-mails and teleconferences. As a result of project stakeholders' meetings, their expectations are analyzed in this section. Each stakeholder within the company was asked the same questions and the results are analyzed carefully to understand their business and IT requirements.

3.1.1 Vattenfall Business Services Nordic

VBSN is a shared services department at Vattenfall Nordic and provide IT and business services for other units. VBSN's financial goal is not to earn money but to spend money for other departments by providing them IT and business services.

Currently, they are using mix of different systems and integration platforms either internally developed or bought from external parties. They are using BizTalk, Business Connector and some other solutions but not SAP PI. BizTalk is their main integration platform and that's why the competence and available resources are much higher for BizTalk. On the other hand, increasing level of SAP system installations encourage them to have a look at to SAP PI, even if they do not have enough experience at the moment.

Expectations on the project

VBSN expects a change in their department's business processes within few years. That's why integrated systems will be a business enabler for them to increase their ROI and lower the TCO.

They pointed out that; they have some problems with their current integration platform and some parts must be renewed by new solutions. For example, they want to replace business connector and PI can be a good alternative for this case. Because of the fact that department is taking care of financial and HR information, it is a business critical decision to select the most suitable integration platform. That's why they need to be sure that the integration platform will work and performance will be high.

Contact person

A. R.
SAP Cross- Application

Other useful information

Because of the fact that they will be participating in implementation of PI project, we can group this stakeholder as a technical stakeholder. Also they manage lots of IT system within Vattenfall and they will use their technical competence in future to support SAP PI projects.

Based on their answers Security, Performance and Price are the most important critical success factors for them.

3.1.2 CIO & Group Architect

Short description

J. K. is the Business-IT architect dealing with the long-term strategic issues. He is actively involving in the road mapping and prioritization of projects. Because of the fact that he has knowledge on both business and IT – which is one of the core issues of enterprise SOA- he automatically became one of the most important stakeholders for this project. He represents the business units but each unit has more detailed knowledge about their own IT strategies, means he is not the only person taking the final decisions.

Expectations on the project
Before selecting an integration platform it is critical to have enough human resources to handle the operations/development/maintenance of the system. That's why it is a big question to be answered; if we can create a practical competence centre for SAP PI at overall Vattenfall level or not.

Last but not least, a decision about where to start using SAP PI is crucial. It is obvious that, in such a huge company it is not easy to change the systems hurriedly. Changing the integration systems gradually can be a reasonable method. It also means building competence within Vattenfall and decreasing cost of external consultants and consequently decreasing the TCO.

Contact person
J. K.

Other useful information
Thinking about the integration point of view, there will be a high focus on customer-oriented processes; like changing information with other parties involving in the energy business. This is one of the most complex parts of integration platforms.

Due to the market regulations, Vattenfall has different systems in Finland and Sweden. But the Nordic market is on the way to get consolidated. This means that, Vattenfall need to harmonize and consolidate the systems in Nordic. This consolidation is in terms of efficiency and process. But on the other hand, a split between retail and distribution is required because of the regulations in the energy market. While this looks like tricky, it is a method to keep competition high, while the market consolidation is happening. Giving an example, Vattenfall distribution has to treat all retail parties in the market equally. All in all, while a merge is happening a split in another dimension is required.

Based on their answers, Total cost of Ownership (Price), Availability of Human Competence and Quality of Services are the most important factors while selecting the integration platform for them.

3.1.3 Vattenfall Finland

Short description
Vattenfall Finland is using SAP PI as their main integration platform for the last 3-4 years. When the project started most of the connections in Finland were point-to-point and then new requirements on business side and their long-term business goals forced them to have an integrated ERP system.

Expectations on the project
Vattenfall Finland is an early adaptor of SAP PI technology and in this extend Finland is a role model for other Nordic branches.

One of the main goals to make a research about how to use SAP PI in Sweden is that; to see if Vattenfall Sweden can use Vattenfall Finland’s SPA PI platform. Keeping in mind the size of the data volume in Finland and in Sweden, it looks a bit difficult at the moment.

Contact person
M. L.

Other useful information
When Vattenfall Finland started to evaluate different integration platforms, they had 3 different alternatives; MS BizTalk, SAP PI and another option, which is not available on the market any more. They have selected SAP PI over the MS BizTalk because of the licenses fees and long-term flexibility. Even if there was not a huge difference in terms of technology, having large numbers of SAP installations encourage them to use an integration platform from the same vendor. Keeping in mind that SAP PI is for free for connections between SAP systems, it was a good decision to use SAP PI for Vattenfall Finland.

3.1.4 VBSN

Short description

E. F. is an application manager of mySAP utilities, who work at Vattenfall Business Services Nordic AB. They have three different mySAP utilities installed (ISU, CRM, BW) and they are managing these SAP systems. On the other hand, an integration team from another department is responsible for technical development and maintenance. That's why they are not a technical but a business stakeholder for SAP PI project.

Expectations on the project

Current integration platform is working and do not have any major problems. But for some certain time periods, when they need to exchange meter date readings, they have performance problems. Lack of good design or the capacity of current integration platform can cause this. So, they want to have a look at to another integration platform to see if it better fits to their requirements.

Contact person

E. F.

Other useful information

Unbundling between retail and distribution will affect their business and IT landscape. This will force them to re-design their IT systems and re-organize them.

Based on their answers Price, Availability, Human Competence and Performance are the most important critical success factors for them.

3.1.5 Vattenfall Distribution

Short description

Vattenfall Distribution is responsible for distributing electricity to both regional customers and local distribution companies, as well as to the end users. The current integration platform is quite complex and has several different methods such as, point-to-point, web services, BizTalk and so on. Integration technology or method is selected based on the requirements of projects. But keeping in mind that the regulations will force distribution to re-shape their business, means that they need to re-shape their IT systems.

Expectations on the project

One of the most urgent things for them is to have a real-time integration with the external parties in the electricity market. They need to be up and running for 7/24. Currently they use batch technique to handle the connections several times a day. But this is not real time integration and a platform which will provide such ability will be very helpful for them. That's why they want to understand the SAP PI and see if it can provide such ability.

Contact persons

BM. L.

C. L.

Other useful information

Based on their answers Performance, Reliability and Availability are the most important critical success factors for them while selecting an integration platform. Then the price is also important but if there is a performance or availability problem, cost of a failure in business will be much higher than the actual cost of integration platform. That why, price is not one of the top criteria for them.

3.1.6 Business Unit Services

Short description

B. L. is responsible of IT at Business Unit Services Nordic. They are selling services to other units within Vattenfall as well as external parties in the market. They build / re-build and maintain electricity networks and plants. Generally they work with the customers' systems but they also use their own IT systems to keep track of their work.

Expectations on the project

Generally they work with the customers' systems but they need to be able to have same information within their own systems too. To do that, they manually enter data to their own systems after they complete their work outside. This is not really an effective way of working. So, this is one part where they need integration between their own systems and customers systems. Even if they do not have that much IT systems, it is still really crucial for them to integrate it with external parties.

In addition to this, some of their business processes are not effective. For example, when they work on customer side and prepare a time report, they have to write it twice, one for customer systems and one for their own system. To solve this problem and increase their efficiency, an integration platform is obviously needed. This project can be one of the candidates to start using SAP PI.

Another problem, which they try to solve, is that when their employees go out and work on different tasks, every customer wants them to use different devices. For example meter readings are done by one device and another task from different customer (sometimes even from the same customer) is done by another device. In order not to carry 5-6 different PDAs, laptops or devices, they want to harmonize and consolidate all these systems as much as possible. Otherwise they will end up carrying 5-6 different devices when their personnel go out to work. It also means cost and complexity for them.

All in all, there is a great need for an integration platform to have an operational efficiency in electricity networks maintenance. They are very positive to use SAP PI because they heavily invest on SAP. Moreover they believe that an integration platform from the same vendor can be a good match.

Contact person
B. L.

Other useful information
Current integration platform that they use is BizTalk and it works. But for some cases, sending-reading data from/to partners/competitors, such as EON and TeliaSonera, just to name but a few, they have had some delay and performance problems.

They have around 3200 people working in their department and they consume lots of IT. When it comes to application level, they mainly use SAP. For example they use SAP for; Finance, HR, Procurement, Time Reporting and Plant Maintenance. Another issue is that, Business Unit Services is a “real user” of SAP at Vattenfall Nordic. Because looking at to the development plans about SAP in Vattenfall, most of the income generated from Business Unit Services and they have most of the ideas about how to develop SAP strategies further. That means their ideas and expectations have high priority for general SAP project and SAP PI is not an exception.

Based on their answers, Performance, Price and Security are the most important features for them to select an integration platform. Besides these, reliability has also high priority for them. On the contrary, speed and flexibility are not the key success factors for their case.

3.1.7 Nordic Business Council

Short description

D. B. is chairman of the demand council, who also represents the business units at Vattenfall. They are one of the large users of SAP and today they use most of the SAP modules like Finance, Human Resources, Plant Maintenance, Purchasing and Procurement.

Expectations on the project

In their current IT landscape they are using SAP in a large extend. But interestingly most of the connections between SAP instances are done by point-to-point connections. They are positive to use an integration platform in future. Only for some cases, for example, connection between Nordea Denmark and Vattenfall in Denmark BizTalk has been used to provide B2B connections. As a one-sentence summary, they mostly have point-to-point connection and for some cases they use BizTalk for external connections. They also implied that using BizTalk is a little bit problematic and it is not cheap either.

Another important point is that; even if they are one of the SAP customers, they are not using an integration platform; rather they use point-to-point integration even between SAP instances. Looking at to their as-is architecture, they don't have any big problem; it works. But it is quite clear that they can move to SAP PI to have more control over their IT landscape and as an enabler of SOA. Because SAP PI can be a backbone for more distributed, service oriented architecture.

Contact person
D. B.

Other useful information
Based on their answers Performance, Price and Vendor Quality are the top three critical success factors for them. Besides all these, vendor product strategy and a product road map are also equally important for them. Last but not least, they are quite positive to use SAP PI and they are looking for a suitable business case to start using SAP PI.

3.1.8 Vattenfall Business Services Nordic

Short description
H.W. is one of the IT managers working at Vattenfall Business Services Nordic (VBSN). Since his department is the responsible of integration projects at Vattenfall, this project is important for him to get a good result.

Expectations on the project
He wants to understand the product and find a good business case to start using PI at Vattenfall Sweden.

Contact person
H. W.

Other useful information
Based on the meetings with him, Human Competence, Vendor Quality and Performance are key success factors.

3.2 Analysis of Stakeholder Meetings

3.2.1 Stakeholders Interest

First of all, stakeholders will be grouped as business and technical stakeholders. Business stakeholders means; the ones how are interested in using SAP PI because of their business requirements and do not involved in the technical part. Technical stakeholders means; the ones who care about which technology will be used and they will participate in the technical parts of the project. Keeping in mind that most of the projects, one way or another, have a business goal; technician and business stakeholders do not mean that they are totally unrelated or separated from each other.

The ones in between business and technical stakeholders are managers and CIO & CTO group members, who have roles related with both IT and business.

In fact one of the most important success factors is that, the combination of business and technical stakeholders will form a team and discuss the project outcomes from the beginning. By doing that, unexpected results will be eliminated and project success will be strengthened.

Business Stakeholders		**Technical Stakeholders**
B.L.	D. B.	H. W.
E. F.	J. K.	A. R.
BM. L. & C. L.		

Table 1: Stakeholder Groups by Interest

3.2.2 Stakeholder Matrix

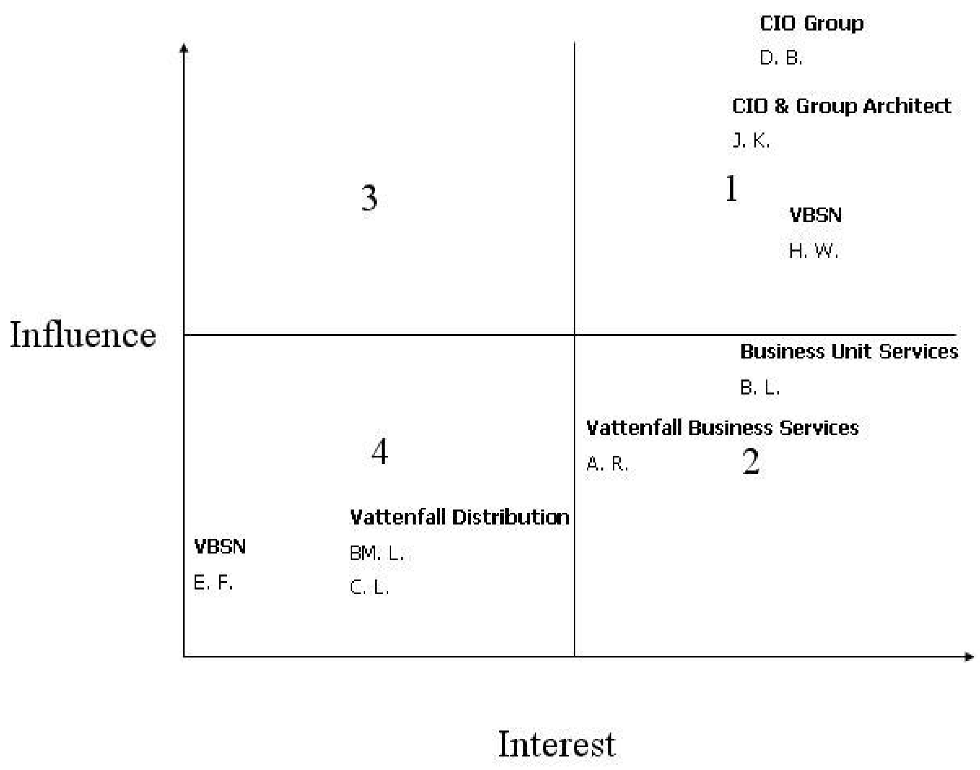

Figure 13: Stakeholders by Interest and Influence

Referring to the graph above, stakeholders are grouped in terms of influence to the final decision and interest for the project. Because of the fact that top right corner group has very high influence over the project, their support is crucial. Looking to the interest axis, B. L. and A. R. have highest interest and they can be start point for SAP PI project at Vattenfall Sweden. More detailed information about how to approach each of these stakeholder groups and their contributions to the overall SAP PI project will be analyzed to ensure

3.2.3 Critical Success Factors

Each stakeholder was asked to select most important criterias for them while selecting an integration platform. According to our project stakeholders, top priority quality attributes are; **Performance, Reliability, Price** and **Human Competence**. 70% of our stakeholders said Performance is crucial. Because lots of business critical data have been transferred to internal or external parties and if something goes wrong this will be costly to fix. 60% of our stakeholders implied that they have concerns about SAP PI in terms of available human competence. Because right now the company does not have a competence center for SAP PI related projects.

When it comes to building a competence center; it will take some time before they have enough experience to handle SAP PI installations, development and maintenance. One of the practical ways to do this is that, starting a pilot project by installing SAP PI platform in Sweden to see how things happen. Then build SAP PI competence in Sweden and gradually start using SAP PI.

Last but not least, price is always important. But on the other hand, much more money involved in business and if there is a problem or a disturbance, it will be costly to fix. So, the actual price of the product will not be that important as long as the performance and reliability are high.

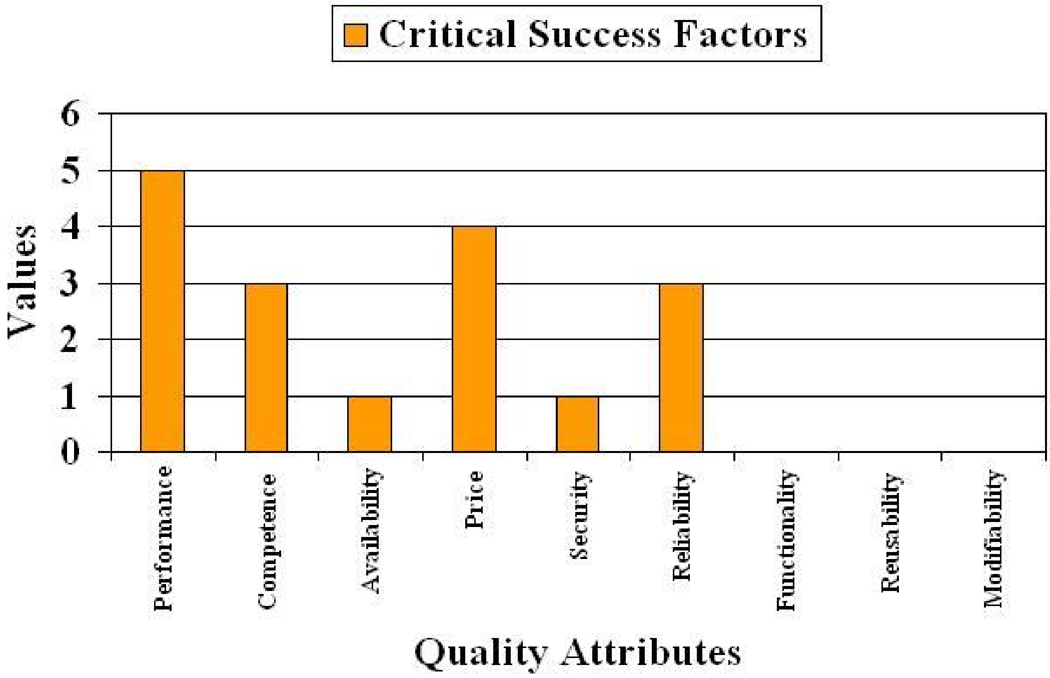

Figure 14: Critical Success Factors for Stakeholders

Referring to the graph below, integration demands are:

Fulfilled (green): 60%

Partly fulfilled (blue): 30%

Not fulfilled (Light Metal): 10%

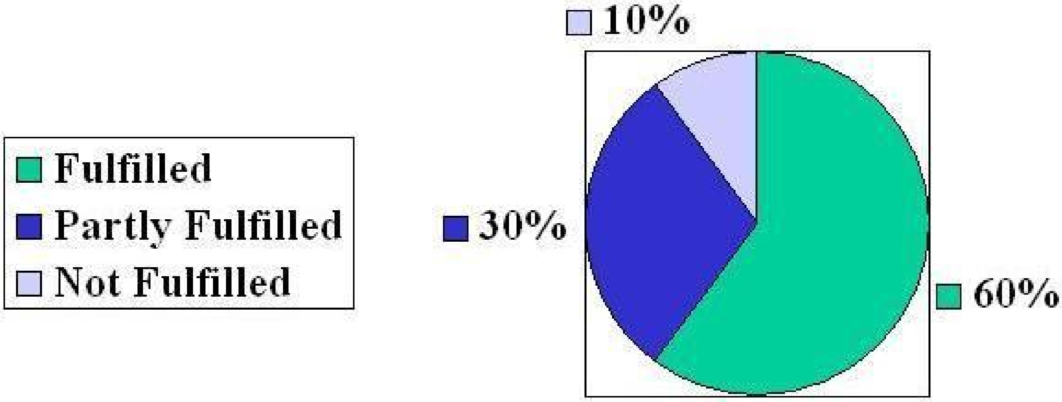

Figure 15: Current Integration Platforms Performance

One of the biggest reasons why integration demands are partly fulfilled is mostly because of performance and availability problems. Besides that, stakeholders do not have any problems with their current integration platforms. Also, BizTalk is not the only reason why some stakeholders are not happy with their integration platforms. For some cases, they need real time integration or need to replace some legacy integration platforms. So, all of these different reasons create integration platform problems and they are not only related with BizTalk. Also, keeping in mind that the research company is very big and every department has unique needs, it is sometimes difficult to solve the problems by the same integration platform.

3.3 SAP PI and MS BizTalk

3.3.1 Microsoft BizTalk

Based on the qualitative investigations pros and cons of BizTalk will be analyzed in this section.

Advantages

1. Relatively easy to find human competence.
2. In BizTalk, an interchange can contain two or more messages, such as a batch. With the introduction of recoverable interchange in BizTalk Server 2006, only messages that fail validation are suspended, and the messages can be resumed after the error is corrected.
3. Failed message routing. New functionality is available to allow orchestration and send ports to subscribe to failed messages. When used appropriately, failed message routing can be used for notifying users of failed messages or building rich error handling and message repair capabilities.
4. Lowest total cost of ownership (TCO). BizTalk Server reduces the cost and complexity of automating and managing business processes with a single, unified solution for Enterprise Application Integration (EAI),
5. Business-to-Business integration (B2Bi), and Business Process Management (BPM).
6. Enhanced productivity through integrated management and development tools.
7. Well known and widely used product in middleware market.
8. Large number of Adapters included out-of-the-box
9. BizTalk has a very broad support of standards, such as WS-*
10. Business Activity Monitoring, Business Process Management tools and Business Rules Engine included out-of-the-box
11. Synchronous and asynchronous communication is possible.
12. Empowers enterprise, cross-boundary applications and collaborative business processes.

Dis-Advantages

1. Recovery is manual.
2. Fault tolerance capabilities are supported through other Microsoft products.
3. Repository only works with MS SQL.
4. Only runs on Microsoft/Intel platform.
5. Product is not an SAP oriented solution.
6. Supports only Microsoft operating systems.

3.3.2 SAP NetWeaver PI (XI)

Advantages

1. It offers exhaustive monitoring features like message, performance, component monitoring etc, all of which can be used to track and rectify the errors.
2. Mappings and adapters are good as comparable with any other middleware product.
3. Synchronous & Asynchronous communication is possible.
4. Supports almost all of the operating systems.
5. Increasing customer base.
6. Empowers enterprise, cross-boundary applications and collaborative business processes.
7. Reduces integration cost in case of extending or modifying the system landscape due to reusability of interfaces and by using pre-configured content

Dis-Advantages

1. Web methods are particularly good if u have B2B kind of communication with their trading partners product.
2. PI is lacking full-fledged message queue compared to other established middleware products.

3. It does not have a messaging layer exposed by APIs like IBM MQ-Series.
4. SAP relies on other vendors except for a few adapters.
5. Difficult to find human competence for SAP PI projects, expensive consultants.
6. Product is based on hub and spoke architecture.
7. SAP PI is a dual stack product which requires both ABAP and Java stacks.
8. Needs lots of CPU and memory.

Figure 16: SAP's Vision of SOA Middleware

The next major stages for SAP NetWeaver PI middleware can be summarized as following:

Simplified integration (2008/2009)

SAP delivered new SOA middleware capabilities within the SAP NetWeaver Composition Environment (CE) and for PI customers there will be a Java only deployment option offered. From this move, and based on the meetings and research; a change in ABAP part is expected in future. This change will not be an incremental, evolutionary change instead a major, revolutionary change is expected in the product.

Some highlights in this phase would include:

- Support for mass configuration of services for composites built on SAP NetWeaver Composition Environment (CE).
- Extended support for automated governance rules used at design time in the Enterprise Services Repository (ESR).
- Enhanced monitoring support for EDI scenarios.
- SOA management capabilities including integration with Amberpoint agents to be used in heterogeneous landscapes – Amberpoint agents can be instrumented within the service proxy calls.
- Continued investment into web services standards.

Managed deployment flexibility (2010+)

In this stage, SAP will deliver new SOA Middleware capabilities that will also support federated deployments but still have central management and monitoring aspects included.

Some important points in this phase are:

- Heterogeneous connectivity options will be supported by the service bus in CE.
- The Enterprise Services Repository (ESR) can be deployed centrally or federated across enterprise wide deployments.

- The ESR tooling will evolve to an Eclipse framework.
- The Service bus in SOA Middleware will support federated deployments, which will be needed in enterprise wide SOA middleware scenarios.
- The Java only deployment option will also be extended to support the BPM capabilities.
- Continuous availability of SOA Middleware deployments will be supported.
- Central SOA management including monitoring and configuration will be supported for the different entry points and for the different deployment modes.
- SAP will work with partners to shape and drive SOA Management standards

SAP's enterprise SOA strategy - delivering on enterprise SOA without disruption

After a bird's eye view on how SAP PI has changed and can help drive process flexibility while keeping costs down, it is also important to look at the future direction of SAP's enterprise SOA strategy. Because SAP PI is a central point of integration and so the center point of SAP's SOA strategy.

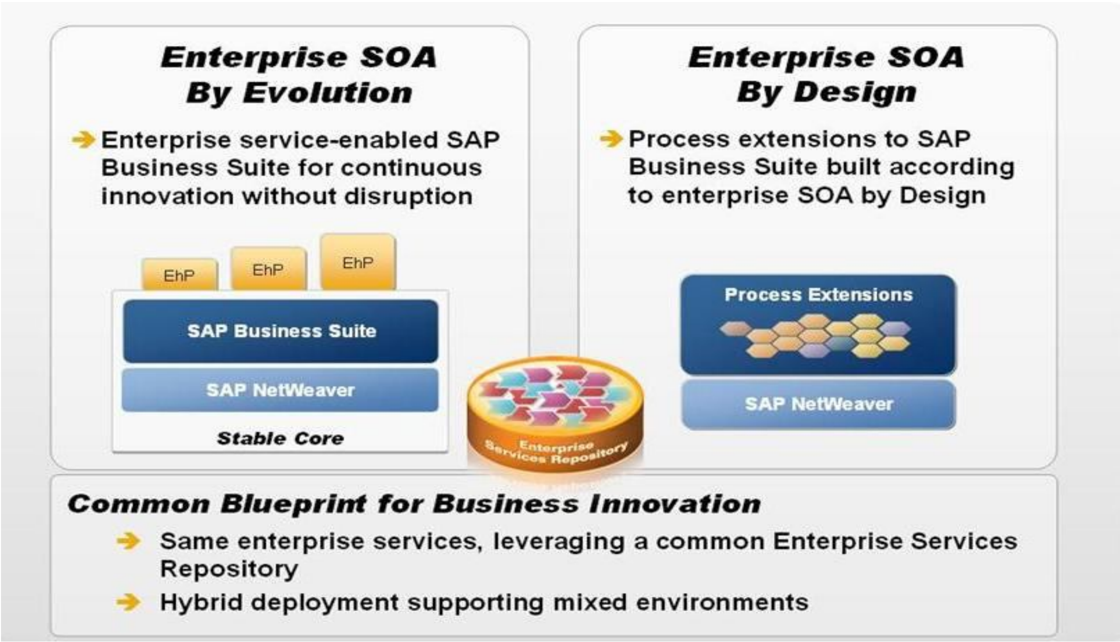

Figure 17: SAP's Vision of Enterprise SOA

The SAP Business Suite follows the **enterprise SOA by evolution** approach, allowing customers to leverage current application investments and get the flexibility to integrate into a heterogonous landscape, and to innovate on top. Enterprise SOA by evolution is one of the key design principles for SAP's offerings for large enterprise customers building upon:

- Clear methodology and governance
- Separation of provisioning of services and consumption of services in all new applications
- Model-driven development for composites

New services, functions and composites are delivered based on a stable core and enhancement packages. Enhancement packages deliver innovations on top of the core applications with minimal impact on existing functionality. In parallel to this evolutionary approach SAP has built a new foundation based on an enterprise SOA by design architecture. This architecture allows a new type of applications, following SOA-based design principles throughout the complete development life-cycle. Processes that run on enterprise SOA by design architecture are built for process flexibility and business agility.

So, how do these two approaches come together? The above mentioned principles of strong SOA governance, methodology and model-driven development led to a common blueprint for both – enterprise SOA by evolution and enterprise SOA by design based applications. The result is a consistent metadata model that includes harmonized enterprise services definitions, administrated in a common Enterprise Services Repository (ESR). Looking at to the stakeholders' demands, it looks like there will be more strategies oriented with SOA mentality. That's why; these kinds of improvements will encourage Vattenfall to use SAP PI in future. This also allows SAP to deliver process extensions to existing SAP Business Suite scenarios based on enterprise SOA by design and enables customers to grow into a full-blown enterprise SOA by design architecture in a step-by-step mode - at their preferred speed.

As mentioned previously SAP has developed a standard blueprint for applications based on enterprise SOA by “Design” and enterprise SOA by “Evolution”. The result is a consistent metadata model that includes harmonized enterprise services definitions, administrated in a standard Enterprise Services Repository (ESR).

This helps SAP to deliver application extensions to existing SAP Business Suite scenarios based on enterprise SOA by design. Due to the standard blueprint these extensions can be integrated smoothly into existing application landscapes. By delivering more and more enterprise SOA by design based process extensions, SAP secures existing investments and allows a step-by-step approach into a full-blown enterprise SOA by design architecture – at the speed of the customer.

Licenses Fees on SAP PI

SAP PI pricing consists of following elements: the SAP PI Base Engine, the Adapters, and Business Packages. SAP PI is free to use between SAP systems and therefore can help to reduce cost of SAP systems integration at Vattenfall. On the other hand, extra fee must be paid if PI is used to exchange data outside SAP world.

Another interesting issue about SAP PI is that, its core license fee is already included in NetWeaver product group. It means, SAP “force” SAP users to use SAP PI. Since it is already paid, and free to use between SAP to SAP systems; it look very compelling to use it for SAP systems integration. On the contrary, if PI is used for SAP-to-NonSAP or NonSAP-to-NonSAP an extra license fees must be paid. Based on the meetings and teleconferences with Gartner, it is also very costly to use PI outside SAP world because it requires lots of CPU and memory power. That why total cost of ownership is very high when using PI outside SAP world.

SAP PI Base Engine

If SAP NetWeaver PI is used for SAP-to-NonSAP or NonSAP-to-NonSAP, SAP PI Base Engine is priced based on the overall processed message volume expressed in Gigabytes (GB) per month. A single message originating from licensee's SAP application and being sent to licensee's SAP application is not counted.

SAP PI Base Engine	GB/month	Price per 50 GB/month (EUR)	Max. cumulated Price (EUR)
	0 to 5	-	Base price 15,000
	6 to 25	-	50,000
	26 to 50	-	90,000
	51 to 250	20,000	170,000
	251 to 500	18,000	260,000
	501 to 1,000	15,000	410,000
	1,001 to 2,000	10,000	610,000
	2,001 to 3,000	7,500	760,000
	3,000 + n units of 50 GB/month	5,000	760,000 + n * 5,000

Figure 18: SAP PI Base Engine License Fees

Adapters

Adapters are only available in conjunction with the SAP PI Base Engine or SAP NetWeaver Foundation for Third Party Applications license. Adapters are priced based on the processed message volume or based on the number of connected systems. Adapters are categorized into following categories:

- Category 1: Standard Technical Protocol Adapters, provided by SAP

  SAP NetWeaver Adapter for IDOCs

  SAP NetWeaver Adapter for RFCs

  SAP NetWeaver Adapter for File/FTP

  SAP NetWeaver Adapter for Http(s)

  SAP NetWeaver Adapter for SOAP

  SAP NetWeaver Adapter for JMS

  SAP NetWeaver Adapter for JDBC,

  SAP NetWeaver Adapter for Mail Protocols (pop, imap, smtp)

SAP NetWeaver Adapter for SAP BC Protocol

The use of adapters of Category 1 is included in license fee for SAP PI Base Engine or SAP NetWeaver Foundation for Third Party Applications license.

- Category 2: Backend Applications
- Category 3: Technical Adapters
- Category 4: EDI Adapters Including Industry-Specific Mappings
- Category 5: Application Backend Adapters (EP Edition)
- SAP Business Packages (Adapter and Mapping by SAP)

4. Discussion

In this section, a comparison between SAP PI and Microsoft BizTalk will be done to discuss which solution is the best for Vattenfall. Technology Adoption Life Cycle and Vattenfall Nordic Integration Strategy will be used among with the critical success factors and stakeholder demands to select which integration platform is the best for Vattenfall. In addition to this SAP PI implementation project success factors will be represented accordingly in order to have a successful PI project at Vattenfall.

4.1 SAP PI and MS BizTalk Comparison by TALC

By the beginning of 2009, adoption of SAP PI platform is growing rapidly, primarily for SAP's application base customers. However, despite SAP's crucial improvements PI is still lacking of most-advanced platforms abilities, but any way it will still be used commonly by SAP customers.

Graph below, shows the roadmap of SAP PI starting from the first version (SAP XI). In fact SAP invested a lot of engineering hours for PI and tried to provide the most up to date features in it. But like all the other products in integration platforms market, PI has some pros and cons.

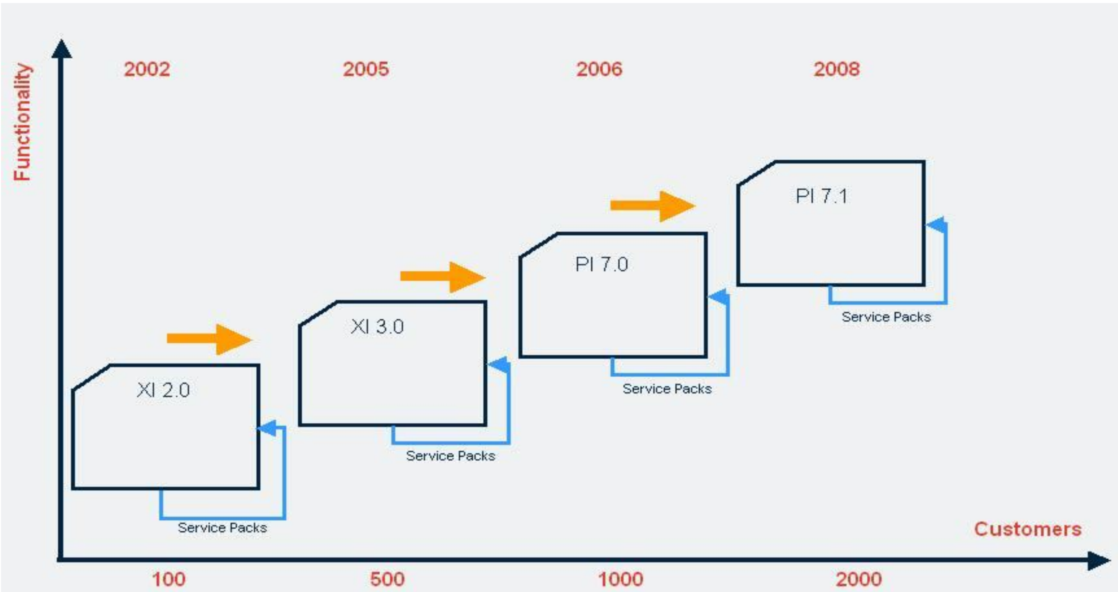

Figure 19: History of SAP NetWeaver PI

In particular, SAP PI is proven for SAP oriented middleware and is widely used by SAP customers. According to a statistic from SAP, only 1% of the PI or XI users are non-SAP customers. So, it clearly shows that PI is very SAP centric product and fits better to SAP product portfolio.

	SAP PI	**MS BizTalk**
Available in market for	7 years	10 years
Total number of active customers	2500	8000
Biggest customer segment	99% SAP customers	SAP, Oracle, Microsoft Dynamics, SSA Global Technologies and so on

Table 2: SAP PI & MS BizTalk Comparison

On the other hand, well known vendors like IBM, Microsoft, Tibco, Sun Microsystems are functionally richer than SAP PI because they focus not only to SAP but also to other application packages. For example they provide much complex event processing, business activity monitoring and other advanced integration features. However, PI is highly optimized for SAP systems and provides a lot of pre-built integration metadata and it is more similar to SAP systems.

As mentioned in results part, SAP PI license for SAP-to-SAP usage is included in NetWeaver suite license and MySAP license. For SAP to Non-SAP integration PI base engine is priced based on the overall processed message volume expressed in Gigabytes (GB) per month. For some large SAP customers, special discounts are available and price mentality of SAP is “more you use less you pay per GB”, it can also be called as progressive scale. Here it is important to understand SAP’s point of view. It is pretty much, SAP centric approach, which means if a company invested lots of money to SAP, in order to get maximum value out of it, they connect other application packages with

SAP. There is where SAP aims to make money from PI. Since SAP has a strong bargaining power, PI is widely used and accepted by most of the SAP users.

Referring to the graph below, SAP PI is the matching opponent of Microsoft BizTalk.

	SAP	Microsoft
Integration Platform	NetWeaver	.Net and Microsoft Server Products
Process Integration	SAP PI	MS BizTalk
Portal Solution	NetWeaver Portal	MS Sharepoint
Application Server	Web Application Server	Windows Server
SOA Architecture paradigm	Enterprise Service Oriented Architecture (ESOA)	SOA on basis of .Net and BizTalk

Table 3: SAP & Microsoft Products Comparison

As a well-known framework on the market, Technology Adoption Life Cycle is a good tool to position the SAP PI and MS BizTalk to show which market segments they are able to reach on the market. For the research, since only SAP PI and Microsoft BizTalk are examined, other tools on the market will not be considered.

After all, positioning of SAP PI and MS BizTalk on TALC is done according to the product quality, number of active users in the market, vendor quality and so on. Before talking about today, the researcher wanted to look back to see how these two integration product were doing. So, during 2002-2003 SAP XI (PI) was only able to reach innovators, technology enthusiast segment of the market. On the other side of the picture, BizTalk was a bit more mature than XI (PI) during 2002-2003, and was able to reach early adopters segment.

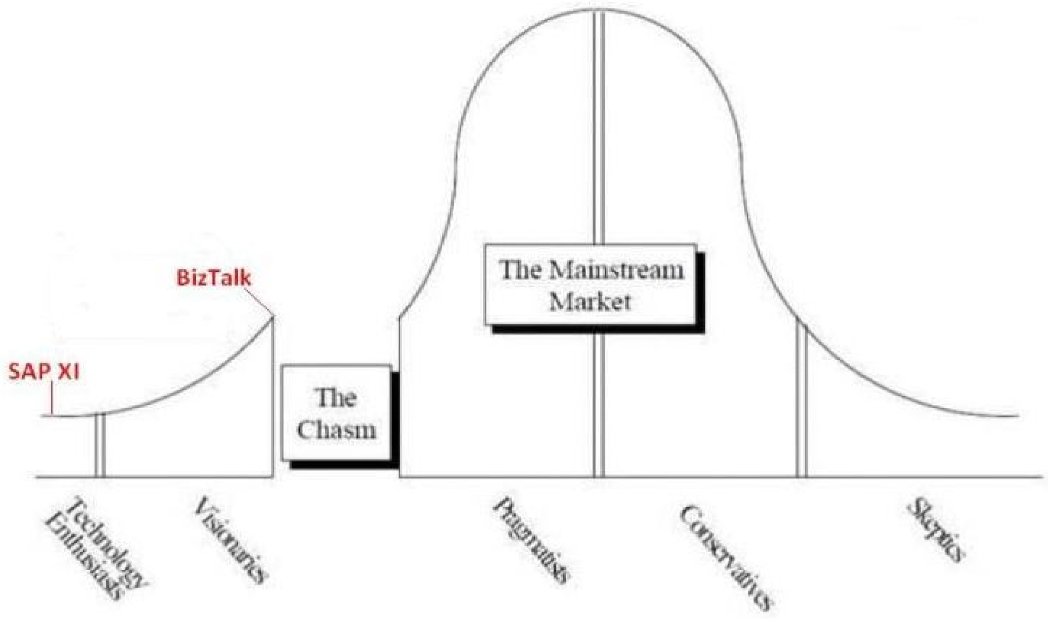

Figure 20: SAP PI and MS BizTalk on TALC by 2002-2003

From the meeting with Microsoft, interesting information gathered about how did BizTalk cross the chasm? While upgrading BizTalk 2002 to BizTalk 2004, most of the customers had to re-write their interfaces from scratch. Because Microsoft changed the product and they made a huge, evolutionary change. The research discuss that, this was one of the factors that helped BizTalk to cross the chasm. An important point here is that; SAP PI did not have such an evolutionary change yet and as a result of the research a major change in PI is expected.

For example, PI is a dual stack product, which requires both ABAP and Java stacks. For sure, it is not a good case when thinking from SOA point of view, because SOA recommends interoperability, openness and industry standards. So, as a one future guess; SAP will get rid off ABAP stack and write ABAP part in Java from the beginning. Or they can also make an OEM agreement with one other middleware vendor in the market to buy their established technology. One way or another, there will be a big change in the product, and then we will see if they will be able to cross the chasm.

But from 2002 to 2009, lots of things happened on the market and vendors invested lots of engineering hours to make their technology widely used by each customer segments.

Both vendors are straggling to provide easy, open standard based fully compatible products. But comparing their current abilities, SAP PI 7.1 and Microsoft BizTalk Server 2006 R2 is positioned on TALC referring to the graph below. As a result of the research, by the beginning of 2009 MS BizTalk is a bit more successful in the market and reached to the early majority, which means to mainstream market. On the contrary, SAP PI 7.1 is getting ready to cross the chasm but not yet crossed.

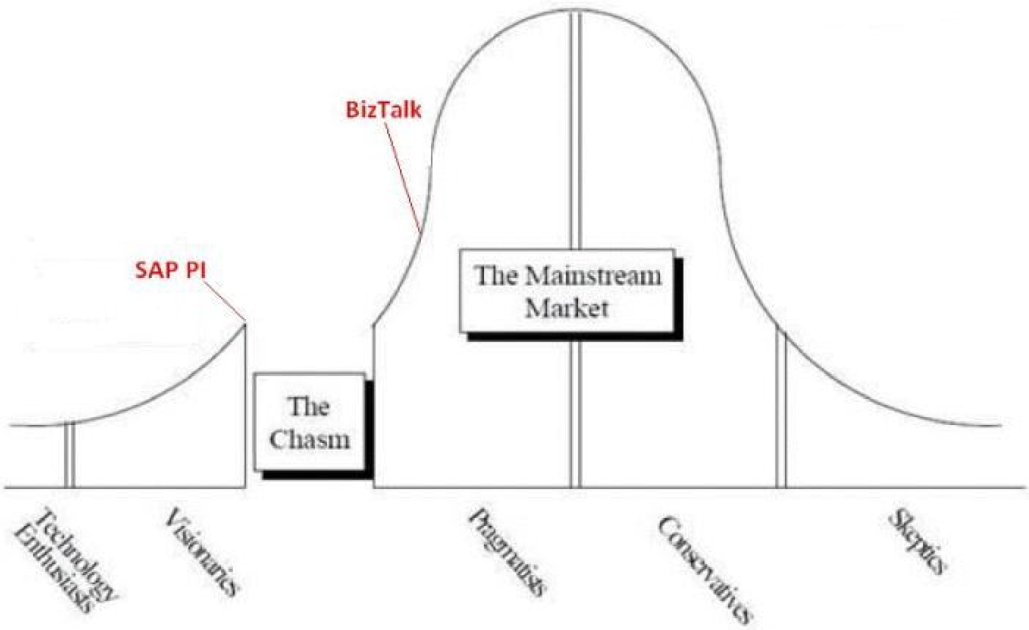

Figure 21: SAP PI and MS BizTalk on TALC by 2009

In a large company like Vattenfall, there are always pre-defined rules and regulations about how to decide, how to implement and so on. Company has decided an integration strategy few years ago and made their integration platform selection on BizTalk. Based on the TALC model showed, it was the right decision to select BizTalk over SAP PI because it was much more mature product. What Vattenfall Nordic Integration Strategy says is that, focus on to the operational excellence but has fair enough ability on product leadership and customer intimacy. Giving an example, if a company focuses on operational excellence they must use mainstream market product, lets say such as Windows XP operating system. Focusing on to Product leadership requires using innovative, latest products such as using Windows Vista and finally focusing on to Customer intimacy requires using what your customers can demand, so it requires using Windows XP, Windows Vista, Linux, Solaris, Mac OS and so on.

Figure 22: Vattenfall Nordic Integration Strategy Focus

As a result, Vattenfall Nordic Integration Strategy says, use mainstream market products to reach operational excellence. So, combining Vattenfall Nordic integration strategy and TALC, Vattenfall should use mainstream market products; which is Microsoft BizTalk right now.

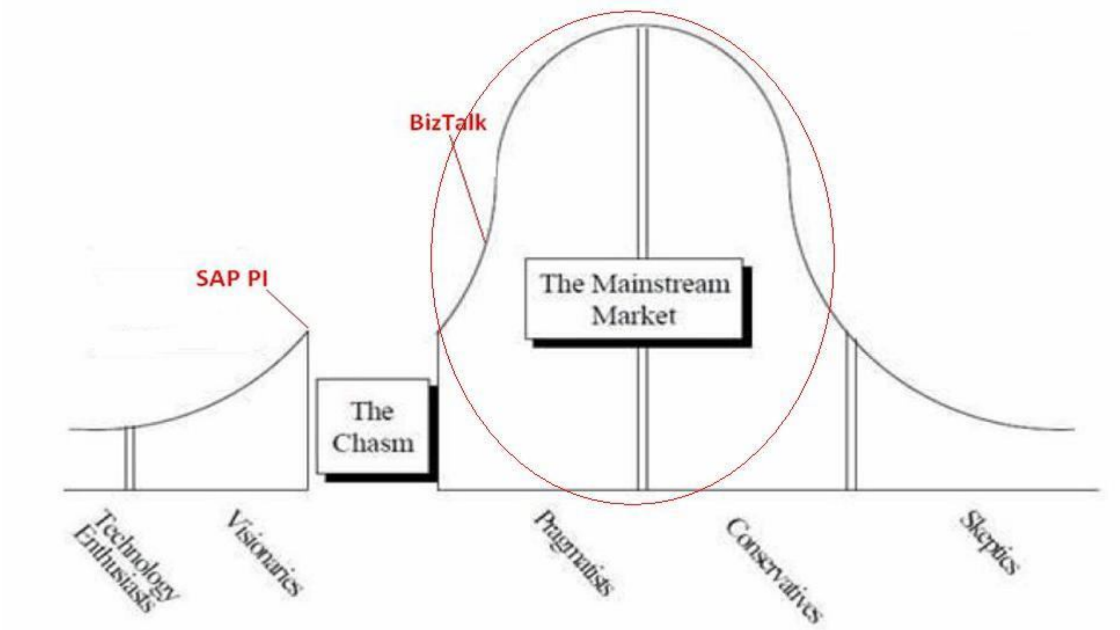

Figure 23: TALC and Vattenfall Nordic Integration Strategy Focus

But, SAP is investing lots of time and money to SAP NetWeaver PI in order to make it more mature product. The researcher guesses that the PI will also cross the chasm and will penetrate into the mainstream market. To do that, SAP has to have a major, evolutionary change in their product like Microsoft had. That's why, it is not recommended to replace BizTalk platform by SAP PI right now but PI can be used in small scale, not business critical projects to build internal competence and have experience.

It is equally important to compare technical and high level features of PI with BizTalk to know which one is the best to use for specific projects. Chart below summarizes most important features of BizTalk and SAP PI.

Feature	SAP PI	MS BizTalk
Licenses Fees	SAP PI Base Engine is priced based on the overall processed message volume expressed in Gigabytes (GB) per month. SAP PI is free to use between SAP-to-SAP. But not free for SAP-to-NonSAP or NonSAP-to-NonSAP SAP internal interfaces are free, no need to pay licenses fees for that.	Pricing of BTS in an Enterprise Agreement (EA). An EA typically runs for 3 years, and when you buy products in an EA, you also buy Software Assurance (SA), a yearly fee that amongst other secure access to all new versions of the product that are released during the agreement period. There is also a lot of other benefits included in SA, like support incidents and vouchers for training. Typically the yearly SA cost is 25% of the license price (L).
Certification and Courses	Certification is available from SAP. The cost for certification and preparatory courses is approximately 80000 SEK, excluding travel and lodging. There are only a handful of certified consultants on the Swedish market.	Certification is available from Microsoft partners in the area of education and training (for example, Learning Tree, Informator). Certification is tied to the version of the software. Certified developers become MCTS (Microsoft Certified Technical Specialist).
Vendor Locked-in Effect	Using SAP PI as integration platform will increase the vendor locked in effect of SAP for Vattenfall. That’s why a detailed plan must be made to mitigate the risks.	As far as using industry standards such as web services, BizTalk will not have a high degree of vendor locked in effect for Vattenfall.
Availability of Competence	Internally, Vattenfall Nordic does not have enough competence for SAP PI. It will take time and money to build internal competence center. To do this, information sharing and cooperation are important at group level. Externally, there are consultants available on the Swedish market from all major consultancy companies as well as smaller companies and independent consultants. Few of the major companies have as many as ten experienced consultants, and the	Internally, Vattenfall Nordic has enough competence on BizTalk. Since it is the main platform for the last 3-4 years, Vattenfall gained lots of experience and built competence on BizTalk. Externally, there are consultants available on the Swedish market from all major consultancy companies as well as smaller companies and independent consultants. The typical number of experienced consultants for a major company is approximately ten. The price level for an experienced consultant is approximately 1500 to 2000 SEK/h. Utilization is currently

	minor companies have one or two per company. Prices for experienced consultants range around 2000 SEK/h, and experienced consultants cost approximately 2000-2500 SEK/h. Utilization is currently very high with in the consultancy companies, for example, upgrade projects and internal integration efforts, meaning that experience consultants are hard to find.	very high with in the consultancy companies, meaning that consultants are hard to find. Major international consultancy companies have the bulk of development resources available off-shore.
Skills required during various phases	For analysis and design, the key skills are knowledge of the problem area and general integration skills (not necessarily tied to the specific product). Participation from a senior developer is also useful, for example, to determine rules and guidelines for development such as naming standards. With early involvement of senior development resources, it is possible to utilize a higher ratio of junior development resources during development and testing. Required skills include beginner Java programming, knowledge of XSLT and XPATH, as well as general database and operating system knowledge. All skills required are useful for development work on all Java-based platforms. Junior development resources can perform monitoring during operations, but experienced resources are needed as backup. For monitoring the WAS platform, experienced resources are needed and there are few with specific PI knowledge (a	For analysis and design, the key skills are knowledge of the problem area and general integration skills (not necessarily tied to the specific product). For development and testing, required skills in addition to knowledge of the platform include programming in C#, use of Visual Source Safe, programming in XPATH, use of XML and web services, and also general knowledge of IIS and SQL Server. These are all skills that are applicable in other parts of the Microsoft platform. In operations, staff benefit from knowledge of the platform in addition to understanding its deployment model and how it utilizes the hardware, for example, in a clustered environment.

	common development path for staff is to transfer resources with general technical SAP knowledge and add Java skills).	
Product support	It is relatively difficult to reach information about SAP PI and get support. SAP can provide both remote and on-site support. Support is also available from SAP partners. The primary information resource is SDN, run by SAP, but with content provided by developers from around the world. There are only a limited number of good forums outside SDN.	There are lots of ways to find information about BizTalk and relatively easy to get support. Partners are the primary source of support, especially on-site support. Similarly, customers get support cases based on the level of agreement with Microsoft. In addition, Microsoft has a consulting organization (MCS) that can provide support to projects, proof of concepts and other activities. MSDN provides a central location for information pertaining to BizTalk, but there are plenty of other sources of information. There are a lot of community sites regarding all aspects of BizTalk, containing news groups, blogs, free software utilities and other resources.
Product Roadmap	The current version is PI 7.1, which is part of NetWeaver. Version 7.0 was available for approximately one year. Version 7.1 is based on a new version of Java (version 5), and is also bring adapters that allow for local routing of messages and features to support high-volume installations. The biggest difference from 7.0 to 7.1 is advanced adapter and direct connection which when used in proper places will result in high performances. The Changes required for / after migrating to PI 7.1 from PI 7.0 1- Need to Migrate System to 64 bit OS before upgrade PI 7.1 will not support 32 bit OS	BizTalk Server 2009 is now available. In new edition, Microsoft heavily invested in application life cycle management and developer productivity issues. The most recent version is 2006 R2, which adds support for EDIFACT, RFID, and WCF. The next major version to be expected is scheduled for 2009 and will be part of Microsoft's ongoing Oslo initiative (a collection of activities for further integrating Microsoft's software and utilize service orientation). BizTalk is a major component in this initiative, and will feature BizTalk Services, a commercially supported release of web-based services enabling hosted composite applications that cross-organizational boundaries. This release will include advanced

	2- Customer Adapters and Adapter modules have to be adjusted and redeployed 3- Java Proxies have to be redeployed because JAVA JVM is installed during upgrade and JAVA JDK not supported at all in PI 7.1 4- SAP JVM is installed during upgrade (other JDK's are not supported)	messaging, identity and workflow capabilities. For more information: http://www.microsoft.com/biztalk/en/us/roadmap.aspx
Vendor Product Strategy	The future will likely bring additional integration between modules. The user interface will move to the portal, which will communicate with information resources using services, meaning that PI will have a central role as the service repository. Composite applications composed of services will increase in importance. Desktop widgets using services will also be available.	BizTalk is a key component in the server strategy of Microsoft. Further integration with other server components is expected, for example, SharePoint, to simplify service orientation and the creation of composite applications. Parts of BizTalk will likely be included as part of the operating system.
Building Competence	SAP is the primary source of training. On the European market there are other providers of training, but they often work as subcontractors to SAP. A person with a good background in software development and an interest to learn can become productive and work independently after approximately five or six months. With basic knowledge of development, a person can become productive after basic training and with guidance after approximately one week when	A person with a good background in software development and an interest to learn can become productive and work independently after approximately five or six months. Simpler tasks can be performed after training and with guidance after one or a few weeks. All major education companies, as well as some minor ones provide training. The curriculum is determined by Microsoft and currently includes three classes: Development BizTalk 2006 (five days), Operations and Maintenance (three days), and Deep-dive (five days).

	performing simple tasks such as mappings.	
Process Management	PI is used for defining process flows (Business Scenario), and also contains the process engine that executes processes once deployed. If more advanced functionality is required for process development, the recommended tool is ARIS from IDS Scheer. It provides an advanced environment for process development, including modeling and analysis of processes. Once the processes have been developed, they are moved into PI (there is no way to move processes back from PI into ARIS). Execution of processes is memory-intensive (cache memory), and a rule of thumb in process design is to use PI mainly for short-running processes. The other key function of PI is to server as the service repository for all services, both those delivered by SAP and user-defined. Visual Composer, a development tool that is part of NetWeaver is used for developing and combining services.	Processes can be defined at low level using the development tools of the platform. There is also an interface between Vision and the development tools; processes can be defined at a high level using a special stencil in Visio. This way of defining processes is rarely used, and there is no ways of reverse engineer an already defined process into Visio. A few suppliers of third-party tools have created other options for process definition. The platform contains various utilities for following up and reporting on processes. The BAM functionality allows for measuring points to be defined in processes; the measuring points then provide the raw data for various reports that can be defined in Excel.
Transformation and mapping	Mapping and transformation capabilities are similar to other integration platforms. Mappings are defined graphically using a drag-and-drop interface to create relationships between fields in input and output data. A set of predefined transforms exists, and users can also create their own transforms by programming	Mapping and transformation capabilities are similar to other integration platforms. Mappings are defined graphically using a drag-and-drop interface to create relationships between fields in input and output data. A set of predefined transforms exists, and users can also create their own transforms by programming. Version R2 adds the capability to

	(XSLT and XPATH, Java, or ABAP).	handle EDIFACT messages without the need of third-party software.
Interfaces	Adapters both for various SAP modules and other applications are included. PI also includes adapters for databases (JDBC), queue manager (WebSphere MQ), and various technologies/communication protocols. There are several suppliers of third-party adapters, such as iWay and Seeburger. SAP certifies third-party adapters. Adapters are built using JCA (J2EE Connector Architecture). No templates are included, but templates and guidelines are available from SDN. Depending on the licensing agreement with SAP, different rules apply, but in general integration from one SAP application to another using PI is free, while integration to applications outside of the SAP sphere are priced based on data volume.	A large number of adapters are included with the platform, both for applications, databases, and various technologies/communication protocols. There is no certification process for adapters, that is, Microsoft does not review third-party adapters. There are several suppliers of third-party adapters, such as iWay. Examples and tools for constructing custom adapters are available from various communities. For example, there are wizards that create code templates for adapters.
Transport	All functionality that is expected from a modern integration platform exists in PI (for example, delivery assurance, once-only, ordered delivery, and prioritization).	All functionality that is expected from a modern integration platform exists in BizTalk (for example, delivery assurance, once-only, ordered delivery). However, a developer must be familiar with limitations and side effects of different transport configurations when designing integrations, for example, when using ordered delivery.
System Management	The monitoring tools in PI are connected to SolMan (Solution Manager) and CCMS (Computer Center Management System), the overall solution for monitoring and managing the	There are two ways to keep track of an installation: through HAT (Health and Activity Tracker) and the administration console. HAT in the current version provides mainly historical data, while the

<table>
<tr>
<td></td>
<td>SAP platform. In the future, a NetWeaver Administrator is expected that will be specialized in monitoring and managing the NetWeaver platform.

Error handling in the integrations includes exception handling, and messages can be reviewed, corrected, and resubmitted.

Management of parallel PI environments for development, test, and production can be handled either by manually moving configuration files between environments, or by using SolMan (the environments can be fully defined and migration of configuration be performed automatically, including workflow steps such as approval).</td>
<td>administration console is used for monitoring current status and performing administrative tasks. Microsoft MOM can be used for monitoring event logs, and there is a plug-in for BizTalk that allows for monitoring of ports, orchestrations and other specific BizTalk objects.

Error handling in the integrations includes exception handling on all levels, configuration of retry attempts, definition of secondary transport, and the ability to correct and resubmit data (which can be easily integrated with InfoPath fur user-friendly interfaces).

For management purposes, integrations can be logically grouped into what is termed an "application". An application can be moved between environments as an MSI package.</td>
</tr>
<tr>
<td>Technology Platform</td>
<td>The technology platform for PI is WAS (as are all other SAP applications), and the part of WAS that is based on J2EE. This means that all services related to execution (for example high availability services such as load balancing and reliability) are provided by the application server. Current version of the product requires both Java and ABAP stack.</td>
<td>BizTalk is fully integrated with the Windows server platform. Load balancing is inherent in the platform, and can provide both improved performance (throughput) and increased reliability. A hardware abstraction called "host" is used when deploying the integrations. A host can for example be dedicated to receiving data, transforming data, or sending data. Multiple hosts may exist on a given server, and the hosts can be managed for example with respect to memory usage.</td>
</tr>
<tr>
<td>Systems Requirements</td>
<td>To install PI 30gb hard disk and 1gb RAM are needed. Also java web start installation is required to run integration repository and directory. Minimum 13-15 GB hard drive and 2 GB RAM are recommended by SAP for the proper functionality and speed.</td>
<td><table>
<tr><th>Component</th><th>BizTalk Server 2006 R2 Minimum Requirement</th></tr>
<tr><td>Computer and Processor</td><td>A computer with an Intel Pentium-</td></tr>
</table></td>
</tr>
</table>

				compatible CPU that is: - 1 GHz or higher or single processors -900 MHz or higher for double processors -700 MHz or higher for quad processors Hyper-Threading and Dual-Core processors are supported. The 64-bit versions of BizTalk Server require a 64-bit operating system running on an x64-based system. Computers based on CPUs that are compatible with the AMD64 (x86-64) and Extended Memory 64-bit Technology (EM64T) processor

			architecture are considered x64-based systems. BizTalk Server 2006 R2 Enterprise Edition and BizTalk Server 2006 R2 Developer Edition are the only editions that support native 64-bit execution. -BizTalk Server is not supported on Itanium-based systems.
		Memory	1 GB of RAM
		Hard disk	15 GB of available hard disk space for a complete installation including the operating system, all prerequisite software, and language packs. This does not include disk space for data storage
		Drive	CD-ROM or DVD-ROM drive

		Display	Windows Server 2003-compatible super VGA (1024 x768) or higher-resolution monitor
		Other	Network adapter card, and a Microsoft mouse or compatible pointing device

Table 4: SAP NetWeaver PI & Microsoft BizTalk Comparison

4.2 Systems Integration Projects' Success Factors

Selecting an integration platform is sometimes a bit like planning a vacation. Going for the "packaged tour" with an integrated system from one vendor, or planning own itinerary, the so-called "best of breed" approach. If looking for the optimal solution, the best of breed option usually provides richer functionality and satisfying more users. But cost savings, convenience, and efficient data sharing can make the integrated approach very appealing. On the contrary, best of breed systems designed specifically to excel in just one or a few applications, can pose challenges, such as increased training and support and complex interfaces with other systems.

One important thing to make clear is that, there is an optimal level of total numbers of vendors. Generally, if not always, large number of vendors can cause chaotic situations and more finger pointing occurs when there is a problem. That's why using not more than two middleware vendors is recommended.

Critical success factors are defined as "those few critical areas where things must go right for the business to flourish" (Rockhart, 1979). Critical Success Factor (CSF) is a business term for an element, which is necessary for an organization or project to achieve its mission. They are the critical factors or activities required for ensuring the success of a project. The term is widely used in the world of IT and business. The critical success factors (CSFs) could either be a risk or opportunities, depends on how the organizations handle them.

Based on a recent Gartner Institute study, 50% of IT projects were delivered above schedule and/or budget. Many projects were delivered with major functionality missing, or even cancelled after requirements gathering.

In 2001, Gartner updated their study to add "**lack of executive sponsorship**" as a major reason to project failures. According to a Standish Group Report, the top success factors for projects were as follows. The list is in decreasing order of percentage factors responsible for success.

- 18% Executive support
- 16% User involvement
- 14% Experienced project manager
- 12% Clear business objectives
- 10% Minimized scope
- 8% Standard software infrastructure
- 6% Firm basic requirements
- 6% Formal methodology
- 5% Reliable estimates
- 5% Other criteria

Considering the statistics above, for success of an integration project it is highly important to have clear goals, management support and good planning. Defining critical success factors can help project managers to spend more time on the issues that are defined as CSF, and focus more on specific stakeholders or actions. As a result of stakeholder meetings and four months research, critical success factors are defined for a successful SAP PI implementation.

Firstly, good planning. All the interfaces and legacy systems must be listed; a template document must be filled with all necessary data including volumes, frequency, protocols/adapters, file naming standards etc. It is also the basis for integration re-engineering, to set up SAP PI and establish servers with unique directories for each interface and planning.

A real life experience from Finnish XI project: *After we started implementation we've noticed that it was not a good decision to use vendor names in interface naming since vendors have merged and/or changed their names*.

Secondly, highly competent consultants are crucial to achieve a good result. For most of the XI-PI users it is a common problem, not to have enough internal competence. To solve this, Vattenfall can start building competence by a pilot projects. Sharing SAP PI competence at group level is crucial.

In addition, close co-operation with business / key users who know how the interface data is utilized in the business process is also a critical success factor. Because testing interfaces is not an easy task, both IT and business people must work together.

Also, internal marketing is a key for the success since the commitment and support of the business system owners are indispensable. As known from previous middleware replacement projects, there will be some additional effort and risk to the business system owners and therefore it will be very beneficial to convince them by explaining the benefits of replacing the current integration platform or method. Moreover, they should be involved as early as possible to prevent the project misunderstandings. According to SAP, most of the ERP related implementation concerns more work of dealing with people than only performing technical tasks.

A real life experience from SAP AG: *In one of the middleware replacement project the original plan was to involve business system owners only for the customer acceptance* *test. But, experiences showed that they are needed much earlier for test planning and even for having proper test data for unit and integration test.*

Another important critical success factor is to apply iterative go live strategy. Due to the limited resources for testing, implementation, monitoring and deployment becomes more important to have an iterative deployment plan to ensure that only manageable numbers of interfaces were replaced per specific time frame.

Last but not least, management support is one of the top critical success factors for SAP PI implementation projects. Referring to the results section, all of the high level management team supports using SAP PI as Vattenfall. So, this is an enabler for a successful PI implementation project. However, in order to gain the support from management, a good business case must be found. For example replacing Business Connectors with SAP PI can be a good business case. SAP has developed its own integration/middleware product (SAP Netweaver PI) so the SAP Business Connector (BC) product line was frozen at version 4.7 for some years[26]. That's why; replacing BC by SAP PI can increase performance and maintainability and reduce license fees.

[26] SAP Business Connector (also known as "SAP BC") is a re-branded version/restricted license version of webMethods Integration Server provided by SAP as a middleware solution for their R/3 product. It was the result of a partnership which began in 1999 between webMethods and SAP in order to provide an integration platform capability to SAP.

The role of the SAP Business Connector is to provide XML/web services type integration between SAP instances or from SAP to 3rd party system/B2B (as the platform had no similar capabilities).

SAP has since developed its own integration/middleware product (SAP Netweaver PI) so the SAP Business Connector product line was frozen at version 4.7 for some years. But in July 2008, SAP released a new SAP BC version 4.8. This version can be seen as a maintenance update to support newer JVM's and operating systems.

4.3 SOA Maturity Model

Transforming to the agile enterprise is a major, long term undertaking and requires a lot of integration and open standards based initiatives. Generally, if not always, agility has been accepted as a business goal for companies and many more researches will be done about planning and managing transformation as well as the technology to support the transformation and implement the capabilities. There are many other maturity models and frameworks in literature but they are well beyond the scope and aim of this research.

A basic and easy to understand SOA maturity model, which is also similar in concept to the Capability Maturity Model Integration (CMMI)[27], from the Software Engineering Institution and Carnigie Mellon University[28], is used. *The model provides criteria for assessment of (1) readiness of an organization to accept and manage the associated discipline and (2) the degree to which the necessary organizational structure, disciplines and supporting elements are in place(Reference: Building the Agile Enterprise with SOA, BPM and MPM by Fred A. Cummins).*

Based on the project stakeholders' meetings and research period spent at Vattenfall, the company is at level 1, which is Explored phase, in the SOA maturity model. So, Vattenfall is aware of SOA and its benefits and may be studying the potential impact or doing some proof-of-concept development. Interestingly, some of the projects have been done in a way that SOA mentality supports, but they did not named as "SOA based projects". This is an interesting situation and can be another research topic. Vattenfall is aware of SOA but the buzzword "SOA" is not always the name when they take these kinds of actions. The company does not have an accurate roadmap towards "SOA" or issues that should be addressed to the next level. In fact in theory, each level builds on the capabilities of the levels beneath it. Just as the construction of a building must start with the foundation, progression to agility and SOA maturity must also start with a base. At Vattenfall, this base is already available and even management is committed to SOA but as mentioned earlier; there is not a clear roadmap about next levels or capacity building.

[27] http://en.wikipedia.org/wiki/Capability_Maturity_Model_Integration last accessed 23 April 2009
[28] http://www.cmu.edu/index.shtml last accessed 23 April 2009

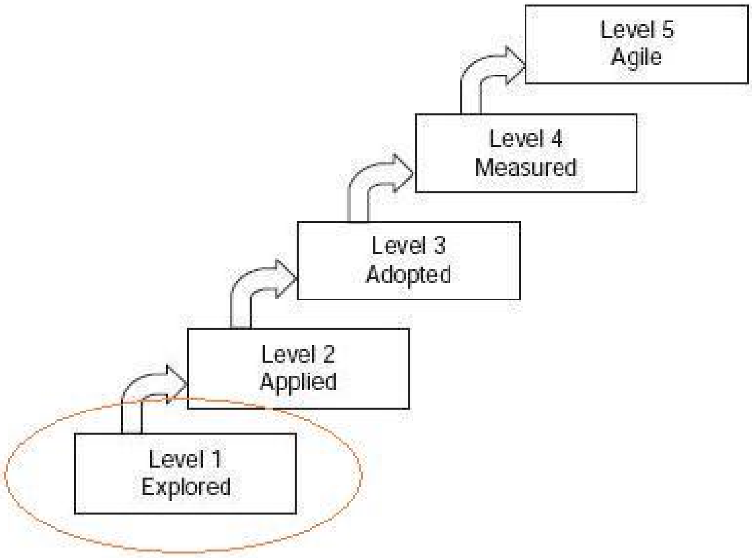

Figure 24: SOA Maturity Level at Vattenfall Nordic

One of the results of this master thesis research implies that, most crucial point of this maturity model is actually in business perspective. Because rather than only technical roadmap, business value provides a foundation for discussion of transformation in this model. Referring to the results part, most of the business stakeholders are aware of SOA mentality but they do not care about which technology to use. This is a proof that business perspective is actually the most crucial step in SOA initiatives.

Since the company uses lots of SAP systems and there will be a huge demand on SAP systems integration, SAP PI can provide a foundation towards Vattenfall's SOA based IT landscape. These kinds of investments in enterprise capabilities are needed to support future advances and to be ready for market changes. SOA based implementations can increase some costs in the short term. At the same time, the transformation roadmap must achieve incremental improvements through projects lifecycles that each realizes business benefits along the way, so the management will be convinced by perceived value.

5. Conclusion

The European energy market is currently subject to the political regulations of ”Unbundling” and ”Nordic Energy Market Consolidation” which require the physical division of sales and distribution data while on the same time increase the need for systems integration.

Vattenfall is an agile company with a heterogeneous systems environment where systems integration is a vital competence. Choice of integration platform is a strategic decision and two options are currently viable for Vattenfall: MS BizTalk and SAP PI. A qualitative study has been conducted to aid Vattenfall in taking this decision.

As a result, Vattenfall has to use SAP PI for integration between some SAP instances because PI is already included in NetWeaver product suite and is required part of some SAP applications. As Vattenfall add new SAP applications or upgrades to mySAP ERP, the core components of NetWeaver, Enterprise Portal, Process Integration, Master Data Management, Business Process Management, Business Intelligence, will be introduced somehow. So, all of the mySAP licensees have access to this toll set waiting unused on the shelf, if they decide not to use PI. However, it is suggested that Vattenfall continues to use MS BizTalk as the primary integration platform during the next 1-2 years due to;

- Insufficient human competence in SAP PI within and outside Vattenfall
- An unclear roadmap of the development of SAP PI
- The maturity of MS BizTalk
- A potential vendor lock-in situation with SAP

So, the hypothesis that the researcher built at the beginning of the research phase is falsified. For the time being, Vattenfall should not use PI as their main integration platform.

During the next 1-2 years Vattenfall should carefully monitor the development of SAP PI and the competence building around this product. If SAP PI becomes more mature, widely used in the market and has more clear vendor product strategy, Vattenfall might use SAP PI even for SAP-to-NonSAP and NonSAP-to-NonSAP scenarios.

It is also crucial to understand the companies' application landscape and then make a final decision to go for one integration platform. Because in fact, it is really difficult to say PI is definitely better than BizTalk or vice versa. Giving an example, many large SAP customers already selected an integration platform. But, they also know that PI (XI) is required component of some SAP modules. Therefore they try to understand the product and decide how much they are going to use it. As far as seen on the market, they are introducing SAP PI along with their established integration platform, mostly to support SAP-to-SAP integration scenarios. Where this looks like an advantage, most of the companies do not want to deal with two different integration platforms. In this case, if a company wants to adopt their integration platform strategy with SAP, gradually moving to SAP PI is the best way to go for. Because, as a result of the research, SAP NetWeaver PI will have a major change and this might cause serious problems for old PI investments. In addition to this, it is for sure that replacing all BizTalks with PI is not really a strong business case, because PI is still not a perfect product and needs a bit more real life experience.

After 4 months of research about ESOA and SAP PI, the researcher makes two predictions about future of SAP PI;

1- PI will be 100% Java based product. It means, SAP will re-write the ABAP part or make an OEM agreement to replace ABAP with an already available solution in the market.
2- Currently, PI is based on hub and spoke architecture. First development of XI (PI) started as a part of MySAP technology but right now SAP has NetWeaver which is more distributed, SOA oriented base technology. So, XI is not a perfect match since it does not support distributed architecture. Because of SAP's ESOA

strategy they need to make integration based on more distributed architecture. By doing that they can dramatically reduce the total cost of owner ship and increase availability and performance. So, this will also cause a major change on product.

These changes can be done in two ways;

1- SAP will outsource PI to some other middleware company but will continue to development of this product. Because they already sold PI or XI to 50% of their large SAP users and they cannot suddenly stop supporting the product. Also, PI is playing a centric role for SAP's ESOA strategy. So that, if SAP wants to be successful on this, they have to pay more attention to integration since this is one of the most crucial part of ESOA mentality.
2- SAP will buy another middleware company or make an OEM agreement to add their solution to PI in order to make it 100% Java based and distributed architecture based more open product.

So, it is important to keep all these in mind before making a buying decision. As mentioned before, a radical architectural change on PI, rather than an incremental evaluation, is expected. In order to mitigate the risks, it is recommended to be careful where companies use PI right now. For the time being, it is recommended to use PI within SAP landscape and for opportunistic applications, which means not mission critical projects. Also, make a good calculation about ROI. If it is 10 years, changing already established integration platform to PI is not recommended.

To sum up, both integration solutions have bad news – good news situation. As PI adoption grows, SAP will invest more into this technology. But if they want to penetrate into the main market, they have to enrich the functionality of their solution against competing integration platforms. Because current picture clearly shows that PI is dominantly used only by SAP customers. While this can be seen as a success, there are still lots of miles to go for SAP. Both integrated middleware approach (SAP PI) and best of breed approach (SAP PI + MS BizTalk) has pros and cons. So, it is up to company to decide which way to go. As mentioned earlier; unlike "Who Wants to be a Millionaire," there is not a "final answer" to this ongoing debate.

After all, the result of the research is to use BizTalk for outside SAP world and SAP PI for SAP-to-SAP at Vattenfall for one or two years and then, if required, make a benchmarking to select only one middleware solution.

As a summary of SAP NetWeaver PI (XI);

Product Strengths:

- Part of NetWeaver application packet
- Highly optimized for SAP-to-SAP integrations
- Prerequisite for some SAP applications and for ESOA
- Infrastructure of some SAP products for example Auto-ID
- Has lots of pre-built content for SAP-to-SAP integrations

Challenges:

- Synchronous scenarios and large file sizes cause performance problems
- Needs lots of memory and CPU power
- Very high TCO if using PI outside SAP landscape
- Smaller market share than leading competitors
- Performance problems for real time integrations
- Unclear product roadmap

Consider SAP PI when:

- Looking for integration of SAP systems
- Have some plans towards ESOA

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7. Appendixes

7.1 Stakeholder Meeting Questionnaire

Abstract

The purpose of this project is to evaluate the need for SAP PI in Nordic Integration Platform. This includes demands from current existing applications as well as future business requirements. This project shall deliver best practices about how to use SAP PI for Vattenfall Nordic for the next three to five years. The project will sum up and use existing knowledge within the current integration platforms and features of SAP PI as input for the best practices on integration services. This questionnaire aims to collect information of the present integration situation as input to final decision.

Company/Unit:	
Name :(leaving the answers)	
Role:	
Date:	

Current Strategies

Influences from Business Strategy

Describe shortly any issues in your business strategy that will have effect on your IT strategy. (i.e. increased customer base, new products, cost reductions, acquisitions, new regulations etc) Any issues relating to increased demand on information supply are especially important.	Note/comment

IT Strategy

Describe shortly current IT strategy Vision, Objectives, Key success factors and horizon (e.g. 3-6 year)	Note/comment

Integration Strategy

Describe shortly current Integration strategy and/or methods Vision, Objectives, Vendor locked-in effect, Key success factors and horizon (e.g. 3-6 year)	Note/comment

Identified Integration needs

Describe shortly current Integration needs State the identified needs below (e.g. technical, functional, organizational etc)	Note/comment
Does current Integration solution fulfill the Business integration needs?	
If no (above) or other need, please state what is missing	
Is the manning (recourses) in line to secure the current service need?	
If no (above) or other resource need, please state below what's missing	
Other needs	

Importance and priority of Integration area characteristics.

Integration characteristic's and capabilities Some of the capabilities are contradicted ional (e.g. low cost and flexibility), so please rank/prioritize the "capabilities" jointly.	Importance 1=very Low 10= Very High 1	2	3	4	5	Priority order/rank 1-10 1=highest priority
High performance (in terms of low latency or throughput)						
High security (confidentiality, integrity, availability, non-repudiation, etc)						
Other quality of service aspects (prioritization, ordered delivery, guaranteed delivery, etc)						
Flexibility (ability to rapidly respond to changes in business process)						
Business monitoring of information flows						
Low cost						
Business enabling (i.e. a high level of functionality)						
Other_____________________________						
Comment's to above if needed						

Current and planned Situation

Quantity information

Please estimate quantities below. Increase/Decrease per year refer to your best forecast.

Question	Quantity	Magnitude	Increase/Decrease per year +/- %
Estimated number of inter connections between systems			
Estimated number of Integration parties (BU:s and Companies)			
Estimated number of integrated systems			
Part (percentage) that are connected via an integration platform			
Estimated number of integrated systems with SAP (SAP-to-SAP and SAP-to-NonSAP)			
Estimated integration data **volume** do You have in production?			
Estimated integration message **volume** do You have in production?			

Technology

Describe Current integration technology solution. What type(s) of technology is used for integration and to which extent?		Note/comment
Technology	**Percentage** of all interconnections	
Point-to-point		
Message based		
File transfer		
Web Service based		

Technical platform

Which technical integration platform(s) are used? E.g. BizTalk 2004, SAP XI/PI			Note/comment
Platform	**Version**	**Percentages** of all interconnections	

Planned upgrades

Describe planned upgrades of integration platform (including functional, security or SLA upgrade)	Note/comment

Flow characteristic

Give some characteristic of current your integrations		Note/comment
Characteristic	**Percentages** of all interconnections	
Online		
Batch		
Message oriented		
Event driven		
Steering /orchestration		
Mapping		

Integration Solution

In your opinion; is the current Integration solution suitable for today's and future situation	Note/comment

Customer satisfaction

Are the user/business/parties satisfied with current integration solution?	Note/comment

Improvement areas

Are there any improvement areas pointed out?	Note/comment

Organization

Quantity of information Integration organization resources

If there are several platforms, please divide resources per platform if possible.
Increase/Decrease per Year refer to your best forecast.

Question	Quantity	Magnitude	Increase/Decrease per year +/- %
Integration Operation			
Integration Maintenance and support			
Integration Development			
How many external consultants are included above			

Integration Plans

Initiatives

Integration related initiatives

Describe planned or ongoing initiatives related to Integration			
Initiative	Description	Start month	End month

7.2 Microsoft BizTalk Meeting Questionnaire

1. What is the roadmap of MS BizTalk and vendor product strategy?
2. What is the Microsoft view of SOA, where will it go?
3. Integration and best practices about BizTalk?
4. SOA governance tools at BizTalk?
5. What are the licenses fees and maintenance cost of BizTalk?
6. What are the recommendations about building human competence (training, certificates) and fees for consultants?
7. How to decrease vendor locked-in effect once starts using BizTalk?
8. Interoperability with other vendors, and how BizTalk handles them?
9. How to connect MS BizTalk and SAP PI?
10. Adaptors and technical capacity of BizTalk?
11. Hardware requirements and systems specifications to use BizTalk?
12. Any reference customer from energy or electricity market?
13. What is unique about BizTalk?

7.3 SAP NetWeaver PI Meeting Questionnaire

1. What is the roadmap of SAP PI and vendor product strategy?
2. What is the SAP view of SOA, where will it go?
3. Integration and best practices about SAP PI?
4. SOA governance tools at SAP PI?
5. What are the licenses fees and maintenance cost of SAP PI?
6. What are the recommendations about building human competence (training, certificates) and fees for consultants?
7. How to decrease vendor locked-in effect once starts using SAP PI?
8. Interoperability with other vendors, and how SAP PI handles them?
9. How to connect SAP PI and Microsoft BizTalk?
10. Adaptors and technical capacity of SAP PI?
11. Hardware requirements and systems specifications to use SAP PI?
12. Any reference customer from energy or electricity market?
13. What is unique about SAP PI?

8. Figures and Tables