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ROADMAP FROM RAW DATA TO OUTPUT

Data flow process in service and manufacturing business

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ABSTRACT

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Data analysis is the process whereby a large volume of raw data is reproduced based on the raw data available through collecting, cleansing, transforming and modelling with the aim of gaining meaningful conclusions as well as useful information to support decision making to achieve efficient and effective results. Companies and enterprises derive their data from a multitude of sources in order to meet business demands.

SAP is system application software that is used to provide users with full packages of integrated modules, which cover all components in business management. Since its inception, SAP has released several products that match up evolution in businesses such as SAP HANA, SAP HANA Studio, and SAP BW/4HANA.

Fujitsu and Wärtsilä, cases in point for the present study, are both multinational companies that have customers worldwide. They both offer a variety of products and services to their customers in a large scale. Besides, both companies also make use of several reporting tools to render services and enhance better customer experience. SAP BW/4HANA, for example, is one of the tools these companies use to provide experienced management solutions and innovative techniques to customers. Focusing on service and manufacturing business, both companies provide such line of business but use different methods and techniques to analyze data. As an example, a service business may concentrate on sales performances, human capital performances etc., while manufacturing on its path, may concentrate on production and purchasing performances.

This thesis set out to describe the data flow process in Fujitsu and Wärtsilä as service and manufacturing businesses, challenges and possible solutions for their further improvement.

Key words
Data acquisition, data analysis, data source, modelling, reporting, sap bw/4hana, visualization.

CONCEPT DEFINITIONS

Adhoc	When necessary or needed
aDSO	Advance SAP Business Warehouse System
BW/4HANA	Business Warehouse for HANA
CRM	Customer Relationship Management
ERP	Enterprise Resource Planning System
RFI	Request for Information
RFP	Request for Proposals
HIF	Hyperion Financial Management
ODP-SLT	Operational Data Provisioning
OLAP	Online Analytical Process
OLTP	Online Transactional Process
SAP	Systems, Applications and Product in Data Processing, Multinational Software corporation
SAP HANA	High Performance and Analytical Appliance Database System Offered by SAP
UCC	University Competence Center

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1 INTRODUCTION

Fujitsu and Wärtsilä are both multinational companies with several branches in Finland. Both companies offer a variety of products and services to their customers with the help of several reporting tools such as SAP, provided by SAP UCC Magdeburg. The goal of Fujitsu and Wärtsilä is to give their customers opportunities to secure the future by providing latest SAP technologies and innovations.

SAP SE is software that stands for Systems Applications and Products in data processing and currently a global leader in software organization and enterprise resource planning systems with its headquarters in Germany. SAP SE provides full packages of integrated modules that cover all components in business management. In the past years, SAP has released several products to meet up with rapid evolution in today's business world such as, SAP HANA, SAP HANA Studio and SAP BW/4HANA. (Shalaby 2017; Walker 2012.)

Data flow is the way data is represented through a process, which in turn transforms and reports detailed inputs to outputs based on data collected from a variety of sources. Data analysis is the process whereby large volume of raw data is produced based on the amount of data available through the act of cleansing, inspecting, transforming and modelling with the aim of reaching useful conclusions, extracting important information to help support decision making. Different businesses and companies make use of multiple approaches and techniques to analyze data in order to achieve their goal effectively. In this regard, data goes through several processes, notably, data requirements, data collection, data processing, data cleansing and modelling as well as algorithms. In this light, they go through the following implementation phases. (Harding 2013.)

- Phase one Project implementation
- Phase two Business Blueprint
- Phase three Realization
- Phase four Final Preparation
- Phase five Golive support

This thesis describes the data flow process in Fujitsu and Wärtsilä as service and manufacturing businesses and focuses on SAP BW/4HANA as the reporting tool for efficient results. Companies need SAP BW/4HANA in their business because it provides users with enhanced modelling and data warehousing

tools for simplicity, openness and modern interface that possess the ability to deliver in real time. Such services are provided by SAP UCC Magdeburg and used by many multinational companies including Fujitsu and Wärtsilä serving as a reporting tool for service and manufacturing businesses in order to satisfy the needs and wants of their customers. Indeed, the use of data management solutions assists transforming data into meaningful information with such large amount of data extracted via different sources and contains a variety of unnecessary information depending on the case.

The focus of this thesis is on data acquisition, data analysis, data cleansing, data collection, data sources, modeling and data presentation. The overall aim is to investigate the difference in data flow processing between Fujitsu and Wärtsilä, their different approaches to data analysis with the purpose to achieve various goals as multinational companies.

The aim is to bring out a comparison, of challenges encountered and possible solutions for the system to be improved. The search is target on the sales process because, companies aim at making profitable sales to customers. It is important to have a clear understanding of the data flow process. This thesis will describe the process from raw data to final output in service and manufacturing companies.

2 SAP SE

SAP SE is a software term that stands for Systems Applications and products in data processing, a global leader in software organizations and enterprise resource planning system. SAP SE, a German company, developed the enterprise resource planning system. Nonetheless, the main business functions of an enterprise were incorporated by SAP. This system is providing a full package of integrated modules that cover every component in business management. (Shalaby 2017; Walker 2012.)

2.1 SAP background

SAP, with its headquarters in Germany, was founded in 1972 by five former employees in IBM with the aim of creating a standard software application for business possesses in real time. Since its creation, several releases on new updates have been made in the past. These releases were SAP R/1, SAP R/2, and SAP R/3. SAP R in this context, stands for data processes in "real-time". (Esteves 2019.)

TABLE 1. Major sap release (Esteves 2019)

Year Released	**SAP Release**
1973	SAP R/1
End of 1970s	SAP R/2
1992	SAP R/3
1998	SAP R/3 Release 4.0B
1999	SAP R/3 Release 4.5B
1999	SAP R/3 Release 4.6B
2001	SAP R/3 Release 4.6C
2003	SAP R/3 Enterprise Release 4.70
2004	SAP ECC 5.0 ERP (my SAP ERP 2004)
2005	SAP ECC 6.0 ERP (my SAP ERP 2005)

The most recent released edition of SAP was made available to the public in 2006 with an enhancing package call SAP ERP 6.0 package 8 released in 2016. This enhancement package supported Enterprises in the transition to a service-oriented architecture. The enhancement packages were aimed at providing possibilities for SAP customers to be able to deploy and manage the new system software functionalities. Here, customers can choose which functionalities to be implemented since the enhancement packages are made optional for SAP customers. The enhancement packages installation usually consists of technical installation of enhancement packages and the activation of new functions. (Lextrait 2017.)

The system behavior does not change due to the implementation of the technical installation of business functions. New capabilities installed are decoupled from activating and companies can decide enhancement package functions that suit their demands. Therefore, there exist no changes in the new installed business capabilities before their activation. In addition, activated new business functions for one process does not disrupt other functionality users. Enhancement package for SAP ERP 6.0 is the most recent package and called EhP8. (Lextrait 2017.)

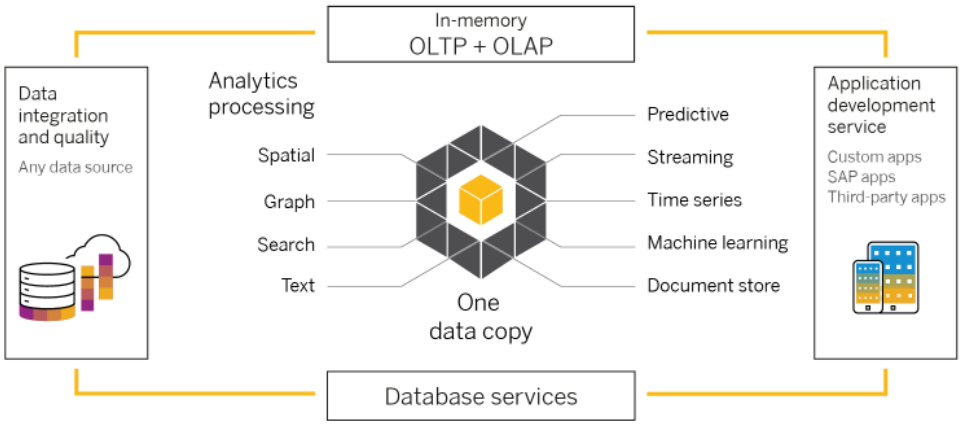
Several modules were included in SAP ERP such as, controlling (CO), financing (FI), human resources, material management, sales and distribution, project systems, asset and accounting, products planning, planned maintenances etc. SAP ERP merged this separate components and modules data in order to provide the company with enterprise resource planning to suit their needs. (Lextrait 2017.)

2.2 About SAP HANA

SAP HANA was brought to use in 2010 and functioned as a database system to help databases speed up with in-build memory systems. Compared to traditional databases, more functionality can be offered by SAP HANA databases and as a result, the term SAP HAN platform was given. The reason for developing SAP HANA into a platform was to be able to merge OLTP and OLAP established databases. Based on this, implementation on technology is base in data warehouse and build in an SAP HANA platform. (Walker 2012.)

Based on this in-memory platform, SAP HANA runs several business data platforms to companies and help predict real time outcomes in order to deliver data-driven insights. SAP HANA developed live solutions with fast data processing on single data copies for real-time decisions in business. Therefore, SAP HANA in-memory platform secures a ready future for users. (Walker 2012.)

The key capabilities of SAP HANA include transforming database management systems by simplifying their operations using secured modify data platforms and single copies as a foundation to building next generation applications with leverage hybrid transactions by means of data virtualization to process transactions and analytics. SAP HANA combine analytics and process transactions on any data type at the same time with multi- model da-ta processing built by advanced analytics. (Walker 2012.)



GRAPH 1. SAP HANA business platform (Walker 2012)

2.3 SAP HANA Studio

SAP HANA Studio works as tool for both the main administration and the central development for HANA system environment. HANA studio is a tool for client to enable them gain access in HANA system locally and remotely. In HANA database system, an administrative environment is provided for data provisioning as well as information modelling. (Mankala & Mahadevan 2013.)

SAP HANA Studios have several operating platforms, which include; Windows 7, Windows Vista, Windows XP with 64-bit versions Microsoft Windows 32, X86 64-bit SUSE Linux with enterprise server SLES11. SAP HANA Studio can also use Mac OS but cannot do so as clients for this operating system are not available. The interaction of both HANA Studio and HANA Database can be done using SOL. Moreover, the availability of all the features are limited on HANA Studio installation. Therefore, HANA Studio client can specify features that need to be installed to match their objectives. To enable the smooth

running of the system, clients need updated software with life cycle manager in order to operate the latest version of SAP HANA Studio. (Mankala & Mahadevan 2013.)

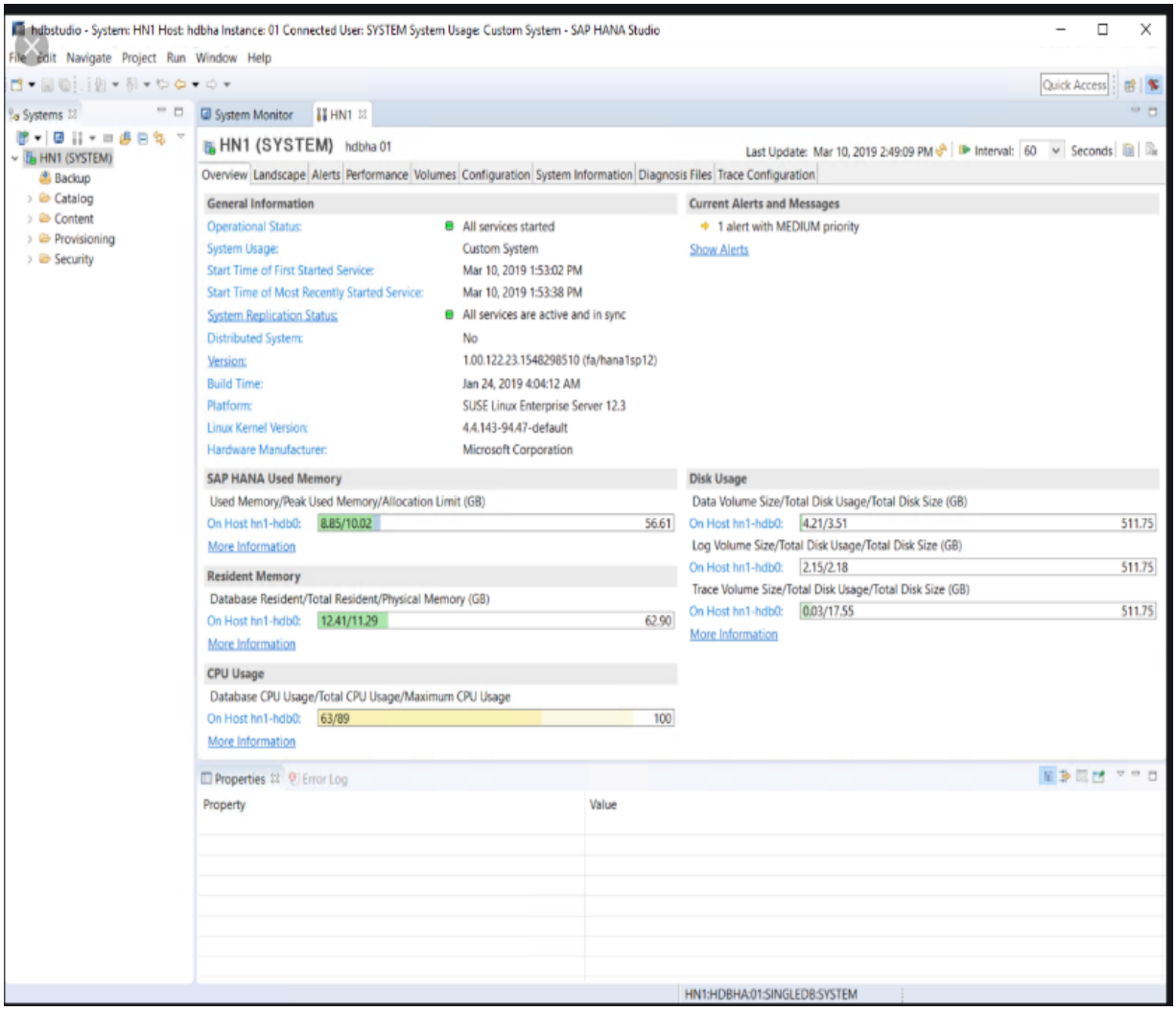
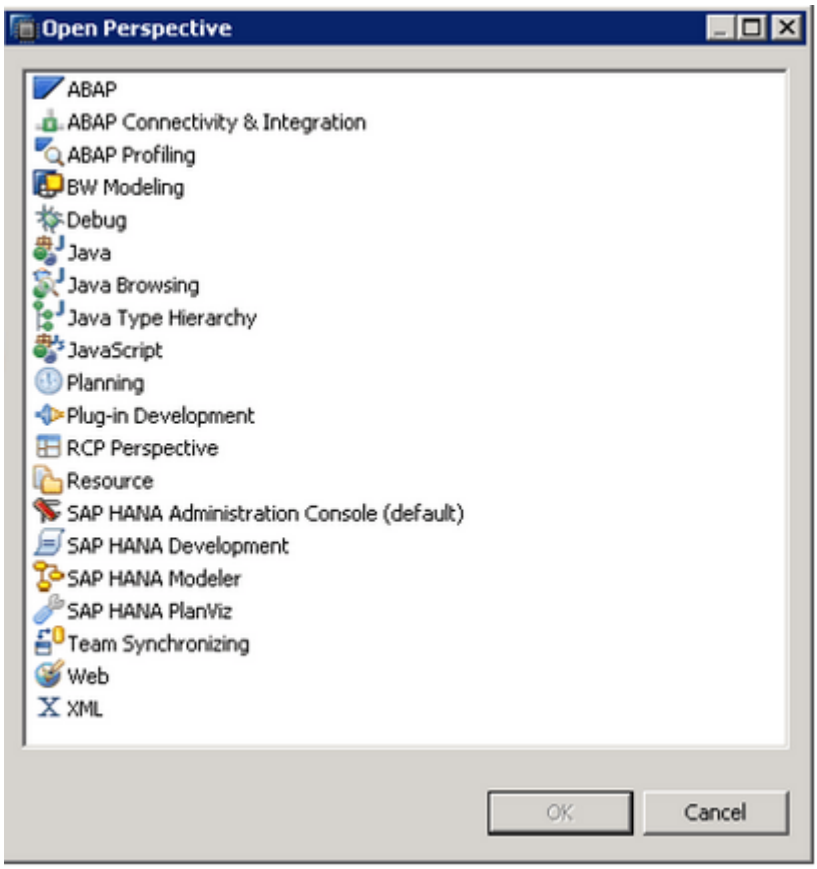


FIGURE 1. SAP HANA Studio Overview (Centria University of Applied Sciences 2019)

SAP HANA Studio has the option to select perspectives on HANA Studio. This can be done by clicking on the window option and then choosing open perspectives. After choosing the open perspectives option, the list can be accessed via an icon for others. These different perspectives are designed to perform different tasks. SAP HANA Studio is an environment provided for data provisioning, modelling for administrative work to be carried out. Perspectives are interface layout designs not only for predefined users but are also to address several applications in SAP HANA Studio (Mankala & Mahadevan 2013).



GRAPH 2. SAP HANA studio open perspectives (Mankala & Mahadevan 2013)

The HANA Studio system is classified into two main subcategories, namely, Catalog and Content. In the Catalog, all table data structures and data categories that can be used are in the dictionary of the SAP HANA System called the 'catalog node'. A node can be defined as a list of schemas done by classifying tables into user-defined groupings in the system. (Mankala & Mahadevan 2013.)

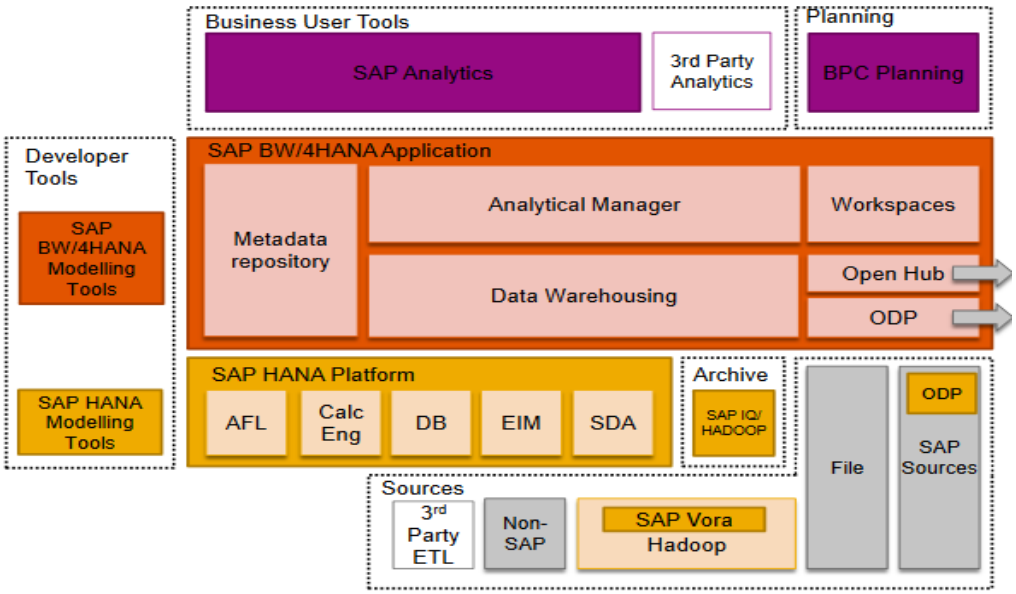
Area content is a design time repository with a modeler where information on data models are created and stored. Contents store models physically including tables in the database. They are, therefore, visible under Catalog with different views provided by content nodes, which are presented in the same data physically and organize the models into packages. (Mankala & Mahadevan 2013.)

2.4 SAP BW/4HANA

SAP BW/4HANA was founded by SAP in 1998 in San Francisco to represent the next generation of SAP business warehouse. This application is designed to operate only on SAP HANA since, the system

provides a new level of simplicity to build and run flexible solutions in data warehouses with capacities in data management in a way that user experience is modernized. SAP BW/4HANA pays attention to a single database technology. Moreover, other BW products were left behind in order to achieve the goal of a single database technology. (Riesner & Sauer 2017.)

SAP BW/4HANA is design only to run with the database in SAP HANA using an ABAP application server integrating with SAP application and no SAP application to provide an intuitive user experience for businesses and customers. A high volume and real-time data processing enable the intelligent automation as well as decreases the amount of waiting time for data handling in real time. Therefore, user's productivity increases and shadow analytics de-creases to provides a modern interface. (Riesner & Sauer 2017.)



GRAPH 3. SAP BW/4HANA architecture (Riesner & Sauer 2017)

In SAP BW/4HANA, models have been simplified compared to previous models that were left behind. New modeling objects were reduced and introduced making a number from 10-4 with a percentage of 60 and no complex data structure added to it. In addition, info Object modeling, external support of structured and unstructured data for virtualization and data persistency, have greater control. Four BW object are present in the current releases of SAP BW/4HANA and are categorized into two groups, namely, virtual and persistent object as can be seen below. (Riesner & Sauer 2017.)

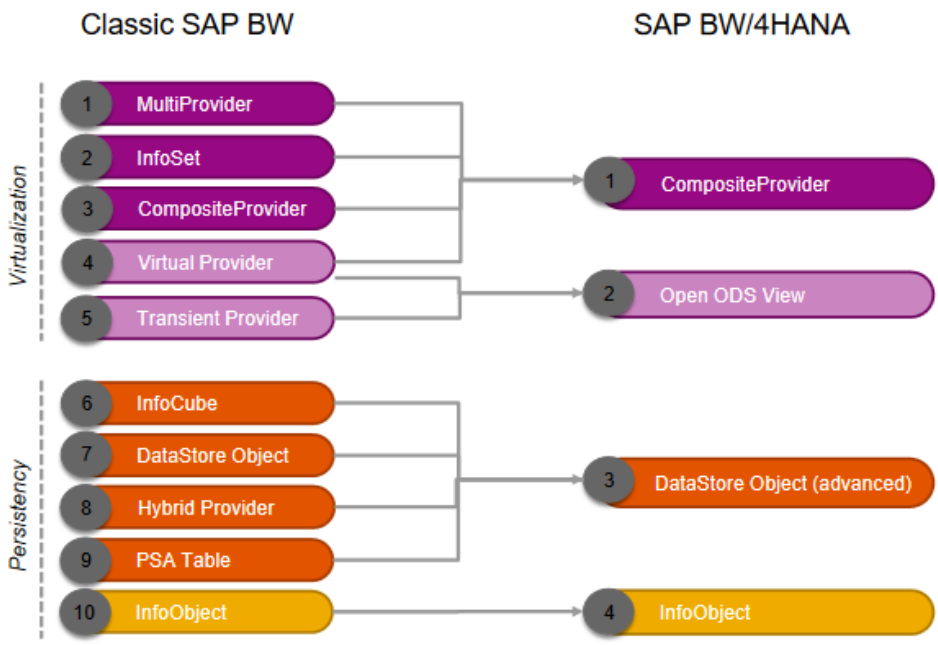


FIGURE 2. Simplified Models Object (Centria university of applied sciences 2019)

In a simplified view, with flexibility and speed, the data warehouse is reported across layers with virtually combined data. Such simplification provides access to data integration, external systems and data replication in real time, especially when using ODP-SLT. Data can be loaded and reviewed virtually by running in an optimized processing with a modern interface, which is easy and faster to use. (Riesner & Sauer 2017.)

Data store object is a data model with the capacity to manage transactional data and the ability to store such data in the system. In the previous released version of BW 7.4 that initially had a support capacity of package 9, changes have been made in order to replace info Cube such as Hybrid provider and data store objects. Data store object known as DSO consists of a combination of Info Object, the field, and info Object. (Riesner & Sauer 2017.)

DSO has the capacity to perform changes in logs, the possibility to manage data by using re-quest through the best possible way with direct interface writing. The DSO is designed in a tabular format with large surface to prevent it from going beyond its limits, but however, has the option to add more information if needed such as modeling pro properties and other modelling possibilities as mention below:

• Unique Data Records: This information can be use if the data records have no changes that existed, and that the data is new.
• Write Change log: This option is valid if new data records or change records exist. The data records will be filled into the change log making the extraction delta possible therefore; only the updated data will be entered. (Riesner & Sauer 2017.)

Info Object is classified into key figures, units, characteristics, time characteristics and technical characteristics. Key figures are those values, which are normally loaded, and this process takes place in the query such as the number of items, the amount and the quantity. The mentioned figures are allocated to additional properties and in the display of the query; it affects the loading of the data. Examples is the unit of measure, the currencies, specifying number of decimals and the setting of aggregation. (Riesner & Sauer 2017.)

Data integration into a BW system is possible and for this to be flexible, the ODS Open view is needed in the system. SAP HANA Database is required in order to have ODS open view and thus, to convert the system into info Object, the data is not necessarily needed for the completion. Nevertheless, it can stay in its original form known as the field-based form. ODS open view makes it possible for BW to be virtually accessible and without physical replication, Integration of data is possible. However, if data is needed to be stored physically in the future, a DSO can be created to serve such purpose. (Riesner & Sauer 2017.)

Moreover, data can be assigned to transactional data such as text data and master data. For this to be possible, the data model needs to be activated. This is done by key figures; unit of measures and characteristics of the data need to be assigned such as units and currencies. Info objects can be evenly associated with data if required. Compared to a composite provider, ODS open view has several good options especially when data is still in the initial form. SAP BW/4HANA composite provider merges data from the info provider that uses SQL to run and several data sources use for reporting. (Riesner & Sauer 2017.)

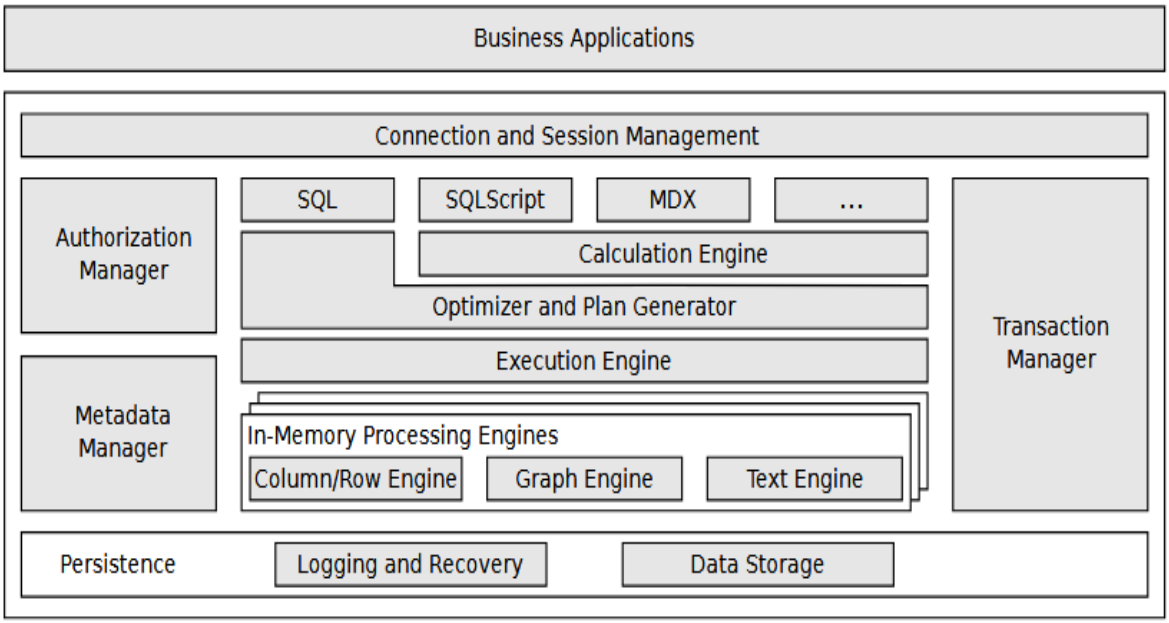
2.4.1 SAP HANA Database

The demand for enterprise applications has increased in recent times, which therefore, requires complex and transactional data for reporting. Due to this increase, many users handling the same data can update

and read records. Integrating analytics and transaction capacities in a central database platform system (database management system) is pointed as the main objectives of SAP HANA Database using an in-built memory platform. In the market, SAP HANA is seen as one of the fastest database platforms. Observing most organizations, one can readily point out that data has become the most important assets recorded through several different channels. Using SAP as an example, enterprises create orders in the system, modify them and then delete them in the sales process. Therefore, production planning must be done in order to deliver these orders. Hence, records are updated and stored in the sales process, which is often referred to as OLTP meaning online transactional processing. (Mankala 2013; Walker 2012.)

OLTP can also be referred to as the row-oriented and current disk databases since they both poses the same processing strength. Product availability is required as part of the sales process to ensure expected sales and delivery which further aids to compile customer demands. Since the goal of every enterprise is to maximums profit, OLAP is perceive as a good example. (Walker 2012.)

OLAP stands for online analytical processing and this method act as a computing process to provide users with the capability of query and data extraction using different views to analysis the data. In order to simplify this process, data can be extracted from several sources. Such method also uses warehouse to store data and after cleansing such data, cubes of them are organized with clean data usually used for periodic reporting. In addition, logical procedures are normally required in application that consist of analysis. Therefore, using mainly SQL cannot be used to express this logic in OLAP. In order to face this approach, data needs to be optimized by transferring from the database what is needed into the application and then the data can be processed. The database Architecture can be seen below. (Mankala 2013; Walker 2012.)



GRAPH 4. SAP HANA database architecture (Walker 2012)

Generally, SAP HANA Database core objective is to provide a central memory platform in data management to be supported purely by SQL model with expressive interactions as well traditional applications. Moreover, the main functional part of SAP HANA database (in memory) is the heart, which consist of the processing engines. The in-memory processing engine occupy rational data in forms of rows, column and tables that combine both rows and column in the processing engine. In this situation, table preforms in both layouts could be converted to enable query expressions with text and graph data residing in the engine, respectively. Here, the main memory is used to store and keep all engines for as long as there is enough available capacity in the main memory. (Walker 2012.)

001:10, Smith, Joe, 40000;
002:12, Jones, Mary, 50000;
003:11, Johnson, Cathy, 44000;
004:22, Jones, Bob, 55000;

GRAPH 5. Row based (Walker 2012.)

10:001, 12:002, 11:003, 22:004;
Smith: 001, Jones: 002, Johnson: 003, Jones: 004;

Joe: 001, Mary: 002, Cathy: 003, Bob: 004; 40000:001, 50000:002, 44000:003, 55000:004;

GRAPH 6. Column based (Walker 2012.)

Furthermore, an execution plan is carried out to enable the transformation of queries coming from different interfaces to the same processing engine before their execution. Firstly, the calculation engine will be described in order to have a more expressive model of data flow abstract. (Walker 2012.)

Nevertheless, the external interface can use the execution engine to distribute and handle the execution over several different nodes in all processing engines. As seen in the traditional database system, queries can be managed and executed in SAP HANA database since it had the components to carry out this function. Between the application and database layer, individual connections are controlled by the session manager. Meanwhile user's permission is authorized and governed by the manager. (Walker 2012.)

2.4.2 Why Companies Need SAP BW/4HANA

SAP BW/4HANA provides users with enhanced modelling and a data-warehousing tool, which is dramatically simplified and delivers its products in real time, less cost and faster than previously done. Real time business applications can be SQL-based or pre-built data warehousing in a fast-based development environment while working with other SQL-based solutions in data warehousing. SAP BW/4HANA has been improved in the following ways;

• SIMPLICITY. Because of simplicity, the number of data objects are decreasing, and data redundancy is eliminated thereby creating consistency in a smaller footprint or scale for users.

• OPENNESS. As native HANA view, users or customers are exposing BW/4HANA models since they see it as a great benefit. As a combination, users will have the ability to use both SQL in native and HANA in BW mode.

• MODERN INTERFACE. SAP BW/4HANA is designed such that errors in data flow are eliminated or reduces and administrative efforts set for the maintenance of data objects. As such, users or customers can develop on top of SAP BW/4HANA model, which include building their own models to improve

user interface for administrators. This will be replaced by HANA Studio instead of SAP GUI. (Riesner & Sauer 2017.)

2.4 Data Flow Process Overview

A data flow can be referred to as a path where data move in the information system from one part to another representing one or more pieces data. As an example, a student ID number could be used to represent a single data item in a data flow or representing a set of data such as name of students in a class rooster and their ID numbers for a specific class. Instructors needs to store the scores of students on assignments and test in other to create a situation where the system must retain data later in time because one or more processes need to use stored data so the instructors can assign final grades at the end of the semester. (Walker 2012.)

A data flow diagram also abbreviated, as DFD is a framework showing or indicating the flow of information, which consist of inputs, and outputs of each entity. The information stream chart has no control system, as there are no standard choices to be made. Clear activities based on the information can be displayed or represented in a flow chart. Many documentations have been put up to show the data flow. (Walker 2012.)

3 CASE STUDY

Fairfax Media, the first customers of SAP BW/4HANA, gained experience over the past years of operation. Fairfax obtained new BW/4HANA capabilities to fit their business challenges. As such, SAP BW/4HANA expanded and gained customers all over the world with Fujitsu and Wärtsilä being one of its biggest customers today. Projects with SAP BW/4HANA took less than expected and such as, projects anticipated for six months were realized three months instead. The main reason for this success is the simplicity of new objects, flexibility and environmental development set to develop in the cloud. (Fairfax 2018.)

3.1 Fujitsu

Fujitsu is a consulting Japanese global information and communication technology company. Fujitsu provides services, solutions and enough range of technology products to more than 100 countries with its headquarters in Tokyo, Japan. Fujitsu was founded in 1935 and since then, it has been using the experience and power of ICT to innovate and shape the future of society through their customers in both the public and private sector such as in the domains of healthcare, retail, automation and financial services. (Fujitsu 2019.)

In addition, Fujitsu focuses more on offering services to customers based on their demands, building a world of digital innovation and a new insight whereby people can benefit from all available information. Fujitsu have thus gain experience in technical innovation for over 50 year, and due to research and development, is the company is currently investing billions of dollars to maintain its position as the front-runner of business transformation every year. Fujitsu combines their value chain of digital technology with the physical environment. (Fujitsu 2019.)

Fujitsu provides a multiple number of solutions to designs it systems, build and help operate this system for their customers. This IT solution provides and improve efficiency, reduce cost, which in effect increases productivity. Fujitsu is now ranked number one in Japan and is among the top ten in the world as provider of IT services. (Fujitsu 2019.)

3.2 Wärtsilä

Wärtsilä is a multinational company leading in complete lifecycle solutions and smart technologies for energy and marine markets in more than 80 countries worldwide. Over the years, Wärtsilä has been providing sustainable innovation, data analysis and total efficiency in order to maximize the environmental and economic performance of the power plants and vessels of its customers. In addition to margin and energy plants, Wärtsilä manufactures gas and oil to industrial customers, provides integrated solutions and innovative products that are ecofriendly to the environment and beneficial to its customers around the world. (Wärtsilä 2019.)

In meeting the world demands in energy, marine, oil and gas act as sustainable ways. Wärtsilä is now providing innovations to support customer-business operations. Wärtsilä also provides its customers with training and maintenance services for multiple engine brands that support their operations effectively. Throughout the lifecycle of the installation phase, Wärtsilä supports its customers and provides services for both power plants and ship machinery to meet up business operations such that the installation can be monitored. (Wärtsilä 2019.)

Wärtsilä originated from ironworks and sawmills and has grown in strength become the top leader in smart technology in energy and marine market which lead to designing most efficient engines in the world today. Wärtsilä has been existing for 185 years now with experience in lifecycle solutions, energy solutions provider, marine solutions, power plants, oil, gas, maintenance services to customers. (Wärtsilä 2019.)

3.3 Service and Manufacturing

Today, manufacturing companies differentiate their market position and maintain long-term customers loyalty relationship by seeking to increase their value perceived from offering provisions for services in a products lifecycle. The value of tangible products is replaced by a content of intangible service throughout the transformation of its services. This product cycle involves enhancing customization in the material used, company mindset and the company operations that require changes to the company structure and processes. However, traditional processes have proven the lack of ability to govern the process-based nature of services and intangibility due to inadequate methods and techniques to support the service stages. (Ian 2019.)

Multinational companies referring to global contexts, face difficulties in organizing complex portfolio with delivery processes among their branches located and characterized by different geographical and maturity levels. Multinational companies need to govern and manage different processes which are interconnected and categorized by increase in the potential number of services. Multinational companies provide services in terms of business scope and numbers, adequate and modern technological equipment or tools that support and maintain the service delivery process as well as a market demand with high uncertainty spread in different customers' needs and segments. (Ian 2019.)

In the context of manufacturing or product design, manufactures need to provide modern and competitive processes fast to increase efficiency and productivity, improve quality thereby reducing costs. For companies to respond to such requirements, they need to upgrade their resources and strategies to fit an approach called technical methodology. Such technical methodology helps to inherit and adapt methods when possible for expertise engineers to innovate and develop the service. In some industries today, services are still applicable poorly despite some few successes. (Ian 2019.)

According to several sources, targeted scope of famous methodologies is limited to certain range in a bid to translate customers' requirements into a concept of services. Methods, recommendation and guidelines that show how to structure delivery processes in service are provided which helps stimulate different customers segments for satisfaction to be gained at the same time, thus minimizing cost of operation. Nevertheless, services are still under-researched in the field of management operations despite their economic and societal significance.

Despite the gaps mention above, this context will focus its analysis on the need to break down the variety of the service delivery processes and the complexity using standardize efforts with aims of increasing the satisfaction of customers and at the same time, reducing the cost of the management process. The proposals put in place to achieve this objective are, a structured approach, which is proposed, to design, and guide identify each single service to be delivered and is offered by a company with internal standard processes. In addition, a model has been proposed to help company set their inside concepts and initiate a process that is standard to the company structure. The model sets procedures that can be followed systematically for the implementation of the research outlined and standardized in the processes of service delivery in the environment in real time. (Ian 2019.)

3.3.1 Research Methodology

As hinted above, big multinational companies experience some difficulties and gaps in service and manufacturing business, but this research tries to answer two specific research questions. These research questions include what techniques are developed to support the standardization of internal affairs and activities of processes in a service delivery and manufacture business. In addition, conceptualized processes can meet the standard in service delivery and can identified ways that are applied in companies with different business units. (Bigdeli et al. 2016.)

A 3-step research approach to study methodology is design in order to answer these questions. From the above relevant gaps of multinational companies and the Hevner, study guidelines. It was noted that an exploratory literature review to further highlight the problem carried out. It is also important to note that, exploratory research serves as an effective approach for researchers to adapt when they encounter a field of study that is new and just little amount of work has been done, particularly to the research related to service and manufacturing business process. (Bigdeli et al. 2016.)

In addition, Hevner designed another guideline called theoretical artifact approach to support the process in service and manufacturing delivery to formalize the compellation together with a framework aimed at improving the management process and this approach is design and address to big multinational companies. (Bigdeli et al. 2016.)

Lastly, Hevner proposed a third guideline. The artifact evaluation, which was performed to gain relevant insights in the case of an industry and feedback that, was collected. This approach was also adapted as a strategy to verify the proposed practical contribution. During a long-term analysis, a large amount of data was collected, and this approach has been adapted highly since its application was the first within this case such that all the relevant information can be collected and gathered. (Bigdeli et al. 2016.)

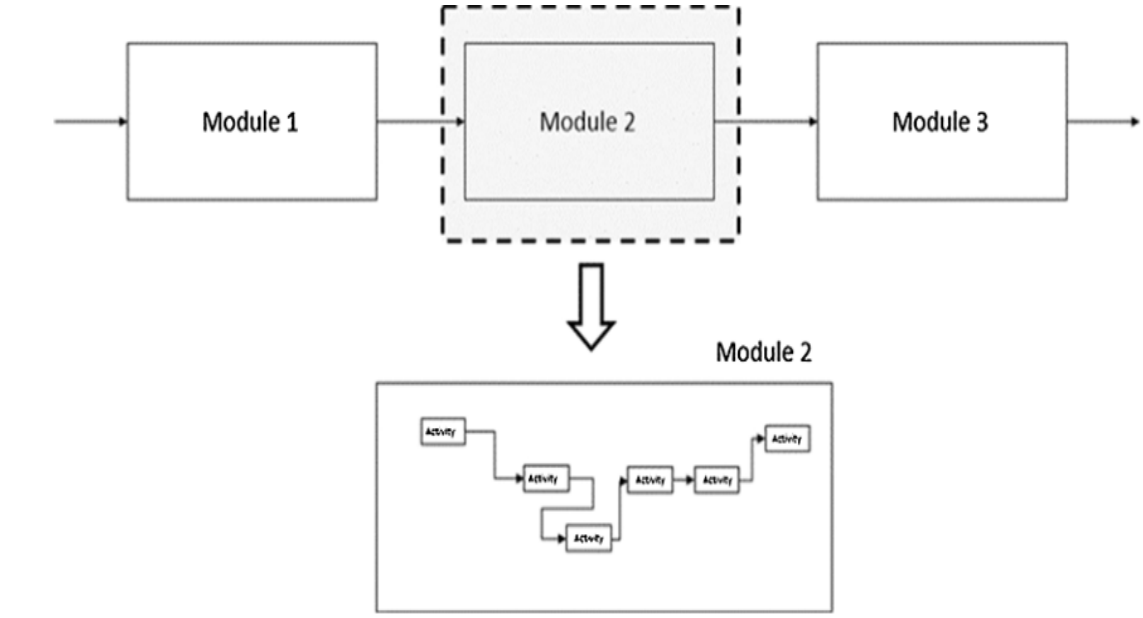
3.3.2 Explorative Literature Analysis

The research methodology is the first step to deal with the explorative literature analysis during the process of service and manufacturing standardization. Nevertheless, service engineering, service operations and service design in literature analysis have been discussed to highlight existing research that focus on techniques to standardize Services and Manufacturing delivery process. Web science and EBSCO database is used to conduct the analysis as a search structure using service and manufacturing as keywords together with the process. According to the research analysis on business processes, there is a common understanding that can be defined. Business process can be described as a business process selected in line with the process archetype, which serve as the master defining the business process as a unifying activity with different variants, highlighting the different business process possibilities in order to manage a big collection of the processes together with the unification of them in a single direction. (Bigdeli et al. 2016.)

In conclusion, the explorative analysis points out business process literature on how well developed and how the investigations are related to the many works coming from the benefits from standardization and the transitional factors influencing the business process. The main gaps in this context is that, none of the researches that exist explicitly refers to service and manufacturing delivery process and none of them prepared a step by step procedure that can be usable in order to support multinational companies to identify and set a standard in the service and manufacturing environment. (Bigdeli et al. 2016.)

Services are categorized and characterized by some specific features that include intangibility that make the traditional processes different from others. The process of service delivery is not mainly the delivery of products traditionally but the continue participation of clients in the provider process together with the relentless interactions makes the process prediction difficult. Nevertheless, many factors depend on the final service process. Examples are companies' resources, client's needs, and the features of the external environment business process which makes forecasting complex and. (Bigdeli et al. 2016.)

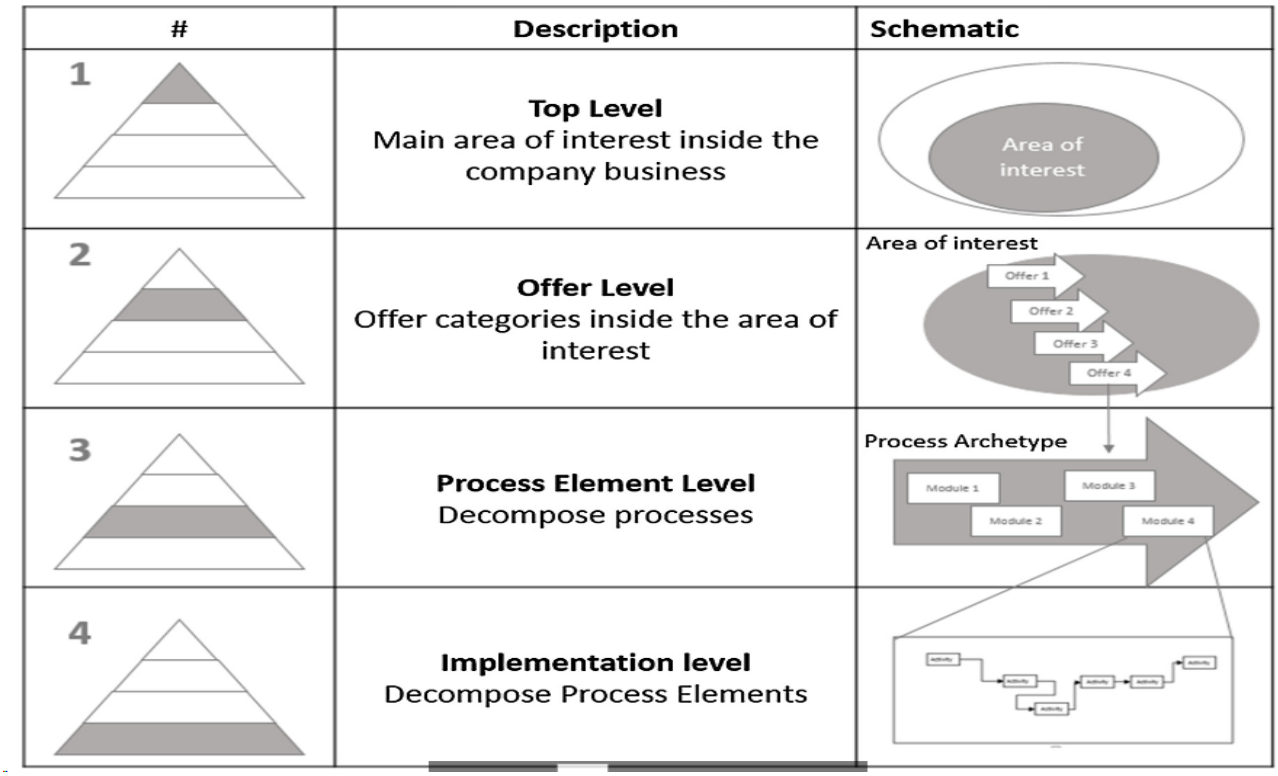
According to this finding, the critical main step in defining archetype process and how to present the process standard is done by a process module. A specific process for service delivery module does not exist yet. A module system is built from components in the system structure and can be described as follows.



GRAPH 7. Graphical structure of the standard module concept (Bigdeli et al. 2016)

In the modules, we can find the interfaces in the activities of input and output showing how each module has one single input and output making it a set or pear of activities. Moreover, the modules in this case are based on specific order and are connected to one another into the archetype process. This figure illustrates the concept proposed by Hevner and how based on the group of activities, the standard modules are design. Every module describes an instantiable function and activities been performed during delivery of the service process. The module is associated with the activities together with the Resources needed to follow up the activities. Each company can decide to define their delivery process in service and manufacturing once the modules are identified by picking and placing them in the right appropriate sequence in the process. The two main goal of the standard module is that, standard activities are set up by using these modules and the services and manufacturing delivery process can be set up using the same modules. (Bigdeli et al. 2016.)

The reference model structure is important in order to represent the process of service and manufacture properly. The reference model helps to summarizes all the modules available in a company by modifying them to suit the overall business and create a unique feature for modules to meet a common understanding of the concepts in the process delivery. The structure is designed to support establish the relationship in each company in the service and manufacturing process to form an organization as well as setting up definition and services and manufacturing concepts. The proposed structure model is presented hierarchically and showed below. (Bigdeli et al. 2016.)



GRAPH 8. Reference model structure (Bigdeli et al. 2016)

- Top level 1 describes the business areas in service and manufacturing delivery process where the station of the reference model is done such as the area of after sales services.
- Offer level 2 identifies the propose offered in the top level by the company. Therefore, different services can be offer by a company within the after-sales service business such as extension of warranty, the provision of spare parts, repairs and maintenance.
- Process element level 3 defines the process archetype area, which is link to every company offer or the combination of the process structure archetype and the modules to set up this level. For example, level 3 combined with level 2 provides spare parts and this is made up of 4 modules in the services and manufacturing process such as, offer of generation process, the order of process management, offer payment processes and the offer of spare parts delivery processes.

The implementation level 4 consists of all the defined activities detailed on each level 3 module thereby describing the company's specific activities. (Bigdeli et al. 2016.)

The reference model structure outlines the different relationships in the service and manufacturing delivery process and how the company offer services to ensure and encourage repeat and regular purchases. The reference model constitutes the fundamental knowledge about the activities in the delivery of services showing a common base where the process service delivery is built upon. The reference main models stated in the modules can be used to compare the process to a certain standard and to engineer latest processes that can be done by designing and merging the modules, which belong to the reference model structure. Moreover, the reference model structure can be used to identify standards internally and shape foundations for standard definition to be used widely in product-oriented service context. (Bigdeli et al. 2016.)

In conclusion, the two-research questions mentioned above have been fulfilled. Firstly, a proposed approach for standard service and manufacture process was fulfilled which is based on the approach in engineering module. This approach defines how through standardization service process, process archetype is achieved due to the set of unique modules that are interchangeable. This module is represented by instantiable blocks that can be used in services of different types in the company. (Bigdeli et al. 2016.)

A reference model structure is used to fulfill the second research question. The reference model structure was aimed at designing a general work path where companies who wishes to use this framework, can adopt their own services delivery process standards. This framework enables concept description, activities and modules within the structure of the company. The standard approach together with the guidelines, the execution has been done in the reference model in a company's case. (Bigdeli et al. 2016.)

4 PROCESS OF ANALYZING DATA

Fujitsu is the leader and provider of IT products, offering services for global marketplace as well as solution for businesses, networking, software and hardware. Fujitsu provides innovative IT services which include digital technology with customers to help in the digitalization. Moreover, Fujitsu operates and is well established across Europe, Africa, India and the Middle East with more than 25,000 employees across the regions, working with customers to create competitive advantages in the digital area and new value. (Fujitsu 2019.)

Data in every organization is the most valuable assets on their market, customers, assets, processes and more. In other for this to work, you need to drive values quickly and easily from existing big data investments. Data analytics helps the organization in the following ways:

1. Collects data from a variety of sources; visualize the data and come up with better strategies and business decisions to challenge competition.
2. In real time, the organization can make critical decisions from manual data analyses and end of month reports focus on this can be taking away.
3. Data analytics takes advantages of services portfolio including customization, data sciences and managed services.
4. Data analytics help get experts on hand customer care services which gives a complete peace of mind to the organization.

4.1 Target of the Process (Sales Process Based on Customers)

Fujitsu processes several data in the sales process such as customer and financial data. Their focus, however, is on customer data. Fujitsu process supporting system picture the sales process using Fujitsu Global definition which is called CUSTOMER SOLUTION LIFECYCLE (CSLC process), Here you can see the phases in data process which start with:

1. Identify
2. Quality
3. Create values proposition
4. Actual proposal
5. Final negotiation with the customer

Fujitsu uses several support systems which include customer relationship management tool (CRM) and sales force. CRM from a point of view is mainly operates with the goal of creating a necessary element for customer interaction and customer relationship management for repeat and regular purchase or consumption of their products. Customer relationship management is a tool used by Fujitsu to influence and understand customer behavior in order to improve and encourage acquisition, customer loyalty, customer maintenance, innovation and profitability through meaningful communication. For the organization or company to secure its existence, the company simply needs its customers.

Here, the focus on customer relationship management is a building bond between the company and the customers in order to obtain better feedback and prospects of customer loyalty towards the company. This seeks customers to becoming supporters, as well as positive thinkers towards suppliers and advocates to those who are recommend supplies to other suppliers. The overall goal is to get the company and the customers to work together to build mutual benefits. (Fujitsu 2019.)

Salesforce as a supporting system that contain several elements that is used to analyses data. The elements are: Customers data, customers contacts, company offerings, opportunities and Quotations for product businesses. The above mention elements are practically the structured data on customers opportunities which are probably more less what they have in scope. Customers also provide quality information such as requests for proposals (RFP) and Request for information (RFI). Fujitsu uses shared points to manage its customers and provides a proposal template together with internal proposal documentations also referred to as called document managements. These are practically the main systems in the sales process. In addition, Fujitsu uses some excel tools, excel template which is used to create big profit and loss tables.

The service business and the customer set are one of the addressing concerns which is relatively stable, is based on the target customers list with the company actively managing about 200 customers and 50 acquisition customers in addition from the service point of view. In the product point of view, the customer list is a little further because the company does some mass marketing type of activities to wilder the total number of customers to sell through the channel but then, the directly manage customers in the services business is productively stated and not too large. For customers, the company has two systems without interface such as: SAP and salesforce on the other hand.

SAP is the master system for financial information for the customer such as name of the customer, the relative number, invoice and address etc. The system has no interface between these two that create a

practical connection manually. Connecting the sales force customers to the SAP customers and how the company create customers hierarchy in SAP, They use SAP internal orders and then map the revenue and margin information to the internal orders which represent as a faster means since they can be serval SAP customers used to send the internal orders. The company uses the same internal orders as a key in the sales force, customers records as well to connect the salesforce and SAP. In the salesforce, there is the current customer and some acquisition customers. Fujitsu do very little of cleansing, filtering and formatting since salesforce act as a merging functionality which the company basically uses a little of adhoc when the company runs or encounters a case or Challenges. Therefore, when they find some duplicates below the number, the company don't work too much with customer data. (Fujitsu 2019.)

- Opportunity owner
- Sales force
- SAP
- Microsoft (human resources payroll and SAP human resource)
- Excel
- Reporting

4.2 Data Acquisition and Sources

For data to be reported, the data needs to be collected, filtered, prepared and then loaded into the system used by the company. The company have a customer hierarchy in sales force and most of them can be manage from the sales point of view which is single top-level accounts, some of them have legal entities and companies. Data is acquired from sales managers, salespersons, Internet persons, customers contacting the company and actively sending information on identifying potentials, acquisition customers based on the customers potentials, one to one customer, for example start addressing customers what have not be addressed for new data. The company can identify the market share for their products and the list of top customers.

In addition, the company identifies which customers are highly productive and interesting for the company and the register or public tenders where all the tenders are published. The company collects the above mention data and follow up to find areas that are beneficial and productive for the company even if the company has no customer yet, it can be a potential customer or potential results to the organization. Fujitsu mainly answers to those requests for proposals (RFP) where they have been part of the selling to

the customers, so the company needs to be on the same opportunity with the customer from the beginning. Below are the sources of customer data in the sales process. (Fujitsu 2019.)

1. Customer relationship management
2. Customers
3. Contact information of the Customers
4. Offerings and proposals
5. Opportunities
6. Request for proposals
7. Request for information
8. Internet persons

4.3 Data Modelling

When data is made, the first step of modelling is done. After data source is being created, correspondence data store object advantaged (aDSO) is needed, for the data to be stored physically. At this stage, transformations are done from the data source to the aDSO. When the transformation is created, the rules of transformation are defined as well. If any formulas are needed, they will be added to it. When the transformation process has been successfully set, it is now possible to transfer the data process and load the data physically in to aDSO. In the case of Fujitsu, they do not have a data modelling tool or a master data system, but they have quite a few micro soft business intelligence systems, which are not really used for specific modelling. Fujitsu combined a reporting system and a differently manually entered for example, sales numbers from SAP system to create an overview or wilder view of the customers in the reporting system. These are one of the challenges fujitsu is facing in line with data modelling.

In service business, the local SAP system is used in Finland and a separate European level SAP system for product business. Fujitsu integrate these SAP systems with the sales force in order to better manage the master data for customer management system for efficient and effective output. Here, customers are originally created in sales force and promoted to SAP customers. Sales force in this case, is sending a message to SAP with customer management team who is reviewing those new customers and completing the information that SAP needs with creating them as an SAP customer. The team then gives feedback or reports back to the sales force system. Fujitsu has a data qualification check system which enriches and enhances the sales force data. (Fujitsu 2019.)

4.3.1 Data Backup and Recovery

Fujitsu relies on and uses sales forces which come with its own sales force backup system. This system has been reported to be working perfectly fine and has never encountered any problem or crash in the past years. SAP runs on premises containing a backup and the same goes with shared point running on premise with its own backup service on premise. With these services, Fujitsu provides their customers with an integrated system that will help bring in the cloud computing a fast-paced innovation to on premises environment which include the software and hardware of a Microsoft based solution called Microsoft Azure stack. this ensure a delivery of consistence services across on-premises. With the right tools and services, customers will benefit application migration and easy deployments, enabling them to focus on their core businesses with hybrid services. (Fujitsu 2019.)

Fujitsu Finland stores data using the following data storing tool:

- On Salesforce cloud.
- On premise SharePoint.
- On premise SAP
- UK Fujitsu on premise SharePoint

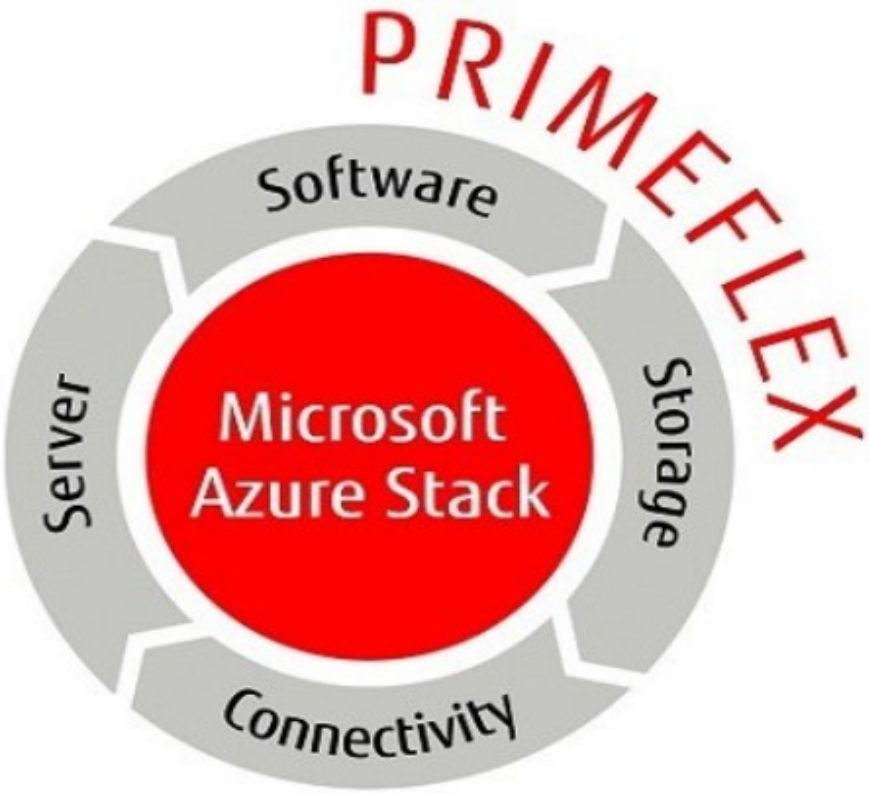


FIGURE 3. Fujitsu Integrated System (Fujitsu primeeflex 2019)

4.3.2 Data Prediction and Forecast

Fujitsu predict and forecast their data by the opportunity owners. The opportunity owner uses three categories for the forecast as follows:

- Commit, meaning the opportunity owner is quite sure to win this opportunity and it is based depending on how to make that sales
- Best case, meaning Fujitsu is in the best position out of the competitors to win this opportunity
- Pipeline, meaning what are they selling, how big it is and what time of the year it is

The manager is making the data forecast and prediction based on the above-mentioned data which can be modified and adjusted. Fujitsu analyses their data order value from different angles which is per person, per offering, per country using wind rating. Analyzing their expenditure, revenue and losses and how it different from country to country, region to region, from industries with the country. The wind

rating also looks at how it differs from public sector sales and private sector sales on order to see the company's strength and weaknesses and to see different offering where the company has a better wind rate or the worse wind rate. Contracts and order values are the key Metrix for the service business since customers have been and still are doing longer commitments like 5years and above and is productively long sales circle, he key Metrix for sales are;

- Orders vs Budget which is the primary Metrix
- The Contracting Margin
- The Revenue
- The sales manager actual margin and revenue in their areas of responsibilities
- Analysis of the wind rate
- The expenditures with budget

4.4 Data Presentation

For data presentation, Fujitsu uses both internal and external services to report or present its data. Internally, sales force dashboards are used to report practically different views to the sales team using their own data taking into consideration every information that has been entered in the system both on the individual level, team level and country level. This reports the sales forecast for the whole quarter level. The business intelligence reporting tools are also used to present and report data but are limited to only a few countries. Fujitsu uses Power Point with business manager in business review as a means of reporting and presenting data to customers.

Externally, Fujitsu report and present data to the global reporting head quarter in Japan using Globally reporting tool. They report the contract values, the global orders, revenue with countries in the Fujitsu group. This is done by making statutory reporting annually in a financial consideration system in Europe where data is taken from the sales force and SAP system and upload them in the financial management system. All this is sent to the consolidation group in Japan which consumes them from a different financial consolidation system the various group result and then reporting based on that. Generally, in Finland, Fujitsu reports very little because most of the revenue is not kept in the country.

Process of data flow from source to destination using opportunity data as an example:

- The opportunity owner makes a manual entry into the salesforce system
- The Microsoft business intelligence system get the sales data from the salesforce

- The data is reported in Excel and upload to the Hyperion Financial management (HFM) system which is then used to report the financial numbers in the European level and reported to the head quarter in Japan.

Using SAP as an example:

- Invoice data which is procreated from number of sources in different services delivery systems like numbers of ticket recorded in and out of the IT service management systems
- Upload the data in the Microsoft business intelligence
- Creating the invoice data which is transfer to SAP to create the invoice
- Report the revenue to Hyperion Financial management (HFM)

Using Microsoft business intelligence:

- Microsoft business intelligence report in Excel and then calculate variable pay plan
- Provide the Excel to human resource payroll
- The human resource entered the data in a different SAP for human resources which is mainly created for payroll SAP
- The payroll SAP send the data back to the opportunity owners

All information mentioned above, is used to manage data and sales owned by Fujitsu by dividing task and monitoring the task which create the structure for general managing directors. The management directors use the information to acquire knowledge of sale targets and where necessary actions are taken on which sales team needs more support, how to forecast if the team meets up with the revenue target or not and where to take positive changes if necessary. It also helps them to keep track of the revenues and expenditures in both managing the sales activities and then managing the capacity or company to meet the demands. In line with this, they can deliver to the sales owners to match up with the profit that the shareholders are expecting. Decisions are made daily on account levels in order to see if investments are channeled correctly and how contracts are executed and if the recruitment team is providing workers for the contracts. (Fujitsu 2019.)

5 CHALLENGES FACED

Analyzing and combining the data from different sources of the sales force and the SAP systems is not effectively combining the sales force data with SAP revenue. The lack of data modelling tool to effectively combine data from different systems for customers have provide system redundancy. This is due to Fujitsu not having many different systems in other countries which makes a difference in the interface. SAP revenue consist of connected enterprises, enterprise productivity, customer engagement, digital platforms etc. The lack of models makes it difficult to connect different data into a single server for better efficiency to produce better result. The sales force components produce data that is needed. Fujitsu's biggest challenge is to combine those sales force components and the SAP revenues into one platform in order to deliver effectively. Furthermore, the comparison is left out due to some circumstances beyond control.

Firstly, I was finding difficulties in choosing a thesis topic as a business student who needed to develop her career in SAP. To decide on my thesis topic was quite challenging and needed to choose something in which I have interest in writing on. As a member of the next gen lab, I saw how data is handled in real life which made me curious to know how the data is collected, module and presented by differently companies.

Finding books and articles on data analysis was quite challenging for me especially working with companies which has customers to protect. I wasn't able to see how the system works in real life because value customers information could not be exposed which made it challenging for me to actual know how to interpret and how the system works. Fujitsu is facing challenges in combing the salesforce data and SAP revenue which makes it difficult to deliver more efficient to meet up with the customer's needs. The next chapter gives some suggestions to take into consideration for better output.

6 POSSIBLE SOLUTION TO THE STUDY

The data flow process in service and manufacture companies presents a challenge for projects that must be carried out by two case companies for comparison. Fujitsu operate on an IT service environment which makes them unique in their activities and service provider. Fujitsu is an IT company that provide services, innovation and solutions to customers and thus deals with data of all kind depending on the project. Data can be presented in many different tools provided by different other sources. SAP is one of those tools which data is presented and before the final reporting stage, it passes through different processes to make it meaningful and understandable. For data to be reported, it goes through different procedures or process provided by the system. SAP provide different products for IT companies dealing with services and manufacturing depending on their demand.

It is understandable that Fujitsu uses salesforce and SAP for data reporting and needs improvements to better deliver its products to its customers. Using salesforce as a reporting tool, has been working without any setbacks and delivers in time. On the other hand, SAP as a reporting tool has some challenges when combining the salesforce data and SAP revenue. The combining of different data sources of the salesforce and SAP system is not efficient. Fujitsu need to improve on the modeling tool which goes to help store the data physically since the data will be in a business warehouse (BW) object.

This step is done when the data source has been created then you can proceed to make a data store object advantaged (aDSO) with transformations made from the sources of data to the object. For the transformations to be done effectively, rules must be made for the transformation to be defined such as time and characteristics. Formulas can be added if needed such as calculating the gross margin. Once the transformation has been set successfully, the data is now transferred and loaded to the aDSO physically. When the transfer is successfully completed, the data flow process will be presented in the whole project and the composite provider can be shown.

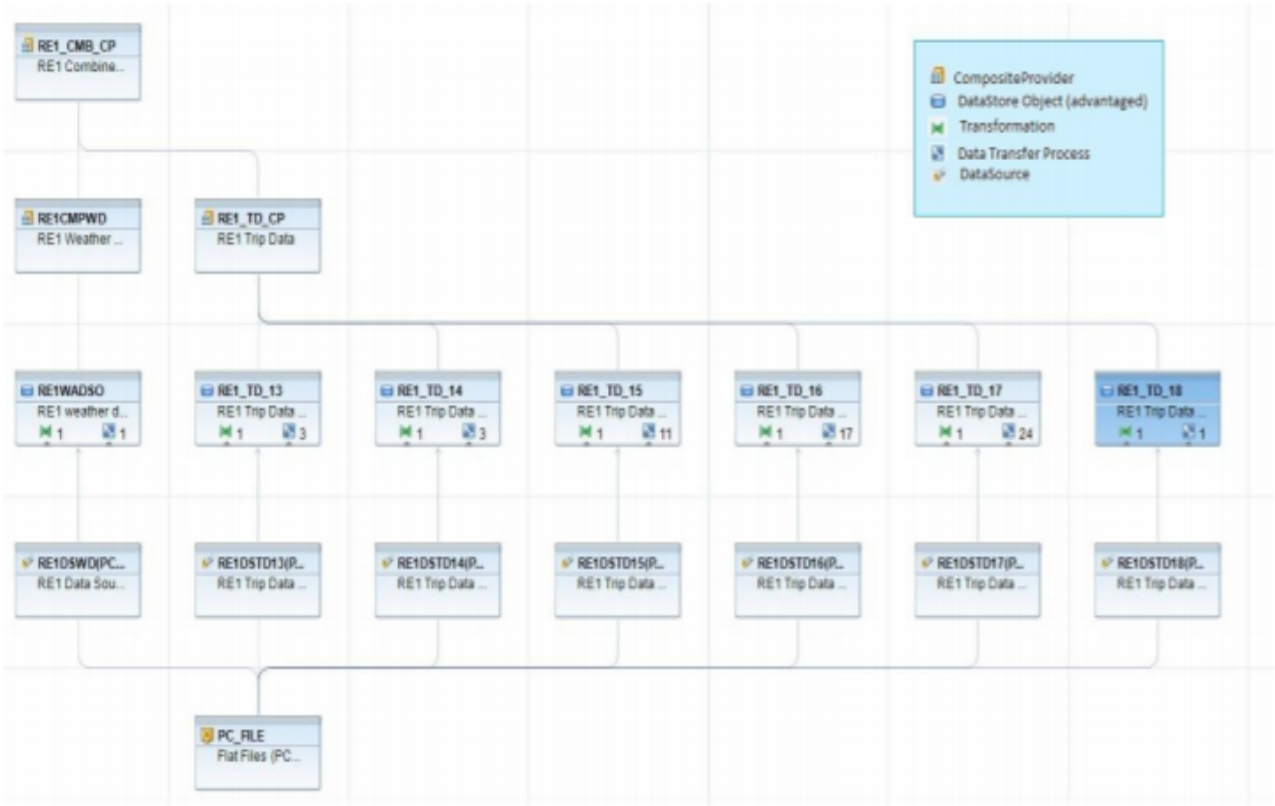


FIGURE 4. Finalized Data Flow (Centria University of Applied Sciences 2018)

The above diagram shows the data consisting of different and multiple data sources with trip data and for one year each aDSO consist of trip data. They can be multiple data transfer once the data is modeled to the system data will be reported effectively.

Another improvement Fujitsu can add is creating an info object which is the base of business warehouse. It defines the amount of data coming in, the color of the product and the warehouse location. The purpose in which the data is going to be used for is important when creating an info object and the minimum required needed for the project. This is based on the data field required. An info provider is defined when the info object is created, and the behavior of the data received can be defined as well. Using key figures, as the sum or the average of the record the data can be shown and define as decimals number in the key figure level. It is important to define the length of the characteristics and the aspect of time depended as well as adding the aspect of language depended. There is a possibility to define hierarchy with characteristic or have attributes which help to organize more deeply the incoming data. The picture below shows the general characteristic view of the info object.

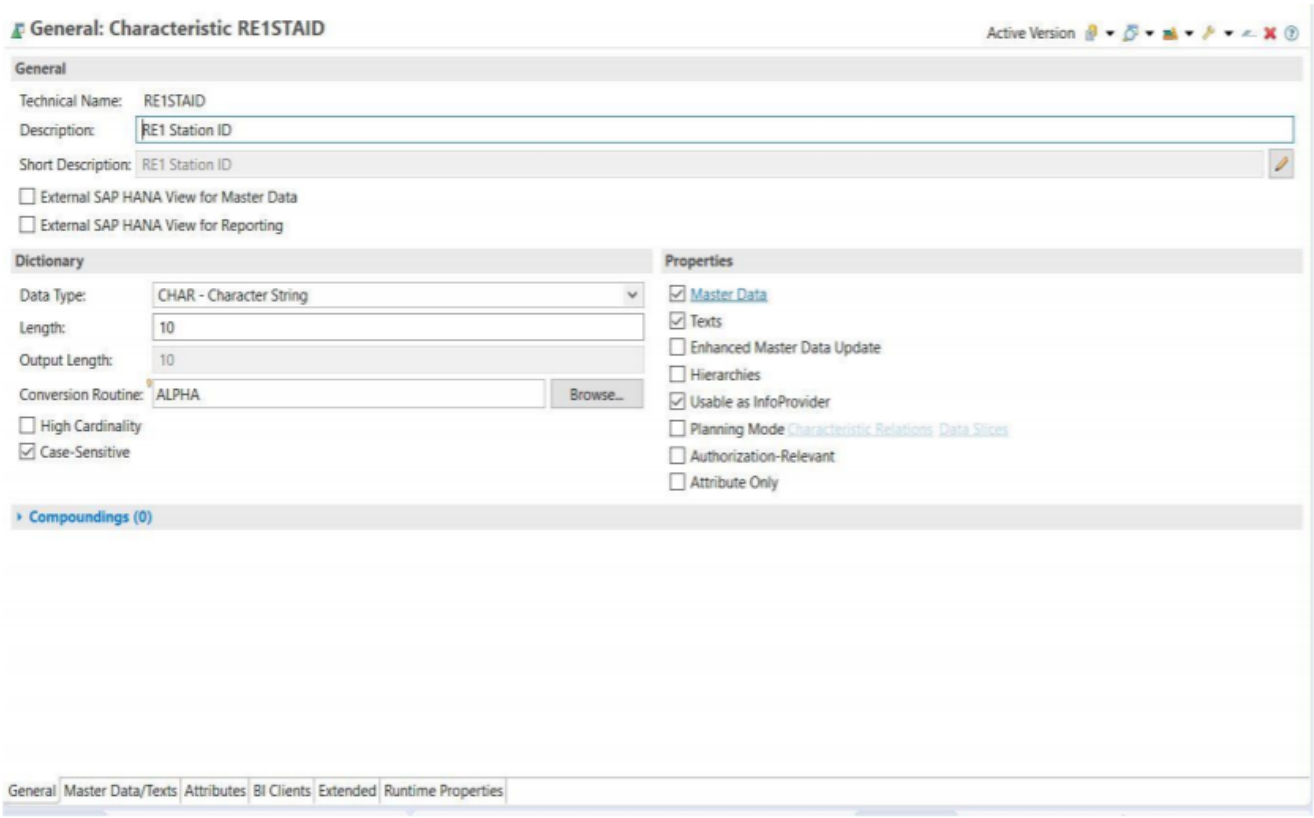


FIGURE 5. General Characteristic View of info Object (Centria University of Applied Sciences 2018)

The above research work in this project can be applied by Fujitsu to modulate, stored and transform data in a BW warehouse to make the entire process faster and more efficient to carry out the project requested by the customers. In this research, one problem faced by Fujitsu was the lack of modelling tool where data could be physically stored and transformed including multiple data. This research also helped to analyze and combine the data from different sources.

Furthermore, data acquisition engineer needs to have a good communication skill to be able to connect with the data analysist working on reporting and presenting the data required. For the data to be effectively combined, special characters and letters such as (#, @ etc.) should be removed or taken out from the source data for the project. This is to avoid further problems on the process. It should be possible to add new column for the data table and clean up the data by the data engineer. This helps to reduce errors presented by the system especially when choosing only the relevant data to be loaded into the system. When modelling a data, the structure requires lots of attention which sends a signal to the system on how the data flow should be planned right ahead. Here, a lot of documentation needed to be done from the plan which has been a success to the ones who failed in order to receive signal in which data is suitable to load in the system. Sometimes this error can be from the time of data gathering. The pillar of BW

warehouse is to be able to make corresponding info object which can be defined by data type. Errors can occur if the info object is not correctly defined. All required data source field should be categorized and studied. Categorizing the data as Master or Transactional data should be defined followed by the data behavior which is needed to define the data by either by characteristic or by key figure and their kinds. When the data flow can be seen and reported, then it is set to be successful.

7 CONCLUSION

In conclusion, Fujitsu is a great environment for customers to invest in since they are having multiple IT innovation, solutions and serval working atmosphere for data presentation and reporting. This makes it a great platform or opportunities for students to learn different data work environments with SAP technology. Here, it is possible for students to gain short term experience as well as interacting with different, customers data and technology around the world. It is an opportunity to learn the different limitations of the various systems they use such as: The Salesforce, SAP, Microsoft and excel. Business skills and IT skills are integrated to satisfy customer needs and want which makes it possible for business student to learn some IT skills as IT student learn some business skills.

Working with Fujitsu as a case company, I have acquired a wider knowledge on how the company operate in terms of data flow with different magnitude and areas which can be presented using different method or tools. In this thesis, a deeper wide study of data flow process in service company is recommended. It is recommended for Fujitsu to have a deeper study of BW warehouse to get a more effective and faster way to transform or bring data into the system. Therefore, it is important to understand the whole concept of SAP BW/4HANA and its requirements on database to get how this system works to further improve your output to the customers.

Students should take internships in writing their thesis with companies seriously because this will give them a deeper knowledge of their study which in the future can create job offers or create connections. Choosing this topic and working with a case company has given an opportunity for me to develop my career path and learn how to work in an environment in real time. Therefore, it is important for students to work with companies related to their field of studies for better knowledge and development. The study of data analysis has given a wider picture and a greater path to continue learning towards this path for my future career.

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