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History data archiving in an ERP project

Case: Neste Oil

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Abstract

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This thesis studies diverse solution options for data archiving in an ERP project. The task of this thesis is to solve different solution options for the client, and in addition, to produce a proposal of the most suitable solution for the client's needs. The client of this thesis is Neste Oil.

During the year 2013, the client will implement an ERP system, which will replace seven of the current systems. This thesis focuses only on the data that will not be transferred into the new ERP system. This thesis doesn't include the process of choosing the archiving solution or the process of implementing that solution.

This project was conducted as a qualitative study. The theory part of this thesis is based on material both in English and in Finnish. Literary works and interviews with the personnel of Neste Oil worked as a basis for the theory. The empirical part also includes interviews with Neste Oil personnel and external service providers.

The basics of data archiving are described in the theory part. The theory part also contains the results of the interviews. Based on these results, there is also a summary on the client's needs of the data to be archived. Based on the empirical study, the three data archiving solution options are described in the results of this thesis. In the results, there is also the proposal of the solution I would recommend the company to choose, based on this entire study.

Key words
Data archiving, ERP, history data, data warehousing

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Tämä opinnäytetyö tutkii erilaisia vaihtoehtoja historiadatan arkistointiin toiminnanohjausjärjestelmän käyttöönoton yhteydessä. Opinnäytetyön tehtävänä on selvittää eri ratkaisuvaihtoehtoja toimeksiantajalle ja lisäksi tuottaa ehdotelma parhaasta vaihtoehdosta yrityksen tarpeisiin nähden. Toimeksiantajana opinnäytetyössä toimii Neste Oil.

Toimeksiantaja ottaa vuoden 2013 aikana käyttöönsä toiminnanohjausjärjestelmän, joka korvaa seitsemän nykyistä järjestelmää. Opinnäytetyö kohdistuu ainoastaan siihen dataan, joka on päätetty olla siirtämättä uuteen järjestelmään. Opinnäytetyön sisältöön ei kuulu ratkaisuvaihtoehdon valintaprosessi eikä valitun ratkaisun implementointi.

Tutkimus toteutettiin laadullisena eli kvalitatiivisena tutkimuksena. Tutkimuksen teoriaosio perustuu sekä englannin- että suomenkieliseen materiaaliin. Teorian pohjana käytettiin sekä kirjallisia lähteitä että Neste Oilin henkilöstön haastatteluja. Tutkimuksen empiirinen osio sisältää myös haastatteluita aiheeseen liittyviltä Neste Oililaisilta sekä ulkopuolisilta palveluntuottajilta.

Teoriaosiossa kuvataan tietovarastoinnin perusteita yleisesti. Osiossa on lisäksi kirjoitettu auki haastattelujen sisällöt, minkä perusteella on vedetty yhteen toimeksiantajan tarpeet arkistoitavasta datasta. Empiirisen osion perusteella kirjoitettiin kuvaukset kolmesta erilaisesta ratkaisuvaihtoehdosta arkistointia varten ja nämä kuvaukset löytyvät opinnäytetyön tuloksista. Tuloksiin on myös kirjoitettu perustelut valitsemalleni ratkaisuehdotukselle, mikä tutkimuksen perusteella vastaisi parhaiten asiakkaan tarpeita.

Asiasanat
Tietovarastointi, toiminnanohjausjärjestelmä, historiadata

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1 Introduction

Every year many companies decide to renew their data systems in order to respond to their customers' needs better and to stay up-to-date in the ever developing world of information technology. Many companies choose to implement ERP solution software, which replaces the previously used and possibly outdated programs.

The implementation of the new system is a story of its own, but it is not the only factor to be considered when having an ongoing ERP project. One must also determine what will happen to the old programs that will no longer be used when the ERP system kicks off. Most often, the solution is to run down the programs that no longer have any value to the company. However, that is not as simple as one might think, since these programs can contain a huge amount of data, which cannot be transferred into the new system.

Therefore, the concept of data archiving has taken up a more important role in the company strategies. Executing data archiving can be done in countless ways, each of which meet different types of requirements. This project covers the subject of data archiving in an ERP project in Neste Oil, and hence is focused merely on this single client's needs for archiving. Nonetheless, the basic ideas of this thesis can be used as a reference for other cases as well.

1.1 Starting point

This project started from a point, where a small amount of preliminary study has been made approximately two years ago in 2011. This preliminary study has looked into the requirements of archiving data at a basic level and the costs of keeping up old systems for an X amount of years. However, since it's been several years when this study was made, it is completely possible that the facts are nowadays outdated and false. For this reason, it cannot be assumed that this study will be of any advantage in this project.

1.2 Thesis objectives

The objective of this thesis is to find out the most suitable data archiving solution to meet the client's needs. The three solution options have been outlined in advance. In order to reach this objective, the project has partial objectives such as a specific analysis of the data to be archived and a detailed description of the archiving solutions.

1.3 Definition of task

The task of this project is to survey the amount and the type of data to be archived. This project only focuses on the ERP project called Rita. The outcome of this project is a proposal for an archiving method that based on the project's results would seem to be the wisest solution for Neste Oil.

This project does not include the choice of the archiving method and its approval, nor does the project concern implementation of the chosen archiving method. This project only concerns the data that is decided not to be transferred to the new ERP system.

1.4 Concepts

BICC	= Business Intelligence Competency Center
Bottled gas	= LPG gas supplied in metallic or composite bottles
Bulk gas	= LPG gas supplied in bulk form
EDW	= Enterprise Data Warehouse, a data warehousing program to be implemented in Neste Oil
ERP	= Enterprise Resource Planning; business management software that allows an organization to use a system of integrated applications to manage the business (Webopedia).
Fina R12	= A project with the target of implementing a new version of an existing finance program in Finland, and in addition, to implement the program globally to other Neste Oil
Fuels	= Gasoline, diesel fuel (& renewable diesel), aviation fuel (& renewable aviation fuel), light fuel oil, heavy fuel oil and small-engine gasoline
Lean	= An ERP program for lubricant sales and invoicing
LPG	= Liquid petroleum gas
Lubricants	= Substances used for lubricating an engine or component, such as oil or grease.
Manu	= A invoicing program for manually handled invoices
Matha	= A program for LPG sales and invoicing
MerittMan	= A invoicing program used in the Neste Oil's Baltic offices
NExBTL	= Neste Oil's renewable diesel
OLTP	= Online transaction processing; a class of program that facilitates and manages transaction-oriented applications, typically for data entry and retrieval transactions (Rouse, M. 2005).
PDT	= Project decision team
PNL	= A invoicing program for fuel sales in Finland
Project sales	= Bulk LPG solutions that involve the design, installing and maintenance of customer's LPG equipment

PTJ	= A program for customer management, card management and pricing (fuels, lubricants, solvents etc.)
Rita	= An ERP project
Tiha	= A program for fuel sales and customer management
Tilasto	= A reporting and statistics program (to be replaced with EDW)

2 Data archiving

Usually, in a company's data systems there is a great amount of important data that is also representative of the company. This data can be referred to as the company's capital, because of its value and because of the amount of work it has required to come about. However, utilizing this data to function as a support for the business has not been easy. Building and maintaining the OLTP systems has required plenty of money and time, but companies seldom know how to exploit this investment at its full capacity. (Hovi, A. Koistinen, H. Ylinen, J. 2001.)

Data archiving is one of the solutions that enable companies to gain benefit from their data capital. Data archiving means moving data objects from an operational database to a data store for long term retention. This data is not actively used or updated anymore, but still provides value and importance for the company. (Janssen, C. Olsen, J. 2010. Rouse, M. 2010). The main idea behind data archiving is to offer more disk space in the OLTP systems, and simultaneously maintain users' availability to the archived data.

An important point in data archiving is that the data is not expected to be referenced again. Therefore, the data must not be moved from the operational database too soon. The correct time to move data is when it's not needed in normal business processes and its probability of being needed again is very low. Nonetheless, the archived data needs to be accessed sometimes, which is one of the main reasons why data archiving is needed in the first place. Archives exist to keep data for legal and business requirements, and it is crucial to determine and clarify the probable uses of the data in the future. These aspects should have an impact on the decision of how and where to keep the data archive. (Olsen, J. 2010.)

2.1 Development of data archiving

The early stages of data archiving began already in the 1980's, when the essential function was mainly history data reporting. In the 1970's and 1980's information technology's role was to support prioritized strategic areas, and this was taken into considera-

tion when developing information technology. Halfway in the 1980's the so called Info Centers were been built. These Info Centers were meant to modify data from operational systems so that users could design and compile reports themselves. Often suitable information bases were constructed, but contemporary microcomputers couldn't handle such data masses. (Törmänen, A. 1999.)

The term data warehouse came up in the 1990's, when both IBM and Digital presented the concept of data warehouse. The developer of this concept, Bill Inmon, highlighted even then that data warehouse is a solution to companies' problem in data management. In 1991, IBM released its interpretation of data warehouse, which was called Information Warehouse Framework. The information was quite technical in the beginning, because the purpose was to describe the process of gathering raw data and turning it into information. (Törmänen, A. 1999.)

Today, data archiving and warehousing has grown up to a strategic tool for the company's management, and the needs of dynamic use of information for business have increased clearly. The current modus operandi of business requires precise and accurate information of customers and their potential. And with a more in-depth analysis of the customers, the company can improve for example their customer service. (Hovi, A. Koistinen, H. Ylinen, J. 2001.)

2.2 Database archiving

Database archiving is one of the forms of data archiving, which also has many other subtypes. Database archiving means keeping of the company's inactive information, which is collected in many ways. Inside database archiving there are two variations, physical and virtual database archiving.

Physical database archiving means that the data is taken directly from the physical database and sent to the archive. This method doesn't concern the original system that used to produce data in the tables of the database. The current problem with physical database archiving is too complex databases, where table and column definitions are

not explicit. This is the result of poor database design, which is unfortunately still quite common.

Virtual database archiving doesn't directly concern the tables of the database. In virtual archiving, the user defines the archive by using application programs. These programs have interfaces that the user can use to extract, search and delete data from the database.

2.2.1 Data objects

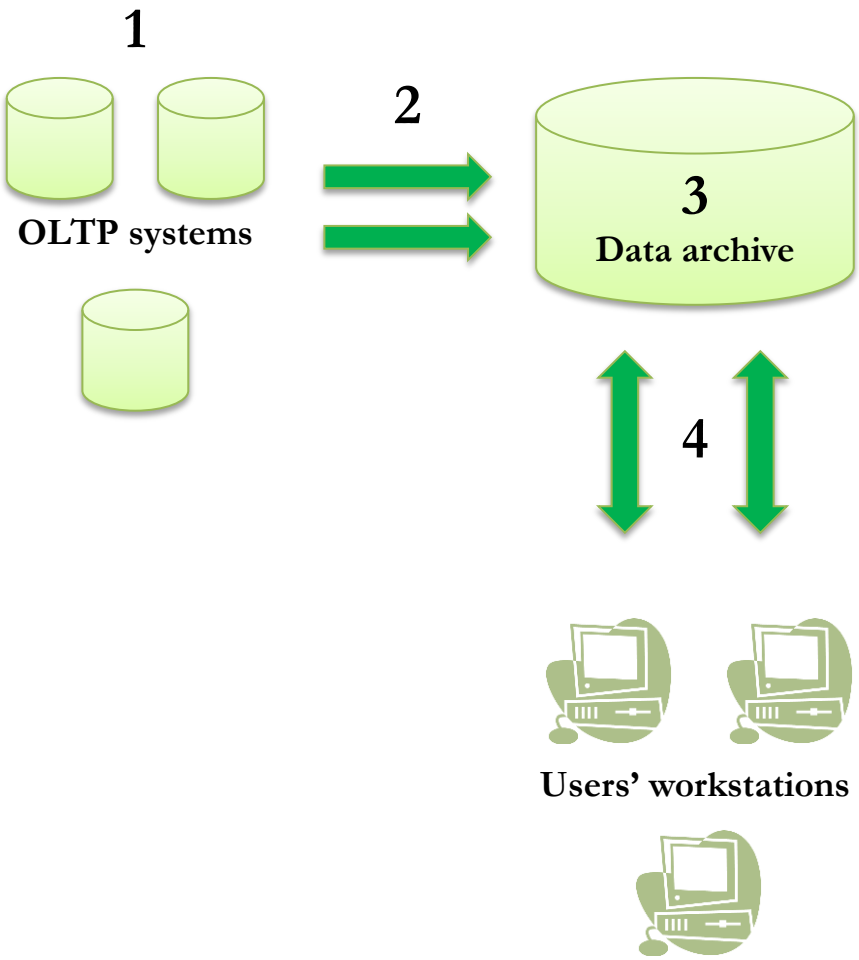
Database archiving consists of data objects that are transferred from operational databases to an archive. Data objects are units of information, which will be searched from the archives in the future. These objects symbolize business events or objects, such as banking transactions. The basic unit is a single transaction, but also some collections of data can be considered as units. (Olsen, J. 2010.)

In archiving, data objects create the data that needs archiving. It is important that not all the data objects are archived unless there is a clear need for that. Also, all data objects might not be available for archiving at the same time, and therefore it is the user's responsibility to create policies and rules that the archiving will be based on. An example of a data archiving policy could be "all transactions that have been created over 90 days ago", but sometimes more complicated policies are needed. (Olsen, J. 2010.)

2.3 The refining chain of data in data archiving

Data archiving is a method to organize data. A data archive can include data from several separate systems, and is able to combine it into information the user has inquired. Below is a figure of the refining chain of data in data archive:

Figure 2. The refining chain of data in data archiving.



1. The OLTP systems handle data in their operational data bases.
2. The data is gathered, read and processed before in enters the data warehouse. If needed, the data will be standardized. Finally, the data will be uploaded to the warehouse.
3. The data archive receives the data, which will be added after the existing information, and this way creates a possibility to analyze history data.
4. The data in the warehouse is queried, analyzed and reported by the users through their workstations.

   (Hovi, A. Koistinen, H. Ylinen, J. 2001.)

Data archiving enables turning pure data into information, which will be useful for the company. Data in the OLTP systems is called "basic data" and they are presented at an elementary level. In data warehouse this basic data can be transferred into information by combining useful basic data from different OLTP systems. The amount of data available rarely is the problem, but companies need important and correct information

to support business. This is what data warehousing and archiving try to enable. (Hovi, A. Koistinen, H. Ylinen, J. 2001.)

2.4 Data archiving vs. data warehousing

Data archiving and data warehousing go hand in hand in some areas of data retention. Data warehousing without data archiving in practice means a data warehouse without logic and upkeep (Agosta, L. 2008). Having a functional data warehouse requires data archiving that verifies the relevance of the data stored in the warehouse. Therefore, considering and executing data archiving when having a data warehouse is vital.

However, data warehousing can also refer to a data warehouse that is used as a throw-away version and might not represent official versions of the data. Data warehouses do not necessarily keep data long enough and they might not be able to offer data at a detailed level. Still rarely, data warehouses can be used as data archives. In these cases, the solution needs to be carefully planned to satisfy all the requirements of both. (Olsen, J. 2008).

2.5 Data retention requirements

In principle, data is not required to be archived by the law. The law does often stipulate the amount of time that certain information must be retained, but it doesn't specify the means of retaining nor the time, when the information needs to be transferred to the archive. (Olsen, J. 2008).

More often, laws are not the governing factor for data archiving. Instead, these requirements come from companies themselves, and the reasons behind these requirements can be solely based on business, such as keeping customer history data to provide better customer service. However, the requirements from business have gotten shorter in the past, and vice versa, the law requirements have gotten longer. (Olsen, J. 2008).

2.5.1 Database configuration choices

Operational

Maintaining the operational database only, and keeping all the data there for its entire retention period. (Olsen, J. 2008).

Operational and reference database

Data is moved from operational database to a reference database, when the data is no longer in active use, but can be expected to be referenced. The data will be kept in the reference database for the remainder of its retention period. The difference between a reference database and a data archive is that the structure of reference database is similar to operational one, and it can be accessed from the operational applications. (Olsen, J. 2008).

Operational database and archive data store

Data is kept in the operational database until it has reached its archive phase, and it's not expected to be used or referenced anymore. When the archive phase has been reached, the data will be moved to an archive, where it stays until the end of its retention period. A database archive store changes the data, so it becomes separate from its original applications and structure. (Olsen, J. 2008).

All three

Data is located in the operational database until it reaches its reference phase. Next, the data is moved to a reference database until it reaches archive phase. Finally, the data will be moved to an archive, where it will be reconstructed and stored until the end of the retention period. (Olsen, J. 2008).

2.6 Objectives for data archiving

Below, there are some guidelines for objectives in data archiving. These points are important, no matter what kind of archive and data is at stake.

- Reports and queries are available around the entire organization, at best around the world.
- Data inside the archive is consistent and documented.
- Users can execute queries without help from experts.
- The data quality is reliable.
- Data can be uploaded to the archive from several different systems.
- History data is available in the archive.
  (Hovi, A. Koistinen, H. Ylinen, J. 2001.)

3 Target of research

This chapter introduces the target company of this project and also explains the ERP project which this project is strongly related to.

3.1 Introduction of the target company

Neste Oil is a Finnish oil refining and marketing company. The company produces a wide range of the most important oil products and is also the world's leading renewable diesel supplier.

Neste Oil's history began already in 1948, when the company's predecessor Neste was established. First, the company operated only with one freighter called st Neste that carried oil from abroad and brought it to storage in Naantali, Finland. In July 1957 Neste set up Finland's first refinery in Naantali. During the first years, the refinery's oil producing capacity was around 800,000 tons, but it was soon raised up to 2.5 million tons since the country's demands for oil were increasing strongly.

In the 1960's Neste established another refinery in Finland and also enlarged its area of business from oil refining to natural gas, oil drilling and chemical industry, just to name a few. Since then the company has grown and developed steadily, and in 1995 Neste was listed in Helsinki stock exchange. Soon after, in 1997, the company merged with Imatran Voima (IVO) forming a new energy company called Fortum. However, in 2005, Fortum's oil business was separated and a new company called Neste Oil was formed. Neste Oil listed in Helsinki stock exchange in 2006.

Today, Neste Oil operates in 14 different countries around the world and employs more than 5,000 people. Neste Oil's headquarters lie in Espoo, Finland, and employs around 500 people. Neste Oil also has two refineries in Finland and these refineries produce different oil products, such as the company's own renewable diesel called NExBTL. In 2010 the company started up a production plant in Singapore and a year later a similar plant in Rotterdam, Netherlands. These plants also produce NExBTL,

making the combined yearly capacity exceed 2,000,000 liters. In addition to these four plants, Neste Oil has a joint base oil plant with Bapco in Bahrain.

3.1.1 Business areas

Neste Oil has two key business areas: Oil Products and Renewables, and Oil Retail.

Oil Products and Renewables purchase crude oil, renewable raw material and other feedstock for refineries and plants around the world. This business area is also responsible for trading of Neste Oil's products to international customers, and the constant development of new products in the chosen growth segments of diesel fuel and VHVI base oil. Neste Oil also has its own fleet, which annually transports around 29 million tons of crude oil, oil products and chemicals, primarily in the Baltic, the North Sea and the North Atlantic areas. Oil Products and Renewables business area is also responsible for this tanker fleet.

Oil Retail business area focuses on the most important oil products, such as diesel, gasoline and fuel oil. This business area is responsible for these products' direct sales to customers and also has a wide network of Neste Oil stations. The total amount of stations is approximately 1,030 and they are located in Finland, Estonia, Latvia, Lithuania and Northwest Russia.

3.1.2 Products

As mentioned before, Neste Oil has a large amount of different products that are marketed to all sorts of customers, from private persons to international concerns. The most important product is the renewable diesel NExBTL that is sold to countries around the world.

For private persons, the most known products are diesel, gasoline and different lubricants for cars, and also the light fuel oil which is used for heating buildings etc. Neste Oil stations also sell bottled gas that can be used in grills and gas cookers, for example. For companies, Neste Oil also offers aviation fuel, heavy fuel oil, bunker oils, solvents and liquid petroleum gas.

3.1.3 Strategy

Neste Oil's vision is "to be the preferred partner for cleaner traffic fuel solutions". The company wants to offer renewable and sustainable products for the ever growing demands of the world of traffic. Neste Oil invests in developing innovative and creative solutions in relation to fuels. In addition, one of the company's targets is to be a pioneer in the area of responsibility.

As a part of the company's strategy Neste Oil has developed and is currently implementing five value creations programs that aim towards the company's vision. These value creation programs were launched worldwide and they are called: Profitable Growth, Productivity, Renewable feedstock, Customer focus and Winning Culture.

3.2 Introduction of the ERP project

This project is related to an ERP system implementation project that is ongoing in the Oil retail area. The ERP project is called Rita, and it has started in 2010. Rita project's goal is to offer a practical but versatile program for over 200 end users, whose work roles and tasks vary from stock control to invoicing. Rita project affects the personnel in Finland, Estonia, Latvia and Lithuania, and the project consists of two major areas: implementation of an ERP program, and changing and standardizing the working methods through the entire Oil retail.

Rita project has already been implemented in Neste Oil Estonia in January, 2013. Estonia was chosen as the pilot country, since they only sell fuels and not lubricants nor gas. Therefore, the functionalities and interfaces to other programs were easier to realize than what it will be in Finland. The go-live date of the Rita project in Finland is now planned to be during the fall 2013, and the implementation will be executed in two phases. The first phase involves fuels and lubricants' implementation and the second phase concerns implementation of gas products and project sales.

3.2.1 Programs to be shut down

Rita project will completely replace seven separate programs that nowadays deal with sales, supply, invoicing etc. Six of these programs are used in Neste Oil Finland, and two programs are used in Neste Oil Estonia. These programs are called Tiha, PTJ, Lean, Matha, PNL, Manu and MerittMan. Next is presented a short introduction on all these programs.

Tiha and PTJ

Tiha and PTJ are similar programs in many ways, and the user is able to complete several identical tasks in both programs. That is why they are introduced in same the chapter. Tiha program is used for selling fuels, but also for customer management purposes. PTJ is used for card related issues, pricing and also customer management. The main difference between these two programs is that with PTJ the user cannot create fuel offers or orders. Both of these programs were created in the early 1990's and have not changed much since.

Lean

Lean is a program that covers only lubricants. With this program the users create orders, observe deliveries, create items and browse invoices. In relation to lubricants, some things are also created and handled in PTJ, and those are prices and customer management.

Matha

Matha is a program for gas sales. Matha includes for example item data, order data and customer data related to both bottled gas and bulk gas, and the program also includes information of project sales. Matha operates almost totally independently, but it has a connection PTJ in regards of interest calculation.

PNL and Manu

PNL and Manu are both invoicing programs and that is why they are introduced in the same chapter. PNL handles the invoicing of all fuels. PNL gets information from Tiha and forms invoices according to deliveries. Manu is an invoicing program that contains all manually handled and created invoices.

MerittMan

MerittMan is also an invoicing program, but it operates only in the Baltic area, and not in Finland. MerittMan handles the fuel invoices, just like PNL does in Finland.

3.2.2 Other projects related to Rita project

In Neste Oil, there are also other ongoing projects that have some effect on Rita project. The two largest projects are called Fina R12 and EDW projects. I will shortly present these projects here, since they also have some impact on the outcome of this thesis project, because of which the reader should understand or know at least a little of these projects.

Firstly, The Fina R12 project is a finance project and focuses solely on one existing program that is used by Neste Oil's credit controllers and accounts receivable clerks. This program is provided by Oracle and the Fina R12 project's target is to implement a new version of the program. In addition, the Fina R12 project will bring the program into use globally.

Secondly, the EDW program is a project that focuses on reporting. EDW is an abbreviation from the words "Enterprise Data Warehouse". This project is going to replace an existing reporting program called Tilasto, and EDW will be implemented around the same time as Rita.

4 Realization of the project

The process of realization of this project was quite clear even from the beginning. The client and I agreed on the basics without difficulty, and therefore the planning part of the project was carried through relatively quickly. In this chapter, I will explain the planning more in detail, and also enlighten the process of executing this project phase by phase.

4.1 Planning description

The planning of this project started with pondering on the most reasonable way to progress. After discussion with the client, the best idea seemed to be dividing the project into three phases that are described in the following chapters. Next, the client and I started to think about these phases in detail. The first phase was to include interviews and research for written information. The second phase became the survey phase, where I would be meeting the service provider(s). The third phase would consist of results and conclusion, and of the proposed decision that I would then present to the client.

4.2 Process description

This project consists of three major phases: the research phase, the survey phase and the conclusions phase. Next, I will shortly introduce each of these phases and their content.

4.2.1 The research phase

The research phase means searching for information about data archiving and trying to understand the basic principles of archiving. The information will be sought on the Internet and in books, both in English and Finnish.

In addition, the research phase contains several interviews with the personnel in Neste Oil in order to find out, what are the real requirements for archiving the data on the client's behalf. These interviews will be targeted at persons, who have strong

knowledge of the old programs (one or more), and additionally have strong knowledge of the working methods currently used and related to the named programs. The contents and the results of these interviews will be described in the Results section of this thesis.

4.2.2 The survey phase

The second phase is made up of meetings with potential service providers (one or two). The meaning of these meetings is to receive an answer to at least the following questions: what the service provider can offer Neste Oil as an archiving solution, how it could be implemented, how long the entire project would take in time, and naturally, what would be the costs of this certain solution, if Neste Oil was to choose to buy it. In addition to these meetings, this phase contains an interview with an internal head of BICC. The BICC department of Neste Oil might be able to offer a data dump solution, and the target of this interview is to find out answers for the above mentioned questions in relation to the data dump solution.

Furthermore, the survey phase contains an overview of the third solution option, which is to keep all the old programs running for an X amount of years. This overview must include a rough estimation of both the amount of work hours and the amount of money that this solution would require to function properly and in the wanted way.

The second phase's interviews and memos will be introduced after the conclusions phase.

4.2.3 The conclusions phase

The third and last phase consists of data analysis and conclusions of the previous project phases. In this phase, the target is to review the interviews done in the first phase, to go through all of the solutions, and based on these analyses, to propose one the solutions for the client.

4.3 The interviews completed in the research phase

The first phase of the process was to interview Neste Oil's personnel, who are working with the old programs that might be shut down, when Rita is implemented. The interviewees were chosen according to their knowledge of the old programs, but also the knowledge of the business processes in Oil Retail. When planning the interviews and deciding on the most suitable interviewees, the data archiving needs were prioritized in the following way:

1. Data that needs to be stored because of law requirements.
2. Data that needs to be stored because of contracts and/or agreements with customers.
3. "Nice-to-have" data, meaning data that doesn't have any official requirements for retention, but the personnel strongly wishes for its storing.

According to the previously mentioned guidelines, the total amount of interviewees became six. Any particular pattern or set of questions wasn't used in the interviews, but instead, they were planned to be unreserved meetings that would include chatting and discussion on the archiving needs.

4.3.1 Interview with Rita project manager Satu Kallio-Kokko

The first interview was with Rita project manager Satu Kallio-Kokko, and the target was to find out whether some preliminary work had already been done in relation to the subject. Kallio-Kokko told me that, in 2011, the preliminary work had been started by the development manager Satu Mäkelä and Satu Kallio-Kokko herself. Kallio-Kokko gave me a report they had created, and this report includes principles and guidelines for data to be transferred to AX. The report was presented by Satu Mäkelä in a PDT meeting held on the 25th of November 2011.

The report contained some background information of data transferring and history data saving. The report mentioned that Rita system's service provider CGI had commented on the transferring of old data from old programs to Rita in the following way: "The history data of previous systems is not reasonable to load into Microsoft Dynam-

ics AX base tables as data amounts would be so large that it would affect negatively to response times of Microsoft Dynamics AX functions". CGI had also recommended that the needed history data would be converted to EDW.

In addition, I found out about the data that was decided to be transferred to Rita, i.e. the data that would be excluded from this project. The data to be transferred is shown in table 1.

Table 1. Data to be transferred to Rita

Data type	From program(s)	Details
Customer data	Matha, PTJ	Valid customer data
Item data	Lean, Matha, PTJ	Valid item data
Station data	PTJ	Valid stations
Projects	Matha	Ongoing projects
Contract data	Lean, Matha, PTJ	Valid contracts and related data
Order data	Lean, Matha, PTJ	Open orders and continuous orders
Price data	Matha, PTJ	Valid purchase and sales prices

Moreover, the report contained information on requirements for saving history data. This information was raw material, but it could perhaps be used as guidelines for the forthcoming work. The history data required to be stored according to the report is presented in table 2.

Table 2. Requirements for saving history data (preliminary work)

Program	History data type
Lean	A need to store all data for three years, since there is a warranty given to all sold lubricants
Lean, Manu, PTJ, Tiha	The following history data would be useful to have: Merchant history, order data and modification history
Matha	Rent history of gas bottles and cabins and service history of delivered projects

The last issue the report covered was a raw assessment on the costs of keeping the old systems up and working. Here are the points that were introduced in the report:

- Databases are running on shared database servers with other applications (e.g. Kola, ATAP). No other costs than used disk space expected.
- Possible some costs of maintaining Oracle licenses which could be ramped down otherwise.
- Some cost savings could be gained by:
    - Ramping down other environment as there are both production and test
    - Releasing useless integrations
- New software maintenance agreements (with required service level) should be negotiated.
- Maintenance of the old systems load system managers
- Finding help to resolve incidents might be difficult

As mentioned, this interview focused on the preliminary work rather than on the exact history data. The meeting presented a good look at the starting point of this project.

4.3.2 Interview with senior legal counsel Ilmi Korhonen

The second interview was with Oil Retail's senior legal counsel Ilmi Korhonen. As prioritized before, the most important factor in clarifying the needs for data archiving was requirements that the Finnish law brings. The target of this interview was to find out these requirements and also to find out possible other information regarding laws that might affect this project.

Firstly, I asked about the Consumer Protection act (Finlex. 2013) and its effects on data archiving and saving. Korhonen answered that she cannot think of any data that this particular act would demand Neste Oil to archive and present to the customer later in the customer's request. Vice versa, Korhonen told about the Personal Data Act (Finlex. 2013), which stipulates that no information of private persons can be kept or stored without a reasonable purpose. Therefore in terms of the Finnish law, the

amount of archived data attached to private persons should be kept as minimal as possible.

In addition, Korhonen mentioned that there is a requirement to store all invoices for 6 six years plus the present year, which is stated in the Accounting act (Finlex. 2013). Nonetheless, Neste Oil already has an invoice archiving solution provided by Itella, so there are no additional archiving needs regarding invoices. Similarly, all contracts concluded with customers are stored in the contract archives managed by Neste Oil's contract administration unit.

However, Korhonen had some suggestions about the data that might be wise to archive in order to maintain customer relations and provide good service to customers, especially in reclamation cases. Certain information from the old systems might provide Neste Oil with a better understanding of the actions and contacts that have been made with the customer. In reclamation cases, it would be easier to figure out whether the errors or mistakes have happened in Neste Oil or on the customer's behalf. In table 3, I have listed Korhonen's suggestions about the data that might be helpful in these cases.

Table 3. Ilmi Korhonen's suggestions about the data to be archived.

Data	System
Customer changes' history	PTJ, Tiha
Customer's contact history	PTJ, Tiha
Contract information	PTJ, Tiha
Customer information	Matha, PTJ, Tiha

4.3.3 Interview with project manager Tomi Rechardt

To find out the needs regarding the lubricant sales program Lean, I interviewed project manager Tomi Rechardt, who has years of experience in the system at issue. Rechardt clearly expressed that the use of history information in Lean is necessary and quite regular. Rechardt also had some knowledge about the information that will be converted and transferred into Rita system. This information is for example supplier information,

items and some stock actions. However, this information is not enough when considering all of the tasks that are completed in Lean nowadays. In this case, there are so many different kinds of history data that the wisest thing, according to Rechardt, would store all data from Lean.

Instead of archiving data from Lean, Rechardt proposed that the program would be kept as a read-only version and stored in one computer for future use. The use would be limited enough so that one workstation could enable it quite easily. This way also the amount of users, and therefore license fee costs, would decrease from the current situation.

4.3.4 Interview with project manager René Wecksten

In order to learn about needs regarding Matha, I interviewed project manager René Wecksten. Matha includes information on both the bottled gas and bulk gas sales meaning also project sales, which Wecksten especially has knowledge about. The projects sales' needs for data archiving seemed to be quite clear, and the importance of saving this data is quite high.

According to Wecksten, the most important data that should be kept is information about the delivered and completed projects and information about the maintenance work completed for each customer. This information is vital, especially in incident or reclamation cases, when something has happened in the customer's property where is LPG equipment sold and installed by Neste Oil. Without maintenance history, it is almost impossible to find out the details of the operations and actions completed for the customer.

In addition, Wecksten explained that there is also data that is already archived in some way. Naturally, this data doesn't have any additional archiving needs. The data at issue is contracts, which are stored in contract administration's archives, and information that is requested by various authorities. This information is stored in paper versions or in Microsoft Excel documents.

The needs regarding bottled gas were not discussed with Wecksten, but instead with Lehtonen and Salonen, and the results of this discussion can be found in chapter 4.3.5.

4.3.5 Interview with development manager Eeva Salonen and invoicing manager Rea Lehtonen

I interviewed development manager Eeva Salonen and invoicing manager Rea Lehtonen simultaneously, since Salonen has prior to Lehtonen worked as an invoicing manager and has a broad knowledge on the invoicing systems and processes.

Firstly Salonen and Lehtonen mentioned, as discussed already in the interview with Ilmi Korhonen (chapter 4.3.2.), that all invoices must be stored for six years plus the present year, and Neste Oil already has a solution to this. Hence, there are no special needs for data archiving from the invoicing systems. In fact, the only specific case Salonen and Lehtonen mentioned was the gas bottles' rental history information, which is stored in Matha. However, this case has not been clarified yet regarding the possible conversion of the rental information to Rita, and therefore Salonen and Lehtonen wouldn't underline the importance of this case.

Secondly, we talked about the information from other systems that might be useful for persons working in invoicing. Salonen and Lehtonen both agreed that there is some information that these persons gather from the other systems. This information is for example customer changes' history and contact history, both of which might be useful in reclamation cases.

4.4 Summary of the data archiving needs

In this chapter, I will present a summary of the data archiving needs based on the interviews. The needs proved to be quite different between the systems and the most divergent results were with Lean, since the wish was to keep the entire program and all of its data. In regard to PTJ and Tiha, the needs turned out to be quite similar according to the different interviewees. The most hoped-for data to be stored was customer changes' history and contact history. In table 4, I have collected all the hoped-for data from all of the systems.

Table 4. Summary of the data archiving needs.

System	Information	Interviewee(s)
Customer changes' history	PTJ, Tiha	Ilmi Korhonen, Eeva Salonen and Rea Lehtonen
Customer's contact history	PTJ, Tiha	Ilmi Korhonen, Eeva Salonen and Rea Lehtonen
Contract information	PTJ, Tiha	Ilmi Korhonen
Customer information	Matha, PTJ, Tiha	Ilmi Korhonen
All information	Lean	Tomi Rechardt
Completed and delivered projects	Matha	René Wecksten
Maintenance history	Matha	René Wecksten
Gas bottles' rental history	Matha	Eeva Salonen and Rea Lehtonen

5 Results

In this chapter I will describe the three solution options one by one and give estimation on the costs of each option. Finally, I will introduce a proposition that will include the choice of solution I find most suitable for the client's needs based on the analysis and execution alternatives I've found out about during this project.

5.1 Solution options

This project includes three different solutions options for data archiving. These options are quite different from each other, and this means that they fulfill the archiving needs in different ways. First, I will explain a little bit about the methods I used to look into these solution options. After that I will present the three options, and explain every option's solution model, estimated costs and what sort of work this model would need before implementation. I have also included a pro-con list in every solution that will openly show the biggest positive and negative points.

As mentioned previously in the introduction of this thesis, the three solution options were outlined beforehand. This outlining happened with team leader Lauri Heinonen, when we first discussed on the execution of this project on the whole. We both agreed that finding out about a solution model provided by Tieto seemed to be a wise choice, because of Tieto's expertise in the area of information technology. Secondly, discovering a solution which could be executed by the company itself, sounded reasonable since one of the criteria in the solution selection would be the costs of the solution. Thirdly, the business department of Neste Oil had previously strongly spoken for keeping the old systems in action alongside Rita, and hence it was chosen to be the third solution option. Unfortunately, I never received a total understanding of the current license fee costs of the old systems, but the estimation will offer some guidelines on the costs of the third solution.

5.1.1 XML Database

The first solution option is an archiving solution offered by Tieto. Tieto is a Nordic IT services company providing full life-cycle services for both private and public sectors

(Tieto 2013). I met with three of Tieto's consultants on the 12th of April 2013, and other participants from Neste Oil were team leader Lauri Heinonen and team leader Sirja Salminen.

The meeting began with an introduction to Tieto's solution at a non-specific level. Next, I presented my results from the interviews to Tieto's consultant, so they got an introductory understanding of our needs in terms of archiving and of the amount and type of data that is included in our old systems. The meeting ended with discussion of the next steps, which were not clearly decided yet, since the aim of the meeting was to get some preliminary knowledge about the solution. Next, I will present the details of the solution model.

Solution model

This solution model consists of building an XML database for all the data that needs to be archived. The data from the old systems would be converted into XML and then transferred to a joint database for all data from every old program.

Estimated costs

The estimated costs of this solution are presented in the appendix 1.

Work needed before implementation

There is quite a lot work needed before the model can be implemented. Firstly, the data to be archived should be accurately defined, and the locations of the certain data in the old databases should be clarified. Secondly, the specs of the old databases should also be clarified in order to create the rules for conversion. The third part is naturally the construction of the new XML database, which would be completed in Tieto. Testing the conversions would follow construction and as a final stage, the entire solution should be tested with several users.

Table 5. Pros and cons of XML database solution.

PROS	CONS
Support from specialists	Expensive
Unlimited amount of user licenses	Demands quite a lot of preliminary work
Old systems can be run down	Construction might take time
No need for regular maintenance since the data is stables	User interface not suitable for basic user
	Not all data from the old systems can be transferred

5.1.2 Copying databases from old systems

The second solution option is strongly related to our business intelligence unit, and therefore I interviewed Neste Oil's head of BICC, Pekka Kaipiainen. Firstly, the idea was to ask Kaipiainen about a data dump solution. This data dump could serve as a platform for all the databases from the old systems. I introduced the idea to Kaipiainen, but he suggested that instead of a data dump, we would consider an option that the old databases would be kept as they are and be located in some server that already exists in Neste Oil. The main problem or challenge with the data dump solution is that the data from the old databases should perhaps be transferred into Oracle databases and this might be quite challenging in MySQL cases. Therefore, we started to talk more about the idea of maintaining the old databases as they are.

The maintaining of the databases would in practice mean copying the old databases to a common server, where they could be stored. This would also mean that the systems containing the databases could be run down, because there'd be no use of them anymore. The information retrieval would happen with SAP Business Objects tool with which it is possible to create different types of reports that gather data from the old databases and present in a clear table form. These reports can be predefined and saved as templates for users, and these reports can be built in BICC unit, so no external help is needed. The regular reports are built in one working day, and the more complicated ones take up 2 to 2.5 working days.

Solution model

This solution model means copying the existing old databases from the old systems and locating the copies to an existing server. This model would also able the rundown of old systems, since they would become useless.

Estimated costs

The estimated costs of this solution are presented in the appendix 1.

Work needed before implementation

Before this solution could be implemented, the old databases' providers and versions need to be clarified. The possible need of licenses must be cleared, since some of the old systems might require a license to be paid if the existing database is actively used. The last thing to resolve is the needs for reporting, i.e. what kind of reports would be needed and most useful for business.

Table 6. Pros and cons of copying databases from old systems.

PROS	CONS
Inexpensive if reporting needs are limited	Some old database queries might be challenging to realize
Can be executed without external workforce	If the need for totally different types of reports is very big, the costs can get high
All existing data from old systems can be stored	Possible extra cost from license fees
Requires quite little preliminary work	
User interface clear and easily learnt	
Unlimited amount of user licenses	
Old systems can be run down	
A part of the personnel already has the skills of how to use Business Objects	
Unlimited amount of queries can be executed	
No need for regular maintenance of the reports, since the data is stable	
New reports and changes in existing reports can be realized with short notice	

5.1.3 Keeping the old systems running

The third and final solution option is to keep the old systems running, so users can execute queries and are able to get the history data directly from the old systems. To clarify this solution, I talked with team leader Lauri Heinonen, whose team members are currently responsible of the old systems' management and maintenance.

Heinonen feels strongly against the idea of keeping the old systems running, even at a read-only level. Although the company would save money in license fees and avoid the building of a new platform, there'd be costs from for example maintenance and user management. Even if the programs are in a read-only state, they still need system man-

agers. These programs are used through Citrix cloud service, which will also include the new ERP program in the future. In regards to the old systems, this means that when there are changes or updates to Citrix, system managers will need to test the functioning of old systems in the updated environment. The same situation is repeated, if the work stations change somehow or are renewed completely. This testing naturally requires time and money that otherwise could be used elsewhere.

In addition, if the old systems are kept running, all of them will still have their own user management. The existing users shouldn't cause any trouble. However, when new personnel are hired, they won't have user rights to the old systems. This might cause problems, since either there will be a need of training for the new persons or burdening the existing users with the history data retrieval requirements. Training new persons to use the old systems sounds quite impractical, and opening new user accounts would cause extra work for the system managers.

The total costs of this option are yet difficult to estimate, since the read-only contracts would need to be negotiated with service providers. The sole exception is the invoicing program PNL, which wouldn't cost anything in license fees, since it has been built inside Neste Oil. As a guideline, the rough estimation of known license fee costs can be found in appendix 2. In addition to the license fees, it is also quite challenging to estimate the amount of working days that the maintenance and testing of these systems would require from the system managers.

Solution model

Instead of building or buying a new solution for data archiving, the old systems would be kept running at a read-only state. This would mean that users could retrieve history data from the old systems.

Estimated costs

The estimated costs of this solution are presented in appendix 1.

Work needed before implementation

This option would require preliminary work with clarifying the real yearly costs, such as license fees and maintenance costs. Before implementation, Neste Oil's representatives would need to negotiate new contracts with the systems' providers. In addition, a new working method concerning the administration of user management needs to be decided.

Table 7. Pros and cons of copying databases from old systems.

PROS	CONS
Can be executed without external workforce	Some costs from license fees
All existing data is available to users	Costs from maintenance and testing of the old systems
User interface familiar to existing users	Burdening the system managers with work related to old systems
Requires quite little preliminary work	Creating new users quite impractical
	New personnel either not able to retrieve history data or need to attend training
	Burdening existing users, if new personnel are not trained
	A risk that the old systems wouldn't work in the updated environment

5.2 Proposed solution

In conclusion, the above mentioned solution options vary quite much from one another. The process of deciding on the proposal was based especially on three points: the costs, the amount of work needed, and the accessibility of the data in each solution. Every one of these solutions has both pros and cons, but the solution option number two clearly stands out from the others. That is why my proposal is to choose as an archiving model the copying of old databases to a new platform and access their data through Business Objects' reports. The reason why I settled on this option was the

clear advantages that this solution would bring versus on the negative aspects. I would say that this option is the most neutral choice, which will not cause excessive costs or work load and still providers quite reasonable chances for the users to access the data at stake.

In addition, during the course of this project, I had a realization that Neste Oil's needs aren't so much related to data archiving or data warehousing, but instead on keeping the history data somewhere, where it can be easily retrieved from and accessed. Therefore, I would not recommend the first option, since it is a clear data archiving model and requires advanced users to execute queries. The third option, instead, offers easy access to the history data, but demands quite a lot of working days and money yearly to operate. There is also a big risk that the old systems not functioning with the newer Citrix environment version, and I think this is a very important point to consider, when making the selection for the solution.

The second option likewise offers an easy access to the history data, and several people already have the knowledge of how to use the Business Objects program. However, this solution does not include a risk of not working since Business Objects program is actively managed and maintained. An additional plus side of this solution are the costs that are the smallest of the three options. As a conclusion, this option wins the two others in all areas of criteria: the costs are the lowest, the amount of preliminary work prior to implementation is small and the accessibility of the history data is excellent.

6 Own assessment

This thesis project began in January 2013, when I emailed certain people in Neste Oil asking for possible thesis subjects from the information technology area. Lauri Heinonen answered and told me about the topic of history data archiving. I instantly became interested in the subject, since it touched on the previous work experience I had received from Neste Oil. I had used Oil Retail's systems in my previous employments, and hence had good basic knowledge on them. In addition, I had worked for one year in the ERP project Rita, so I also had an understanding of that. Moreover, the subject was very important and topical for the company, and this work needed to be completed sometime this year anyhow. I agreed on the subject, and Lauri Heinonen became my supervisor on the client's behalf. Lauri Heinonen also requested that I did this thesis in English, which to me sounded like a great idea since I could, simultaneously with the project, improve my language skills.

The execution of this thesis began with planning and writing the project plan. The plan itself turned out to demand quite a lot of work and time. I think the template of the project plan had lots of repetition, and therefore in the beginning it wasn't clear to me what information belonged where. Also, the schedule was quite difficult to plan, since I already knew that I needed to interview many people in order to gather material, and the reconciliation of everyone's schedules would probably be quite challenging. The entire process of writing the project plan took a few weeks, and I was relieved when I finished it and could begin the real work with the project. After the project plan was finished I needed to arrange a meeting with the steering group of the project, meaning myself, my supervisor on Haaga-Helia's behalf, Jarmo Harmonen, and my supervisor on the client's behalf, Lauri Heinonen. The meeting took place quite late in March, since both Lauri and Jarmo's schedule were relatively full and the mutual time was rather problematic to find.

I began the work with the research phase a few weeks before the first meeting, meaning that I searched for written material both in the internet and from libraries. Quite surprisingly, the material proved to be difficult to find. There was lots of material available, but most of it was related to SAP systems, and hence provided no use to me. Fi-

nally, I discovered some books that touched upon the subject of data archiving or data warehousing. Nevertheless, I wasn't able to begin writing the theory material, since I found it challenging to pick out the correct facts from the broad content that each of these books had. Therefore, I moved on to the next part and began the interviews.

The interviewees were quite easy to decide upon, because of my previous experience in the company. I already knew all of the interviewees beforehand, and they all agreed to participate, which was really important in terms of this project. As mentioned earlier, I didn't use any particular set of questions, but I had certain things written down, so I could begin the conversation as fluently as possible. This also meant that I needed to book only 30 minutes for each interview, which made it more likely to find time for the interviews from everyone's calendar. In my opinion, the interviews succeeded well and I got a lot of useful information from them.

After the research phase, I moved on to the survey phase. This phase was quite easy to carry out with a few interviews inside Neste Oil. Also during this phase I had my seminar in Haaga-Helia. The thesis project was approximately 50% ready, when I presented it. I received useful feedback from my supervisor Jarmo Harmonen and also from my opponent. After the seminar, I continued with the writing and began to analyze the solution options in order to produce a proposal for the client at the end of the project.

I wrote down the theory chapters at the end part of the project. The subject of data archiving is extremely broad, and I think that it was much easier to pick out relevant facts from the material after I had needed to familiarize myself with the needs and requirements of the client. Also, when I knew the subject more deeply, I knew how to search for more material on the internet using relevant search words. In the end, I was happy with the amount of material I managed to find and utilize in the project.

Interestingly enough, at some point of the project I also understood that actually the needs of the client were not so much related to data archiving, but more to data keeping in a reference database, because there was a need to access the information almost daily. This realization logically affected my choice of the proposed solution and the criteria which I based my choice on. Fortunately the realization, however, didn't jeop-

ardize the project itself in any way, since the objective of the thesis was to propose the client with the most suitable data archiving solution.

Generally speaking, the entire project has taught me many things. Naturally my project work skills have improved, since I have had to be responsible of entire project's progress. I have had to manage many things at the same time, and I think that will help me greatly in the future. I have also learned more information retrieval skills, since I had problems with finding the theory in the beginning, but after all managed to gather good quality information. The whole concept of project work and project management has become even clearer to me, since I have now seen the entire life cycle of project.

During the entire project, I tried to keep my thoughts clear on what the client wanted as an outcome from this project. I was quite surprised how, almost all the time, I knew what I needed to do next, and how I could do it. I met up with Lauri Heinonen a few times during this project, and he gave me some advice. However, the execution of this project was relatively independent and I think I managed it well. After the first meeting with Jarmo Harmonen, we only communicated by email, and I didn't feel a need to meet up with him, since the project advanced constantly and in a quite logical manner.

Overall, I have enjoyed working in this project, even though it has also caused me also stress. One of the best results of this project is the fact that this thesis will definitely be of use in Neste Oil. I also hope that I can continue work among this subject even though this project will come to an end. I am very eager to find out what will become the choice of the archiving solution and how the implementation of that solution will happen in the future.

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Appendixes (secret)

Appendix 1. Estimated costs for the archiving solution models.

Appendix 2. Current license fees and estimation of license fees in solution option 3.