Czech University of Life Sciences Prague

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Bachelor Thesis

Material Management in SAP S/4 HANA: A case study

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BACHELOR THESIS ASSIGNMENT

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Thesis title

Material Management in SAP S4 HANA: a case study

Objectives of thesis

The main objective of the thesis is to compare three categories of SAP applications within Fiori interface in SAP S/4 HANA system module Material Management.
The partial objectives of the thesis are such as following:
- to make a comprehensive literature review of the latest industry standards for Material Management and its implementation is SAP systems.
- to compare three different applications in Material Management module
- to summarize results and make recommendations for material management

Methodology

Methodology of the thesis is based on literature study and practical research. At the beginning, the literature review will be done and then own research on the given criteria will be performed. The own research will be done through training courses by using three applications within Fiori interface in SAP S/4 HANA system and accomplish a given task independently. When the given task is finished and the related data is collected and analyzed ,the practical recommendation will be given and conclusion of the research will be formulated.

The proposed extent of the thesis

30 – 40 pages

Keywords

Fiori interface, SAP S/4 HANA, ERP, Comparison, Transactional app, Analytical app, Factsheets app

Recommended information sources

AKHTAR, J.; MURRAY, M. Materials Management with SAP S/4 HANA. Business Processes and Configuration. 946 pages, 2019. ISBN: 978-1-4932-1742-7

COOLEN, Bram; BOOR, Aart-Jan. Creating Business Value with SAP HANA.

MATHEW, Bince. Beginning SAP Fiori. Bangalore: Apress, 2015. ISBN: 978-1484213360

PLATTNER, Hasso; LEUKERT, Bernd. The in-memory revolution. Springer International Publishing, 2016. ISBN: 978-3319166728

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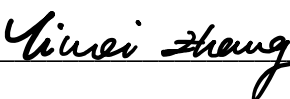
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Declaration

I declare that I have worked on my bachelor thesis titled "Material Management in SAP S/4 HANA: A case study" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 21.11.2020

Material Management in SAP S4 HANA: A case study

Abstract

In SAP S/4 HANA system, there are 3 different categories of applications: Transactional, Analytical and Factsheets. These three types of applications have their own characteristics and functions. The main objective of the study is to compare three categories of SAP applications within Fiori interface in SAP S/4 HANA system, then find differences and similarities among the three types of applications. The SWOT analysis of the material management module in SAP S/4 HANA system is also made during the process of comparing operation. The case study is based on the literature review and operation in a given task scenario, the thesis used quantitative approach to generate statistical comparison as well as qualitative approach, for example method for User Experience inspection, to find more differences among the three types of applications and put forward to advice in relation to the SWOT analysis for the module Material Management and the system SAP S/4 HANA.

The results showed the differences among the three categories of applications in time consumption, number of applications, design of main user interface and running database. Otherwise, there was existing interconnection among the three types of application to indicate they have similarities as well. Eventually, the overall strength of the material management module in SAP S/4 HANA is greater than the weakness, the module and SAP S/4 HANA system itself still have strong competitiveness in the ERP software market, which is the first choice for customers who want to standardize their business processes.

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List of abbreviations

1. MM --- Material Management

2. ERP --- Enterprise Resources Planning

3. SAP S/4 HANA --- SAP Business Suite 4 SAP HANA

1. Introduction

In today's big data era, information technology is constantly developing and innovating. The use of information technology achievements for data control and management has become an indispensable tool in the operation of various industrial companies, because it can improve the efficiency of enterprise management and control, increase the efficiency of work and reduce unnecessary additional costs. In this social development trend, SAP announced the first version of SAP Hana in December 2010 (SAP, 2019), which is a new product for "In-memory computing". Later, in February 2015, SAP continued to release S/4 HANA, an ERP business suited based on the SAP HANA in-memory database, allowing companies to implement business execution and analysis of business data.

SAP regards SAP S/4 HANA System as one of its flagship products. The SAP S/4 HANA System was created to make it easier for enterprises to use and manage, while helping to solve more complex problems and process more data than its predecessors. The functions of SAP S/4 HANA System include database services, advanced analysis and processing, application development, data access, management and openness. In its official website narration, SAP S/4 HANA System has remarkable advantages such as visualization of the entire sales process from order acceptance to payment collection, real-time inventory follow-up, increase order fulfilment rate, decrease manufacturing error rate and improvement of customer satisfaction.

SAP has revolutionary innovation such as SAP S/4 HANA System, which becomes a powerful force to promote the development of information technology. But at the same time, in thesis opinion that SAP S/4 HANA System also has many problems and challenges to be settled: in the business processing of different enterprises, does SAP S/4 HANA System really performance the advantages described by the official, making the business process more transparent? According to the feedback user experience, what changes can SAP S/4 HANA make in the Fiori user interface to make users feel more convenient to use? In Fiori user interface, can the 3 main types of applications in module Material Management meet the needs of enterprises for material control, are there any use conflicts between them? Is SAP S/4 HANA System able to leverage its product strengths and innovations to reduce regional constraints on material management for different organizations in different regions and achieve its full performance? Bachelor thesis will analyse similarities and differences of

the three types of applications in SAP S/4 HANA system through case study and practical operation, as well as put forward personal views, conclusion and suggestions.

2. Objectives and Methodology

2.1. Objectives

The main objective of the thesis is to compare three different categories of SAP applications within Fiori interface in SAP S/4 HANA system module Material Management.

The partial objectives of the thesis are such as following:

- to make a comprehensive literature review of the latest industry standards for Enterprise Planning Resources (ERP), Material Management (MM), SAP and its product SAP S/4 HANA as well as Fiori, doing a well literature basis for other parts of the thesis.

- to record the process of the operation of the case study task and its necessary data, summarize and analyse it to complete the main objective.

- to make SWOT analysis briefly for SAP S/4 HANA system and its module Material Management.

2.2. Methodology

The thesis was finished in two sections and used two research approaches to complete the objectives of the thesis. The first section was through literature review to make a comprehensive and well knowledge review of topics related to this thesis, such as ERP (Enterprise Resources Planning), Material Management, SAP and its creative product SAP S/4 HANA, SAP Fiori etc. Literature review materials come from official websites, published articles, or trusted websites. Moreover, by participating in the SAP S/4 HANA training course, the thesis obtained the support from the official tutorials, which lays a good theoretical basis for the second main section of the thesis, the practical part.

The practical part of this thesis was based on the official tutorial " The case study: Material Management", which means that assumed operation scenario, task and record of process are based on the "Challenge" assignment from the end page of the official tutorial " The case study: Material Management". The description is given in the subsection 4.1 Introduction of the case study.

For the second section, the author used two research methods which were quantitative approach and qualitative approach to finish the main objective and SWOT analysis. The quantitative approach was applied for statistical comparison about 3 different types of

applications within Fiori interface in SAP S/4 HANA system. As for the qualitative approach, except for collecting the main user operation interfaces of the 3 types of applications to make comparison during the operation process of the case study task , the author would find more differences of the 3 types of applications on others sides and make reasonable suggestion in relation to the evaluation and experience as a user through using method "Evaluation by Expert" and searching on the official website as well as other reliable websites.

3. Literature Review

3.1. Enterprise Resource Planning (ERP)

Enterprise Resource Management (ERP) is a kind of business process management software, which is a management platform based on information technology and systematized management thought to provide decision-making and operational means for enterprise decision-makers and employees. ERP is an enterprise resource management system which integrates enterprise management concept, business process, basic data, human and material resources, computer hardware and software. Enterprise resource management refers to the systematic management activities such as overall planning and allocation of resources, utilization and development. That is, the process of organizing, planning, coordinating, supervising and controlling the resource allocation, utilization and development activities of enterprises, including the management activities of obtaining enterprise resources, rational allocation of resources, rational development and comprehensive utilization of resources, tapping the potential of resources, giving full play to the role of resources, and achieving good economic benefits of enterprises.

3.2. Material Management (MM) of ERP

Enterprise resource planning (ERP) is a management platform based on information technology to provide decision-making and operation means for enterprise decision-makers and employees with systematic management ideas. The material management of ERP application software has a direct impact on the business activities of enterprises. It is an indispensable part of modern enterprise management, including planning, material balance, purchasing, inventory, warehousing, receiving and other activities. In ERP system, material management involves finance, project management and purchasing module, which fully reflects the high integration of capital flow and logistics and the timeliness of information.

The application characteristic of ERP in material management is the utilization of ERP system technology in production material management. First of all, it can redesign and arrange the business process of the enterprise, realize the fixed operation inside and outside the process system, reduce the randomness of the execution of the production process, greatly improve the efficiency of the production work, have an important role in promoting the enterprise, and create more economic value for the enterprise.

Secondly, the ERP system can centralize the management of material data. It mainly manages the data of suppliers, purchasing items and materials in a unified way to ensure the accuracy and uniqueness of all kinds of data. Accurate data can provide real and reliable basis for production material management for staffs, it is beneficial to the production material management personnel to carry out the material management work better.

Thirdly, using the ERP system combined with the data of material standardization and material purchase catalogues, can quickly determine the production material procurement strategy and material procurement mode, avoid the occurrence of procurement errors caused by human intervention, thus burying potential safety hazards for production material management and optimizing the overall process of production material procurement, It is an essential factor in production material management.

In the process design of production materials, ERP system technology can clarify the material management, the work contents and responsibilities of relevant departments and the key points in material management by its own system, which greatly improves the work efficiency and timeliness of material management. The system realizes the specialization of material management, makes the material business data quickly and accurately transmitted to the required departments, and standardizes the whole process of production material management.

ERP plays a key role in the management of production materials. The reason why it has been widely used in material management is because of its own functional advantages. The use of function modules about Material Management in the ERP system can systematically maintain and manage the master data in the production material management, so as to make the whole production material management process more standardized.

3.3. SAP

SAP, which stands for "Systems Applications and Products in data processing", is a multinational software corporation in German. It was founded by 5 people which are Dietmar Hopp, Klaus Tschira, Hans-Werner Hector, Hasso Plattner, and Claus Wellenreuther. This company makes enterprise software for managing business operations and customer relations. SAP is headquartered in Waldorf, Baden-Wurttemberg, Germany and now it has over 420,000 customers in 190 countries, therefore SAP is one of the world largest independent software manufacturer and it is also an element of the Euro Stoxx 50 stock market index. From 1972 to 1996, SAP company was keeping bringing the new

products through the old, such as SAP R/2, R/3 and R/4, among them SAP R/3 became partnership with Microsoft which was connecting with Windows NT operating system and in 1996 it joined the internet and could be used online. SAP was the third largest independent software provider in 2002. From 2005 to now, SAP company has designed and launched varied versions and products to satisfy customers demands, such as SAP HANA, which is the fastest growing product in history of enterprise software and the outstanding one of ERP software in big data era.

SAP this name is not only used by the company, but also for its software. SAP software was founded in the same year as the company, it was deemed as development of real-time data application software. As a software program, SAP can manage an entire company or enterprise across different apartments, it provides a platform for enterprises in the form of Enterprise Resource Planning (ERP) software to manage and run their company's separate databases. It first sells to small business owners to offer individual users with accounting methods that integrate management assets, costs, production, operations, personal and financial spreadsheets. At the beginning, the Sap program meant providing companies with the ability to work from a company-wide shared database. It has evolved to replace all corporate spreadsheets with a single user accounting package in the company's business management system, so that the accuracy and effectiveness of the software can not be ignored, but they are also the highlights and advantages of SAP software.

3.4. SAP S/4 HANA system

With the expansion of business and the deepening of information technology, the ability to quickly process massive data and effectively conduct real-time analysis will determine whether enterprises can quickly respond to market changes, decisions, and take the lead in development. Nowadays, many enterprises have invested in "big data" to ensure the ability of timely access to and analysis of all operational data in an increasingly competitive business environment. Therefore, it can be predicted that enterprises will face the continuous outbreak of data, the increasing data types, and the acceleration of data processing speed. At the same time, business users need to have a deeper insight into the data and a wide range of data, and be able to access the latest data, and implement the answer without delay. In this context, SAP HANA (SAP High-Performance Analytic Appliance) emerged as the times require. This real-time data platform has powerful functions of analysis, storage, and

processing of large data. It can fully tap the commercial value of large data and help enterprises seize the opportunity to make real-time decisions.

S/4 HANA is the latest technology of SAP. It can extract, analyse data, and then provide high-performance data query function. It is an independent memory database, based on the combination of hardware and software of "Column-oriented storage" and "Memory Computing Technology". HANA is a complete set of solutions, while there are many applications based on HANA. In this solution, users don't need to model and aggregate business data, HANA system offers users with high-performance queries and analysis of a large number of real-time business data.

The most prominent characteristic of HANA technology is the application of memory-based computing technology. By processing a large amount of real-time data on the main memory of the server, the HANA technology is able to obtain the instant results of analysis and transaction, provide support for customers' timely insight, prediction of the future and the connection between action and decision in order to practice better business performance .

However, SAP HANA also has its shortages and needs to be improved. For example, HANA does not support JOB definition and monitoring thus needs to call application scripts and system tasks, does not support variable definition, etc.

3.5. SAP Fiori

According to the official website, the definition of SAP Fiori is "the design language that brings great user experiences to enterprise applications. Based on user roles and business processes, SAP Fiori simplifies doing business. SAP Fiori is a paradigm shift away from monolithic ERP solutions towards light-weight apps tailored to the users' tasks. To accelerate the transformation of the world's digital economy, SAP is applying this design language to leading technology platforms." (21)

SAP Fiori is a new user experience (UX) for SAP software and applications. It provides a set of applications for general business functions, such as work approvals, financial applications, calculation applications and various self-service applications (13). SAP Fiori provides more than 300 role-based applications, such as material management, human resources, finance, etc (13). Otherwise, it supports multiple device applications and allows users to start a process on their desktops or laptops, then can continue the process on a smartphones or tablets .

When SAP Fiori combines the power of SAP Hana, it provides unparalleled application response and query-execution time.

3.6. SAP S/4 HANA in ERP

SAP S/4 HANA is an intelligent ERP solution that helps companies catch every opportunity in today's digital world and get rid of common obstacles associated with traditional ERP applications, such as batch latency, complex environments and manual-driven processes. As for its superiorities, SAP HANA enables a company to support and optimize its business processes, helps the organization run smoothly. It creates a real-time environment for data and collects logically related transactions within identifiable business functions.

SAP S/4 HANA is comprised of several modules, including Sales and Distribution (SD), Financial Accounting (FI), Material management (MM), Production Planning (PP), Controlling (CO), Project System (PS), Warehouse Management (WM), Enterprises Asset Management (EAM) etc. SAP HANA collects and combines data from individual modules to supply enterprise resources planning for companies or organizations.

When it comes to data, in ERP system of SAP HANA, data is divided into 3 types: organizational data, master data and transaction data. The organizational data must be recorded in system, it is included such as company code, plant and storage location etc. The master data is stored for a long time and seldom changed, it represents logically grouped data, for example customer master or vendor master. The transaction data is system record of business event, which means it is depended on the business event, different master data and organizational data will be referenced.

3.7. 3 types of applications within Fiori interface in SAP S/4 HANA system

In Fiori interface of SAP S/4 HANA system, there are 3 main application types which are transaction apps, analytical apps and factsheet apps. Each of them has its own unique functions and infrastructures requirements. There is a figure which can explain and show the 3 main types their definitions and general purposes.

Figure 1   Three types of Fiori Apps: Transactional, Analytical and Fact Sheet.
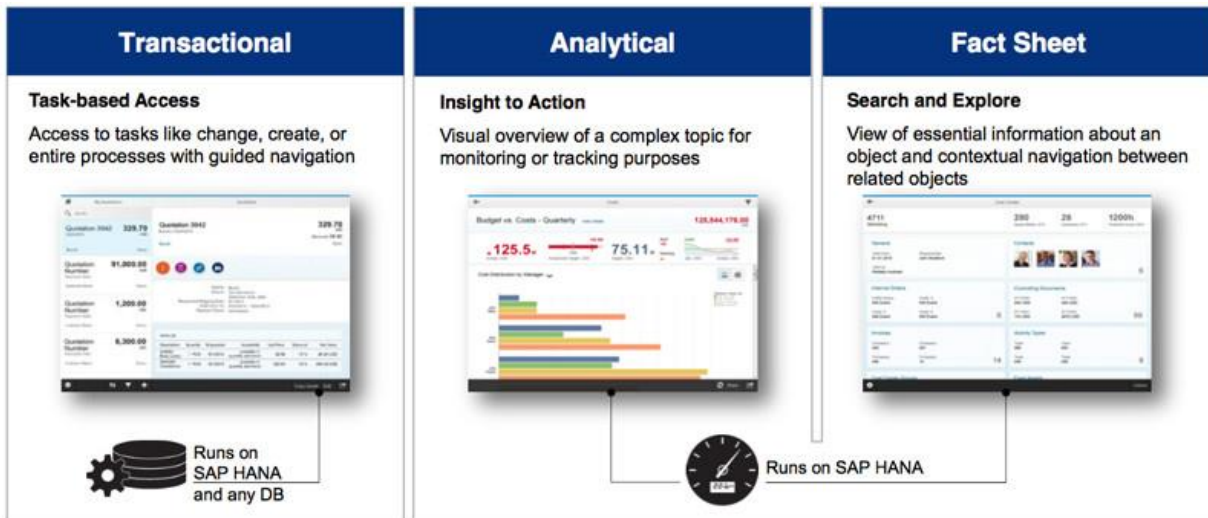
Source: Ramya Ramasamy, 2016

3.7.1. Transactional applications

  Using transactional apps, you can perform transactional task for example create a material or business partner. They stand for simplified view and interactions with existing business processes and resolvent. The best apps of running on SAP HANA databases are them. Otherwise, they are also able to be ported to other acceptable performance databases. Users are allowed to run simple SAP transactions on mobile devices as well as desktops or laptops.

3.7.2. Analytical applications

  Through these apps, users can collect and display key values directly in browsers, thereby gaining role-based insight into the real-time operation of your business. The analytical apps SAP HANA's data and analysis capabilities with SAP Business Suite's integration and interface components. They provide real time information about large volumes of data at the simplified front end for enterprise control. The analytical apps can give you a hand to monitor the most important performance indicator carefully so then you are able to respond quickly to changes in market conditions or operations.

3.7.3. Factsheet applications

  The factsheet apps display that contextual information and key facts of the central objects used in business operations. You can go into more details about what you want to find. Using factsheet apps, you can navigate one-fact sheet to all its fact sheets which is related and transactional apps to run SAP transactions. Some fact sheets provide a geographical

integration option. Factsheets allows users to call it from launchpad research results, other factsheet applications, transactional or analytical applications.

But it should be noted that Factsheets app only run on SAP HANA database and it is also required an ABAP stack, which cannot be ported on the SAP HANA Live tier 2-architecture.

3.8. Material Management (MM) in SAP S/4 HANA

In SAP ERP Central Component (ECC), SAP Material Management (MM) is a model which provides material, inventory and functions of warehouse management for organizations. It involves purchasing process, master data, material determination and material evaluation, inventory management, invoice verification, material demand planning etc. The main goal of SAP MM is to ensure that the materials are always maintained in appropriate amount and avoid shortages or gaps in the supply chain of organization. It can help professionals in supply chain and other SAP users to complete goods purchasing without delay and ineffective cost, professionals and users can also deal with the daily changes in these processes. In addition, it accelerates procurement and material management activities, makes sure that the business runs smoothly with enough time and effectiveness of cost.

As a critical module, SAP MM is a part of logistics function of SAP ECC. It plays a crucial role in the supply chain of manufactures. Other ECC components, such as production Planning (PP), Sales and Distribution (SD), Plant Maintenance (PM), Quality Management (QM), Finance and Control (FICO) and Human Capital Management (HCM) are integrated with Material Management (MM).

In S/4 HANA, there are some innovations about MM. For example, the transaction for Business Partner is the single point of entry for all master data such as vendor or contact person and has replaced over 50 ERP transactions, which means the core function of SAP S/4 HANA is the simplification of data structures. The maximum length of the material field has been extended from 18 to 40 characters, you can create and find more material products. Final example but not the final innovation, data model has been changed significantly, actual stock quantity data will be calculated on-the-fly from the new denormalized table --- MATDOC.

3.9. Methods for User Experience inspection

User experience inspection is a process which is to test different aspects of user experience, also determine the most optimal way for a website or software and its elements to interact with the audience. You can test for client trust, first impressions, comparison and more. There are several reasons why user experience inspection should do, firstly nowadays the majority of products on the market are "2C" (to customer) and there is a demand for the number of users, so that companies need to familiarize users with and use the product quickly. Secondly. In the past, users often use the manual and teaching mode to understand and use products, which takes too long and costs a lot. This mode is no longer applicable now. Thirdly, the quality if user experience directly determines the ease of product promotion. In order to increase sales, you have to know how your product affects or prevents users from buying your product or service. To pursue the growth of users, products or services have to fulfil the needs of users. These are the importance of user experience inspection.

When it comes to the methods of user experience inspection, it follows the scientific methods. You identify a question or need, generate a hypothesis, set up the experiment, run the test, and analyse the results (25). There are some of the most common methods to test user experience: card sorting, moderated user testing, unmoderated user testing, voice of customer, asking your users, recordings, availability and accessibility, etc. The thesis focuses on evaluation by experts. Expert evaluation is mainly to make a full heuristic evaluation to verify whether the design scheme follows the design guidelines, whether it violates the common usability principles, whether it violates the usability-related principles such as cognitive psychology and human-computer interaction, and whether it contradicts the expert knowledge and work experience of the review experts in this field. Because of the emphasis on past work experience and expertise, this review method is called "expert" evaluation or review.

A written recommendation will be submitted at the end of the expert review, even if the recommendation was given orally by the expert at the review meeting, it will be filed in writing. The main contents of the evaluation by experts are design highlights, usability issues, problem severity, modification suggestions and providing good actual cases etc.

A big difference between expert evaluation and common user experience testing is that expert evaluation produces direct output analysis reports and provides suggestions for improvement. In this regard, expert evaluations are more time-saving and effective. One

premise of expert evaluation is that it is more suitable for simple-functioning products, because only by meeting this requirement can the behaviour of the experts participating in the evaluation more truly reflect a user's habits, rather than overriding them.

Method "Evaluation by Experts" was used to inspect the user experience of SAP S/4 HANA Material Management module. By standing in the user's perspective, completing a given task and recording the experience of process as well as issues encountered during the operation to find more differences among 3 different types of applications in SAP S/4 HANA system. Additionally, the author was able to make reasonable advice for the module and system.

4. Practical Part

4.1. Introduction of the case study

In this part, the thesis will complete the research of the differences and similarities among 3 types of applications within Fiori interface in SAP S/4 HANA system, especially focusing on the differences. In addition, Material Management module in SAP S/4 HANA system as well as SAP S/4 HANA will analysed by using SWOT analysis method and combing with literature review and user experience at the same time. Through the research on the differences of 3 types applications within Fiori interface in SAP S/4 HANA module Material Management, this thesis explores differences of the 3 types applications, defines the scopes of functions, use frequency and time spent, and determines the impact of the 3 types of apps on the actual work efficiency. Additionally, the thesis evaluates user interface design combined with user experience so that put forward reasonable suggestions for improvement of product.

In relation to data collection and methods used in this part, the author will use quantitative method for statistical comparison by using Microsoft Excel and qualitative method which is linked with literature review and user experience to compare main user interface design of the 3 types of applications, also through supporting by official website to find more differences. For data collection of the quantitative comparison, the author mainly collected three kinds of data:

1. Application usage count, to see how many and which type of application was used in each step. This data was collected to compare which of the 3 different types of applications was used the most in the given scenario and to show the differences among the 3 different types of applications in terms of usage frequency

2. Time count, to show how long were applications used in each step, and the total time used and average value were calculated. This data was collected to analyse the impact difference of the 3 different types of applications on productivity during user use.

3. Total number count of 3 different types of applications within Fiori interface in SAP S/4 HANA system (secondary data from Fiori APP library), which is used to display percentage difference in the total number of apps.

The above data were recorded in an Excel file and the relevant calculations were done by Microsoft Excel.

The qualitative approach was used to find more differences among the 3 kinds of applications within Fiori interface in SAP S/4 HANA system in other aspects such as running databases and main interface designs during user use. The test started from the user's point of view with using method "Evaluation by Expert", through the observation and experience in the operation process, to find more differences about 3 different types of applications from the user's operation interface design. This was done by comparing the screenshots of main user interfaces while using the 3 types of applications separately. Additionally, one of the important results was also gained by searching and reading the material on the official website.

The problem encountered in the process of completing this thesis was that the results of the main research objective could not be obtained by quantitative method only, because the statistical result of application use type after completion of the task was special, there was transactional application only. Quantitative data for the other two types of applications were scarce and could not be compared. Since that, statistical comparisons can only be made simply with additional examples. The results were not in the assumed scenario and were out of bounds. Therefore, this paper used qualitative methods to explore and find out more results that fulfil the main objectives of this thesis.

Description of the case study scenario and task: A new Security Chain Lock is available on the market and you want to add it to your inventory. This security chain lock has the same characteristics as the created Chain Lock, with a price of 50.00 USD. To create the new Security Chain Lock, use the Chain Lock created previously to Copy from. Select CHLK2001 as material number. Based on your inquiry of 300 pieces the Mid-West Supply gives a new offer to the price of 32.50 USD per piece. The Dallas Basic Bike gives an offer of 36.00 USD. Please choose the best offer and order the material. Then pay the delivery (15, p.79).

4.2. Operation steps and notes

4.2.1. Step 1: Create material master for trading goods (Material CHLK2001) (Appendix 1)

According to description of scenario and task, it requires the creation of the new Security Chain Lock by using the chain lock created previously to copy from, because their characteristics are same. The new material number is CHLK2001 and the price is 50,00

USD. This step needs to use transactional application "Create Material (MM01)" of Fiori applications for the new chain lock in SAP S/4 HANA system.

In this step, the usage times and detailed names of the application in 3 main types applications in SAP S/4 HANA are shown in the table (Table 1) below :

Table 1 The usage count of 3 main types of applications in step 1

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	1 (Create Material – MM01)	0	0

4.2.2. Step 2: Create purchase requisition for 300 pieces (Appendix 2)

Because of the inquiry of 300 pieces, in SAP S/4 HANA the thesis use application "Create Purchase Requisition" to make purchase order for next few steps which are about choosing a vendor to fill the expected needs.

In this step, the application the thesis used is "Create Purchase Requisition", which belongs to transactional applications in SAP S/4 HANA system. By using this application, you can choose products from catalogues or give descriptions of the items to make the purchase requisitions. Otherwise, you can add an existing item or enter description for the item to be procured. Also, you are able to add more details to one item, for example accounting information (17). The highlight point is you can also search materials wanted by image. This will bring great convenience to the search of materials. The thesis thinks this application is one of the most important applications in transactional type applications of SAP S/4 HANA.

The usage count of 3 main types of applications in SAP S/4 HANA system is shown as table below.

Table 2 Usage count of 3 main types of applications in step 2

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	1 (Create Purchase Requisition)	0	0

4.2.3. Step 3: Create request for quotation for vendors The Mid-West Supply and Dallas Basic Bike and maintain quotations from vendors (Appendix 3)

The following step is divided into 2 parts. Firstly, to create request for quotation for 2 vendors: The Mid-West Supply and Dallas Basic Bike. This process is used to collect the necessary pricing and delivery information. These could provide support to select appropriate vendor to supply Chain locks. In the first part, the thesis uses transactional application "Create Request for Quotation".

As for the second part, when staff receive response to requests for quotation submitted to vendors, it is required to maintain their respective data in procurement system. Therefore, the comparison about items or products can be made for staff to select the fittest vendor (15). In this part. the thesis uses application "Maintain Quotations" from Vendor to finish pricing offered from 2 vendors.

In the 3.Step, the applications used are "Create Request for Quotation" and "Maintain Quotations" from Vendors. Both of them are transactional application. Therefore, the usage situation of 3 main types of applications in SAP S/4 HANA is shown as the following table.

Table 3 Usage count of 3 main types applications in step 3

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	2	0	0

4.2.4. Step 4: Evaluate quotations on 2 different prices provided (Appendix 4)

For this step, use the application "Evaluate Quotations on prices" to display received quotations for RFQs and generate a comparison list for the prices obtained from 2 vendors. On the comparison list, the quotations are ranked by item from lowest price to highest price (15, p.31). Item with the lowest price are displayed as best-priced item and the vendor is selected to do business. Others will be rejected by flagging operation.

In the fourth step, the thesis uses the application Evaluate quotations on price to generate the evaluations of 2 quotations and go process in comparing. This application belongs to transactional application in SAP S/4 HANA system. In my opinion, it also shows the function of analysing data in this step even if it is a transformational application. We can see that some functions of 3 main types of applications in SAP S/4 HANA system can be shared.

Table 4 Usage count of 3 main types applications in step 4

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	1 (Evaluate Quotation on Price)	0	0

4.2.5. Step 5: Create purchase order referencing selected RFQ 6000000004 (Appendix 5)

After operating evaluation of quotation on price, the result is to choose 32.50 as the best price offered by optimal vendor Mid-West Supply. The next step is going to order the material, which means that create a purchasing order by referencing the quotation received from the optimal vendor Mid-West Supply. Also, the details are imported into the new purchase order.

At last, find the following menu item in the menu bar: More – Purchase Order – Save and get the purchase order document number assigned automatically by system. This step is finished. The usage count of 3 main types of application in SAP S/4 HANA system is shown as the table 5 below.

Table 5: Usage count of 3 main types applications in step 5

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	1 (Create Purchase Order)	0	0

4.2.6. Step 6: Create goods receipts for purchase order 4500000002 after paying delivery (Appendix 6)

According to the scenario, the delivery has been paid by purchaser. In material management process, after completing creation of a purchase order referencing the RFQ, staff will then verify the physical receipt in stock, create goods receipt for purchase order and post it. A goods receipt document is related with the purchase order thereby making sure that the purchaser receive the products ordered within the timeframes and in a quality condition.

Goods on hand will increase and an accounting document will be generated recognizing the value associated with these goods (15, p41).

In this step, to create a goods receipts for a purchasing order will use transactional applications Post Goods Receipt for Purchase Order and Manage Stock to verify the receipts of goods.

Secondly to start with application "Manage Stock". By using this application, the staff are able to check the current inventory information about Chain Locks and scrap a material if they cannot use it anymore.

As the operation in this part shows, although "Manage Stock" is a transactional application in SAP S/4 HANA, it combines factsheets and transactional applications to realize the intercommunication of the two types of applications in SAP S/4 HANA system. This enables the staff to browse and check the existing information while carrying out the next operation.

The usage count of 3 main types applications in step 6 is shown as the table below.

Table 6 Usage count of 3 main types applications in step 6

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	2	0	0

4.2.7. Step 7: Create invoice receipt from vendor Mid-West Supply (Appendix 7)

Next but not the last is to make an invoice received from vendor Mid-West Supply for 9,750 USD associated with the generated PO 4500000002 and the goods receipt. This invoice will be posted to an existing G/L account in Chart of Accounts and saved as an Accounts Payable to Mid-West Supply (15, p.64). It will be solved by sending out a check to Mid-West Supply at a late date. To create invoice receipt from vendor, in SAP S/4 HANA system use application Create Supplier Invoice – Advanced.

In this step the thesis uses the Fiori application "Create Supplier Invoice – Advance" in SAP S/4 HANA system. This application is a transactional application. Through using this application, staff can not only create a supplier invoice, but also create credit memos, subsequent credits and subsequent debits (19). As for display supplier invoices, in the detail view, staff can release or reverse a blocked supplier invoice (19). Furthermore, it also allows that one staff save the invoice document and another staff complete the process and post it.

Till this step, we can find that the most frequently used application type in SAP S/4 HANA is transactional application. However, in fact, the staff need to verify the operation or analyse the data after completing the information entry or creating orders and receipts. At this time, they need to use Factsheet or analytical applications.

Table 7 Usage count of 3 main types applications in step 7

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	1 (Create Supplier Invoice – Advanced)	0	0

4.2.8. Step 8: Post payment to vendor Mid-West Supply (Appendix 8)

The final step is to issue a payment to vendor Mid-West Supply to settle their entire Accounts Payable balance. In this step will use transactional application Post Outgoing Payments to post an outgoing payment on account.

The usage count of 3 main types applications in step 8 is shown as the table below.

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	1 (Post Outgoing Payments)	0	0

The application names used in the case study are shown in the table below.

Steps	Application names
1	Create Material
2	Create Purchase Requisition
3	Create Request for Quotation, Maintain Quotation from Vendors
4	Evaluate Quotation on Price
5	Create Purchase Order
6	Post Goods Receipt for Purchasing Order Verify Physical Receipt of Goods
7	Create Supplier Invoice – Advanced
8	Post Outgoing Payments

5. Results and Discussion

It can be seen from the below table 8 that the transactional app is most used in the operation process of the case study, also it is the type of application costs the most time according to the table 9. The average value in the table 9 is the average time value, which shows average time used for each step and indicates the effect of the application used in the step to work efficiency. In the process of completing the case study task, step 5 and step 7 took the most time, and step 2 took the least time. The difference between the maximum time and the minimum time was 65 seconds, and the average time spent was 127.55 seconds. Therefore, the user's work efficiency is mainly affected by the transactional application in this scenario of the case study.

Transactional application undertakes the functions of data entry, modification, management and so on. Because of information entering, people probably need more time to use transactional application, according to the table of time count, even if sometimes they just tick an option. The time data for the other two types of applications in the table are examples applications the author found, they are relevant to the given case study scenario and the time value collected is as close to the actual operation as possible. By comparison, it can be shown that in general, people spend significantly less time on analytical and Factsheets applications. Excluding special cases (for example in the meeting people need to discuss), people tend to browse after finding the specified item.

Table 8 The table of final result

3 types of applications in SAP S/4 HANA	Transactional Apps	Analytical Apps	Factsheets
Usage count	10	0	0

Table 9 Time count and calculation for applications used in each step

Step	Application Name	Time Calculation (in sec)
1	Create Material (1)	74

		Tab1: Basic Data 1	15
		Tab2: Sales: sales org. 1	10
		Tab3: Sales: sales org. 2	5
		Tab4: Sales: General /Plant	11
		Tab5: Purchasing	5
		Tab6: MRP 1 MRP 2	13
		Tab7: MRP3	5
		Tab8: Accounting 1	10
2		Create Purchase Requisition (2)	45
3		Create Request for Quotation (3)	75
		Create relationship between RFQ and purchase requisition	40
		Link to 2 different vendors	35
		Maintain Quotation from Vendors (4)	105
4		Evaluate Quotation on Price (5)	65
5		Create Purchase Order (6)	110
6		Post Goods Receipt for Purchasing Order (7)	40
		Manage Stock (8)	10
7		Create Supplier Invoice – Advanced (9)	110
8		Post Outgoing Payments (10)	90
		Total	**679**
		Average	**127.55**

Other Type	Application Name	Time calculation (in sec)
Analytical	Display Document Flow	30
	Stock - Single Material	20
	Average	**25**
Factsheets	Purchase Requisition Item	30
	Goods Issue	20
	Average	**25**

Combined with the operation process of case study, it does not mean that other types of application are useless or do not show similar functions of other types applications, even if the whole process only uses transactional applications. In some steps, transactional applications display the simple functions of factsheets and analytical applications. This shows that there are differences and similarities between the 3 types of applications in SAP S/4 HANA system.

5.1. Comparison

5.1.1. Differences

5.1.1.1. Limitation of database used

To begin with the first difference, Transaction applications can run on SAP HANA database as well as some database with acceptable performance. Otherwise, Transactional application allows users to create and manage information on different platforms like mobile devices or laptops. Analytical application has different situation with transactional application, it only can run on SAP HANA database and use Virtual data models. Factsheets just run on SAP HANA database either and it cannot be ported to SAP HANA Live tier-2 architecture (13).

5.1.1.2. Different main user interfaces

Next, the author would like to talk about the difference between 3 different types of applications from the user interface in SAP S/4 HANA system. The author will choose 3 applications which are "Create Purchase Requisition (Transactional App)", "Stock – Single Material (Analytical App)" and "Sales Order (Factsheets)" as example and show the screenshots in different stages of 3 different types applications. All of them belong to supply chain in line of business and they are related to Material Management. Firstly, the initial screen of the transaction application "Create Purchase Requestion" is a search box about the purchase requisition. However, if you want to create a purchase request, click " Create Own Item" will go to the screen (Figure 38) which is shown below.

Figure 2 Screen of creating purchase requisition

Source: Source: Screenshot of operating interface in SAP S/4 HANA

As we all known, Transactional applications are used to perform transactional tasks like a manager-employee transaction and create or input, modify, upload and manage the information of the company's material, production, sales, finance etc. Therefore, the interface of transactional applications contains the most user operations. At the same time, transactional application is also the type of applications within Fiori interface in SAP S/4 HANA system that take the most time compared to users.

As for analytical applications, the thesis thinks that the biggest difference of the main user interface of analytical app is the appearance of various analysis charts and through the real-time change of tile surface number, users can closely monitor the key indicators. At here, the thesis uses example analytical application "Stock – Single Material" and material CHLK2001 which is used in the case study. After the material search is completed, the interface shows the material stock information (Figure 39). A thumbnail of stock history changes has appeared on the right of the information column, click on it and then see the details (Figure 40). This is the embodiment of the analysis function of this type application in SAP S/4 HANA system, the results of the analysis are presented in the form of charts for users to check, estimate and make strategic decisions.

Figure 3 Stock information of material CHLK2001
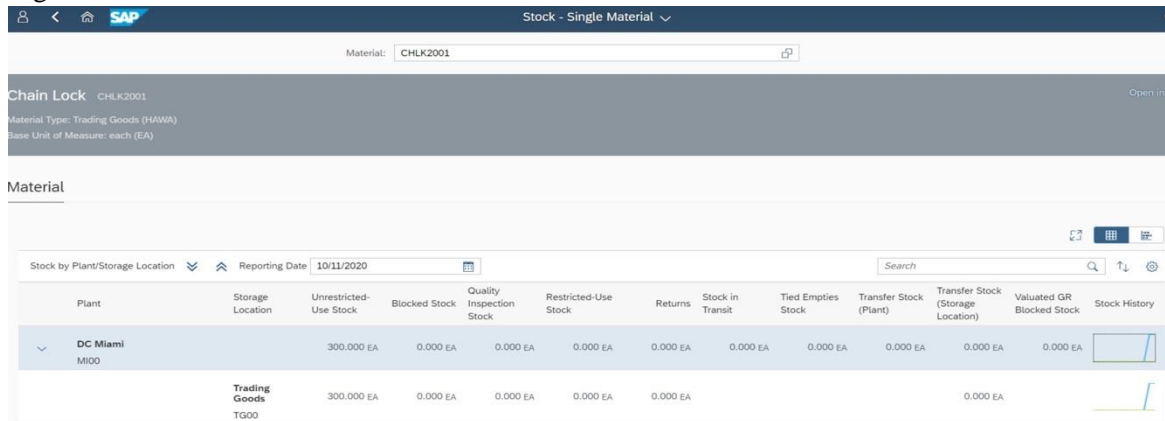
Source: Screenshot of operating interface in SAP S/4 HANA

Figure 4 Stock changes of material CHLK2001
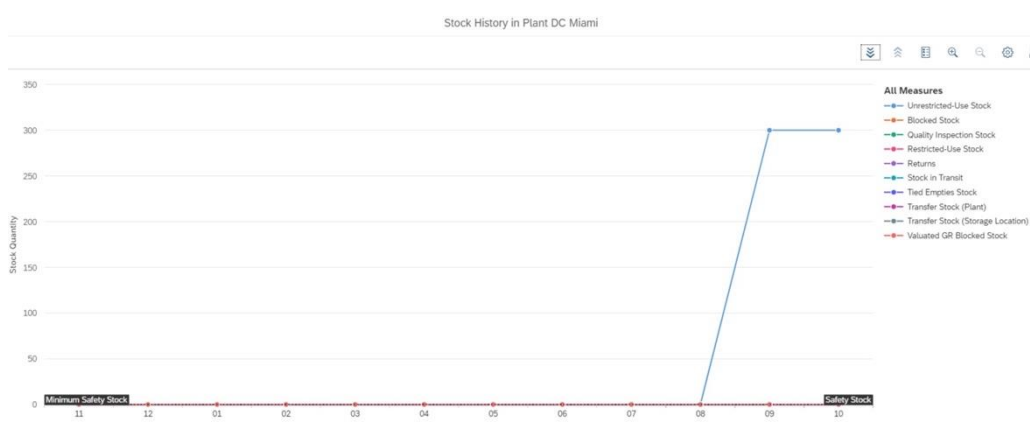
Source: Screenshot of operating interface in SAP S/4 HANA

The third one Factsheets example "Sales order", which is used to display all the details relevant for a sales order in one place. In fact, Factsheets is not widely used in practice, but "What exists is reasonable (Georg Wilhelm Friedrich Hegel, 1820)". According to the author's opinion, the biggest difference of Factsheets is that all key facts and contextual information can be displayed in one place, this saves users' time of searching many times. By using Factsheets, users are able to navigate one-fact sheet to all its related fact sheets (13). The following figures (Figure 41,42) show the screenshots of the user interface of application "Sales Order", it is obvious to see the advantage of showing facts by using Factsheets application than other 2 types of applications, is more multi content, more direct and beautiful.

Figure 5 Sales fact shows by application "Sales Order"
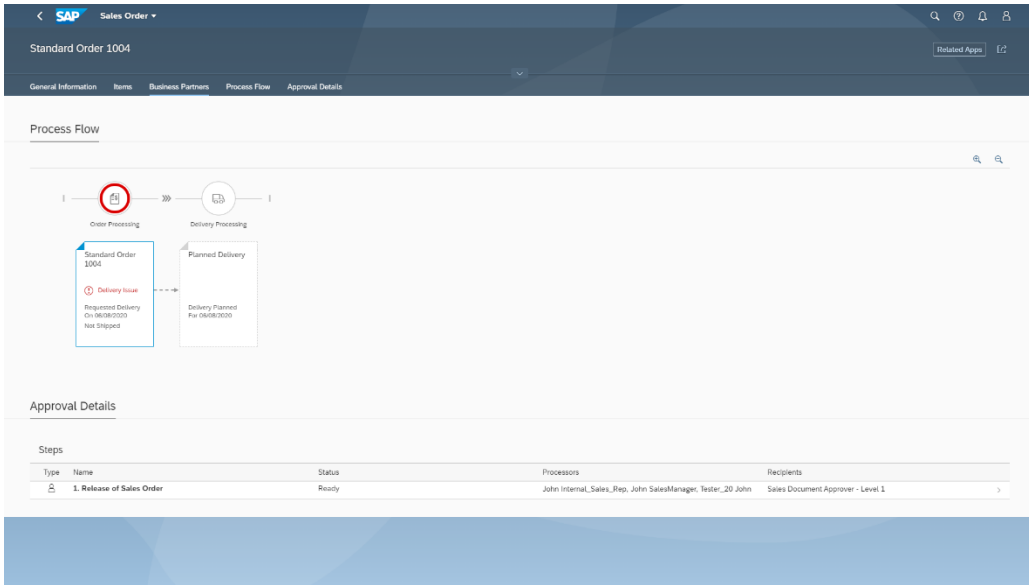
Source: Screenshot of operating interface in SAP S/4 HANA

Figure 6 Sales fact shows by application "Sales Order"
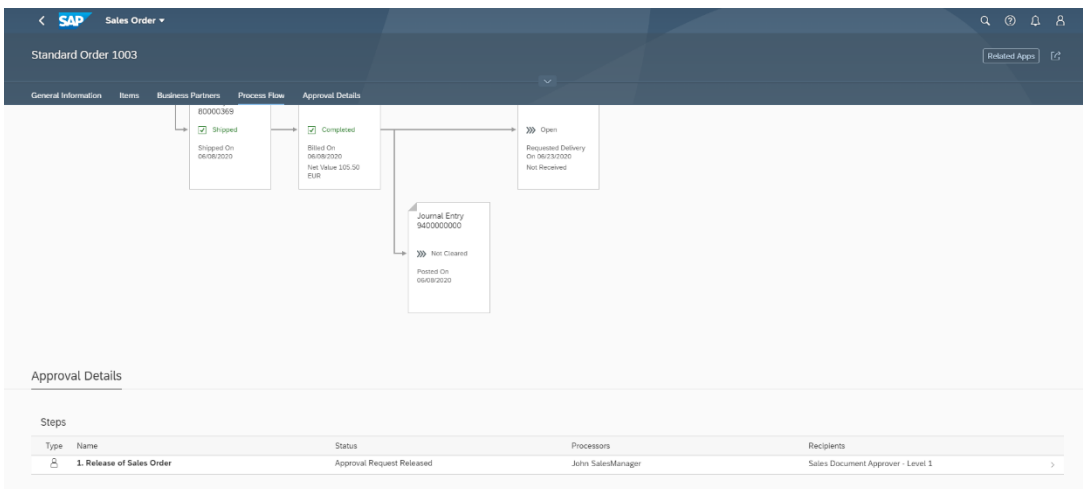
Source: Screenshot of operating interface in SAP S/4 HANA

5.1.1.3. Numbers of 3 different types of applications within Fiori interface in SAP S/4 HANA system module Material Management

In the table of time count about the 3 types of applications within Fiori interface in SAP S/4 HANA system in the given scenario, shows the differences in the use of time and efficiency. Transactional application is used most frequently and takes the longest time. The other two types of applications do not normally take too long.

What's more, in SAP S/4 HANA system module Material Management, there are 10 major applications, which cover the whole workflow from purchase to payment with decision-making ability on the go. They are "Approve Service Entry sheets", "Approve Supplier

Invoice", "Confirm Receipt of Goods", Create Purchase Requisition", "Goods Issue", "Approve Requisitions", "Approve Purchase Order", "Approve Purchase Contracts", "Order from requisitions", "Purchase Info record" and "Goods Issue". All of them are transactional applications except "Purchase Info record (Factsheets)". Therefore, the last difference is a simple one, it is about comparing the number of 3 different types of applications in SAP S/4 HANA system. The relevant count number are given in the table below, which was given by official website Fiori APP library. Obviously and in line with the actual situation, the number of transactional applications in the system is the most used at the same time by most users for the most times. The second one is analytical applications, although the number is less than transactional, it is the most commonly used application type in the company's financial department. Factsheets type has least number of applications in SAP S/4 HANA, but the number of ownerships cannot be ignored. This indicates that sometimes the usage degree of Factsheets application maybe not lower than analytical applications.

Table 10 Number count of 3 different types of applications from official website Fiori App Library

Types of applications in SAP S/4 HANA	Transactional	Analytical	Factsheets
Number	555	65	49

5.1.1.4. Comparison about Material Management module among SAP S/4 HANA system and its competitors (Oracle and Microsoft Dynamics 365)

In order to add more validity of the research, the comparison about Material Management module among SAP S/4 HANA and its 2 competitors Oracle and Microsoft Dynamics is put here as replenishment by using quantitative approach which means inquire relevant literature and information, sort out and make comparison table.

Table 11 Comparison among SAP S/4 HANA, Oracle and Microsoft Dynamics 365

Software Items	SAP S/4 HANA	Oracle	Microsoft Dynamics
Module Name	Material Management	Supply Chain Management	Supply chain management

Suitable company size	More suitable for large enterprises	Any, more suitable for large companies	Any
Customization	Yes, but more complicated	Yes	Highly customizable
User Interface Design	Tile to page	Navigation and page display side by side	Navigation and page display side by side
Steps for completing "Procure to Pay"	13 (26)	7 (27)	9 (28)
Implement	can be implemented easily but it does not support further add-ons.	may be difficult to implement but it is a flexible solution and allow customization.	can easily be installed and customized according to the business requirements of the organization.

According to the above table and the author's research, all three ERP software have corresponding module and functions design for material management. About functions for material management, there is no special difference between the last three ERP software, the process of "Procure to Purchase" can be completed. However, SAP S/4 HANA has the highest number of steps to complete, followed by Microsoft Dynamics 365. In terms of parameter settings in the operation of the material management module, SAP S/4 HANA needs to set specific parameters and if changes occur later, each layer parameter needs to be modified. The other two software do not require feature parameters to be set.

Overall, SAP S/4 HANA focuses on changing the business processes of client enterprises to match the standardized business processes within SAP, thus while SAP also allows customization, further add-ones and change the latter components is much more intricated than the other two. Oracle and MD focus more on development, that is, adjust module functions to suit the business processes of client enterprises and match the business management of clients.

5.1.2. Similarities

5.1.2.1. Connections between 3 types of application in SAP S/4 HANA system

At the beginning of comparison, the thesis will talk about the similarities of 3 types of applications within Fiori interface in SAP S/4 HANA system. Although the Fiori application is categorised into 3 types and given by different names, the three types of applications are not unrelated, they have interconnections with each other, and this connection can be one of their similarities, for example the Transactional app is able to provide function of analytical application or Factsheets. During operation process of the case study, in step 4 the figure 23 "Price comparison list of two RFQs" shows the analytical result after comparing two different prices offered by 2 vendors Mid-West Company and The Dallas Basic Bike. Evaluate Quotations on prices is a transactional application, but it performs the function of analytical applications, presents the results of information analysis based on SAP HANA Database and gives users a reasonable reference when making business choices.

Although the Transactional application is used in each of the case study steps, there is definitely more than that in real life. The material management procedures in life are complex and orderly, and users should not only complete the data entry but also review and verify frequently. Factsheets shows contextual information and key facts about core objects used in business operations. From a Factsheet area (or heading), you can drill down to get details. Factsheets allows you to navigate to the transactional applications to run SAP transactions. Some Factsheets also provide integration options for geographic maps (13). Users can invoke a Factsheet from Fiori Launchpad search results, other factsheets, or Transactional or analytical applications.

5.1.2.2. Same database

The second similarity is all 3 types of applications can run on SAP Hana database. At this point, what the interesting is it can be said that they are both the similarity and the difference, as detailed in the "Differences" section above.

5.1.2.3. Similarity of installation and configuration requirements

The third similarity is about installation requirements of 3 types of applications within Fiori interface in SAP S/4 HANA system. Users need to install the necessary front-end components and the Gateway services to make a connection to the back end possible for

using the SAP Fiori applications (22). The figure below shows an overview of the necessary steps that need to be completed to install and configure Fiori applications (22).

Figure 7 Overview of Necessary Implementation Steps
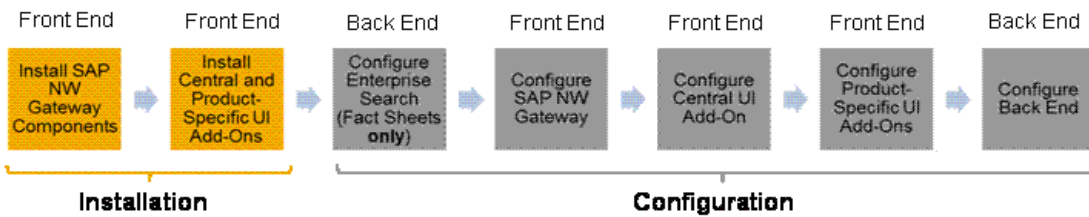
Source: Implementation Overview - SAP Document

The installation of SAP Fiori applications is closely related to these steps, but not every step is required. The following table explains the steps required to install and configure the 3 different types of applications in SAP S/4 HANA system.

Table 12 Explanation of install and configure 3 different types of applications in SAP S/4 HANA system

Activity	Transactional Apps	Analytical Apps	Fact Sheets
Check Prerequisites	Not relevant	SAP HANA live	Not relevant
Install SAP NetWeaver Gateway Components (Front End)	Yes	Yes	Yes
Install Central and Product-Specific UI Add-Ons (Front End)	Yes	Yes	Yes
Configure Enterprise Search (Back End)	Not relevant	Not relevant	Yes
Configure SAP NetWeaver Gateway (Front End)	Yes	Yes	Yes
Configure Central UI Add-On (Front End)	Yes	Yes	Yes
Configure Product-specific UI Add-Ons (Front End)	Yes	Yes	Yes
Configure Back End (Back End)	Copy and adjust delivered back-end roles and assign users to them.	Copy and adjust delivered back-end roles and assign users to them.	Configure the PFCG roles in the ABAP back end system and the privileges in SAP HANA live.

Source: Implementation Overview - SAP Documentation (22)

Through this table, it is easy to be seen that the similarities of 3 different types of application from the aspects of installation and configuration. From the step "Install SAP NetWeaver Gateway Components (Front End)" to "Configure Product-specific UI Add-Ons (Front End)", all 3 types of applications need to meet the relevant installation or configuration before they can be used successfully.

5.2. SWOT Analysis

5.2.1. Strengths

Personally, through above task operation of the case study scenario, as a user can feel the functional comprehensiveness and diversity of SAP S/4 HANA, a creative product of SAP ERP. For different user roles, there are corresponding applications with 3 different types, simple and not complicated. The system interface is neat and fast responsive. Moreover, the initial design of the launchpad is reasonable, it also can be customized by users. The user's feelings are fully considered.

In the author views, "search" function can be regarded as a bright spot during the operation process. After entering relevant search item in "Search" field , the target file or material can be found as well as the information in some areas of the next interface has been filled in automatically by confirming the search results. Even sometimes the associated document number already appears, this will make users feel convenient in daily life. The user's time will be saved and repeated operation can be avoided.

Material Management module in SAP S/4 HANA system has strength of making the whole business process closer to industry standardization. The overall solution of the module is through the procurement, inventory management as its related basis, through a series of demand determination, and then determine the source of goods, after completing the above work, then order processing and tracking, and finally harvest and inventory management, all processes are highly unified, strong combination and in the same level. At the same time, the material management module of SAP S/4 HANA system integrates inventory management, financial management, project management and other businesses together, and saves them in one data sharing information system, which makes it easier to conduct relevant inquiry and search (23).

In the process of material management, there are too many manual interference or telephone communication. Because there is no unified enterprise management platform, in the daily work, each department and unit need to arrange a large number of human resources to solve the basic problems of material management. When the situation is more urgent, telephone communication is also needed to solve the corresponding problems. In this case, a large amount of human resources will be wasted, and business data will also be Serious distortion and loss have affected the normal operation of the enterprise. In the material management module of SAP S/4 HANA system, the relevant staff only need to create the source of

materials in the system, establish a series of contacts between materials and suppliers, and then ensure the real-time and accuracy of the information through the source of goods, which can solve the existing problems and provide sufficient guarantee for the creation of purchase orders. At the same time, it can also solve the loss and distortion of business data by establishing the contacts between materials and suppliers (23).

In the specific application of the material management module of SAP S/4 HANA system, the approval mode can be set flexibly according to the requirements and regulations of the enterprise, and a series of functions are added, which improves the preciseness of process control, saves the main labour cost and enhances greatly the efficiency of work.

Material inventory in enterprise is flowing, which means the change of location, quantity, value and state of material. In SAP S/4 HANA system, each change is equivalent to a "Transaction", which is realized as "Transaction processing" and "Accounting processing" in SAP S/4 HANA system. Each transaction is assigned a code, and the accounting subjects related to this code and the debit and credit relationship on each subject are defined. In this way, the dynamic integration relationship between logistics and capital flow is illustrated (24).

The integration of material management module and financial module reduces the workload of financial personnel, business data can be updated to the financial module in real time, which reduces repeated input, avoids human errors, and realizes information sharing (24).

5.2.2. Opportunities

Speaking of the opportunities for the module Material Management of SAP S/4 HANA, the first and important one is that there are many new product markets and niche markets appearing and rising constantly, such as the development of tourism in the existing industry is thriving. In the author's opinion, these markets create much opportunities for the material management module, if the module can successfully adapt to these emerging markets or make corresponding changes and upgrades according to these markets' needs, the functionality of the module will be greatly improved and the range of users will be expanded. At the same time, these new markets also provide a wide range of business and product line expansion opportunities for SAP S/4 Hana and SAP company.

Active utilization of social media can also enable the module Material Management in SAP S/4 HANA and SAP company to promote themselves, interact with users and non-users to

increase the product visibility, make people have a clearer knowledge of the material management module and the system itself; collect users' feedback, adjust and enhance the functionality of the material management module as well as improve the module's deficiencies.

Last but not least, the process of information technology and science also bring great support to the usage stability of material management module and even SAP S/4 HANA itself. Moreover, it provides more possibilities for the development and innovation of material management module in the future.

5.2.3. Weakness and Threats

First of all, the thesis would like to talk about the Material Management module in SAP S/4 HANA system while performing as user. In the process of completing the task of case study scenario, as a user, the interface of a few applications feels laborious and some areas of the user interface are not well designed, such as it is difficult to find some areas to fill in, the buttons to perform operations are too hidden etc. In addition, it can be seen from the results that after the entire case learning operation is completed, all the applications used are transactional type. This indicates that some types of application are ambiguous and user may have incorrected interpretations.

Secondly, there is no corresponding applications in SAP S/4 HANA Material Management module on how to monitor and handle the waste generated after material consumption. Therefore, the monitoring, management and disposal of waste is one of the weakness in SAP S/4 HANA system. Otherwise, regarding the quality control of inventory materials, there is no corresponding function in the Material Management module. This results in a lack of consistency in material.

Finally, despite the increasing number of high-quality education personnel and the possible reduction in training costs, the adaptation period of employees after the completion of training course and the error rate of using the module in their work still cannot be ignored, which may lead to the departure of employees at the beginning of entry due to the incapability to adapt to the system operation and high error rate. The high employee turnover rate will lead to the loss of talent in the enterprise.

6. Conclusion

The author conducted a comparison of 3 different types of applications within Fiori interface in SAP S./4 HANA system through the research of the case study scenario and the operation to complete the task of scenario, collecting relevant statistics and analysing them with experience as user.

At the beginning of the thesis, the importance of ERP and its role in material management was introduced, which makes business processes can be standardized, randomness can be reduced and staff efficiency improved. Then, the thesis introduced SAP, its innovative revolutionary product SAP S/4 HANA, and SAP Fiori. SAP is one of the technology and market leader in global enterprise management software and solutions. Through its application software, services and support, SAP continuously provides comprehensive enterprise management software solutions to enterprises in all industries around the world. SAP S/4 HANA is an enterprise resource management software based on SAP HANA memory database system. It is the fourth generation ERP system developed by SAP. The thesis also introduced the Material Management module in SAP S/4 HANA system, which ensures that the materials are always maintained in appropriate amount and avoid shortages or gaps in the supply chain of organization Last but not least, the thesis introduced the 3 different types of applications within Fiori interface in SAP S/4 HANA , which are "Transactional application", "Analytical application" and "Factsheets" as well as their characteristics and functions.

In the practical part, the thesis described the scenario and its task of the case study, recorded the general process of the process operations, and at the end of each step, counted the application types used and made summary. The end result is that transactional applications occupy an absolute position, which means the application types used in each step are transactional. This demonstrates the irreplaceable position of the transactional application in SAP S/4 HANA system and its proportion in total number of the application , as well as the differences among 3 different types of applications in quantities. However, although all of the applications used in the case study are transactional applications, there are certainly much other two types of applications used than that in real life. In this thesis, in order to be closer to the use of real life, the thesis used 2 other types of applications extra as samples, so that the difference about user interfaces of 3 different types of applications in SAP S/4 HANA are found out. The main function of transactional applications is to create new items, manage

auditing, submit and reject transaction processing, thus the interface design is mostly fill-in type. Analytical applications often have data analysis interfaces with charts after choosing a target, which is better for user's analysis and judgment. There are also real-time dynamic updates of data on the tiles of analytic applications, and users can keep track of important KPIs at any time. The final difference of 3 different types of applications in SAP S/4 HANA is about database. All of 3 types applications can run on SAP Hana database, but analytical type and Factsheets have more limitation, analytical applications can just run on SAP HANA database and use Virtual data models, Factsheets run on SAP HANA database only.

At the end of this thesis, there is SWOT analysis about the material management module in SAP S/4 HANA system. Through analysis, it highlights the strengths of SAP S/4 HANA Material Management module in material management and future opportunities. The development of globalization brings more potential customers, also the constant development of science and technology provides SAP with the support of system upgrade technology and more probability for product innovation and progress. On the other hand, the thesis briefly described the weakness of the module and the system either, such as waste disposal is not appeared in the system, and the classification of applications is controversial etc. In any case, everything has two sides, in the future there will be large room for SAP S/4 HANA and SAP to improve based on clients' feedback and requirements.

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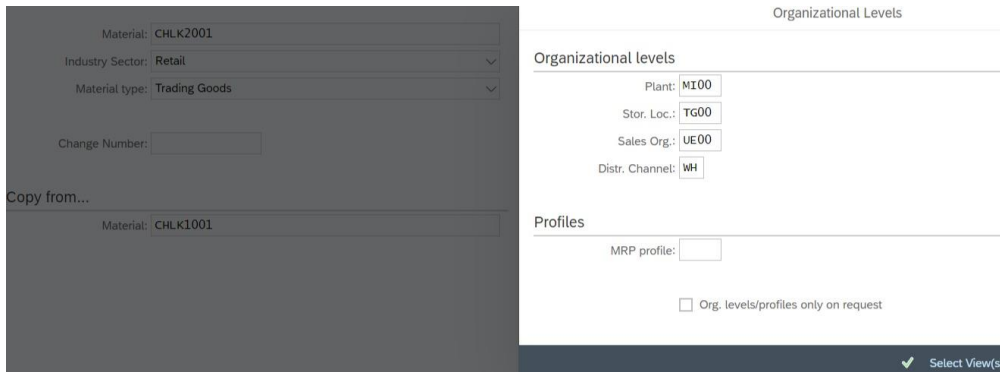
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8. Appendix

8.1. Instruction for operation step 1. in the practical part

After opening the application, type CHLK2001 in the Material field, select "Retail" as an Industry sector and "Trading Goods" as Material type (15, p.9).

Figure 8 Create material
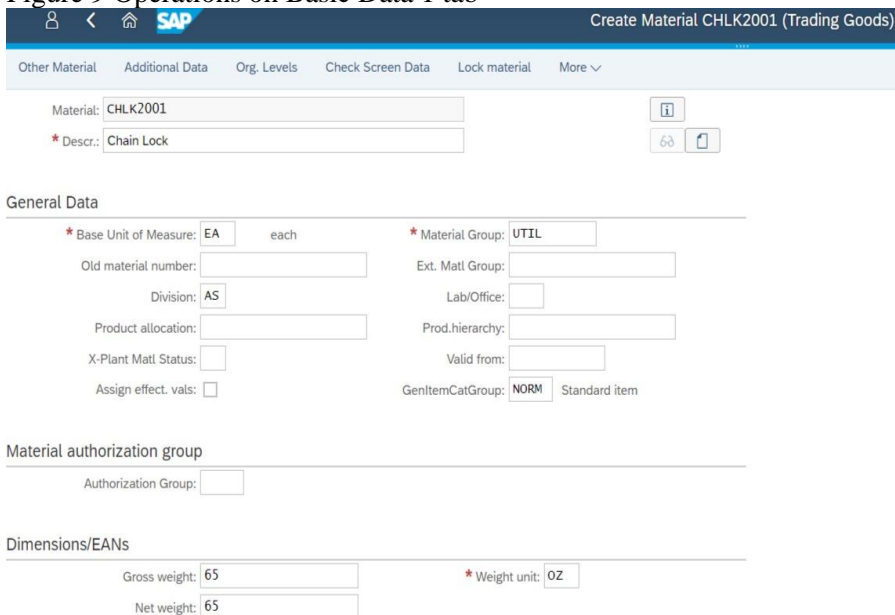
Source: Screenshot of operating interface in SAP S/4 HANA system

On the Basic Data 1 tab (Figure 9), choose Chain Lock as a description, EA (Each) as base unit of measure, enter UTIL (Utilities) in the material group field and select AS (Accessories) as division (15, p.10).

Moreover, enter 65 as gross weight and net weight, then choose OZ (Ounce) as weight unit (15, p.10). Referring to the scenario, set price as 50,00 USD and scale quantity as 1.

Figure 9 Operations on Basic Data 1 tab

Source: Screenshot of operating interface in SAP S/4 HANA system

Figure 10 Set price and scale quantity
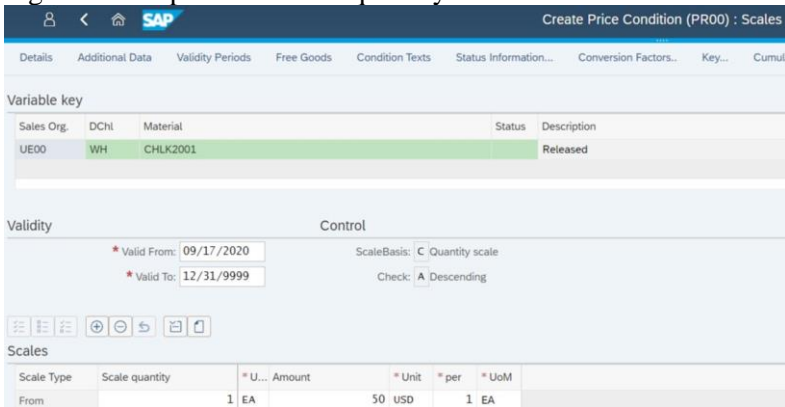
Source: screenshor of operating interface in SAP S/4 HANA

Later, on the Sales: sales org. 1 tab (Figure 11), choose MI00 (Miami plant) in the delivering plant field and enter 0 for all 3 tax categories in the left tax classification column, which is about Tax data field group (15).

Figure 11 Sales: sales org. 1
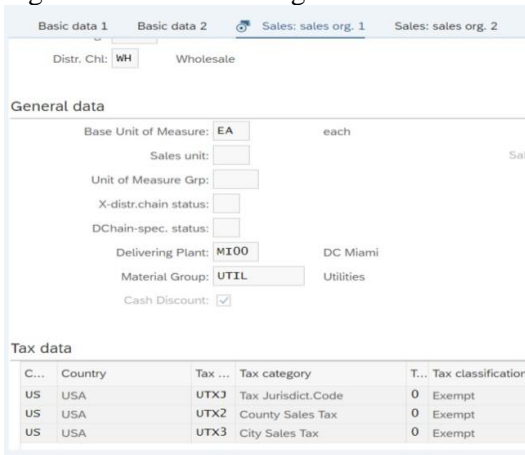
Source: Screenshot of operating interface in SAP S/4 HANA system

On the Sales: sales org. 2 tab (Figure 12) , enter 1 in the blank of Matl statistics grp. On the Sales: General /Plant tab (Figure 13), select 02 (Individual requirements) as available check, 0001 (On Pallets) as Trans. Grp and 0002 (Hand lift) as Loading Grp (15, p.10).

Figure 12 Sales: sales org. 2
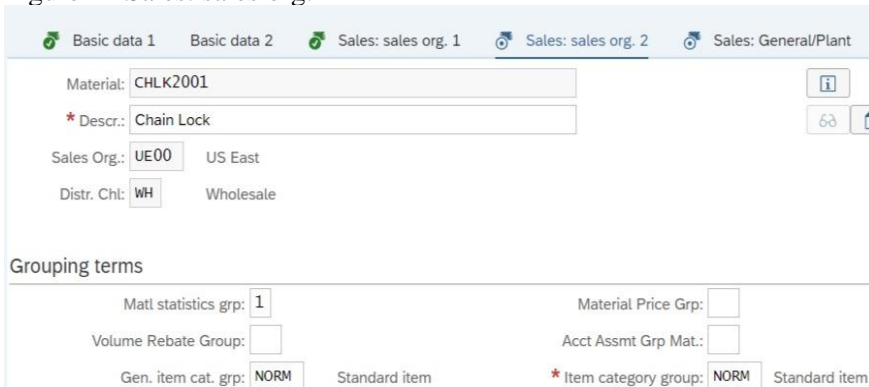
Source: Screenshot of operating interface in SAP S/4 HANA system

Figure 13 Sales: General/Plant

Source: Screenshot of operating interface in SAP S/4 HANA system

Click Enter to the Purchasing tab (Figure 14), enter N00 (North America) as purchasing group (15, p.10).

Figure 14 Operations on Purchasing tab

Source: Screenshot of operating interface in SAP S/4 HANA system

On the MRP 1 Tab and MRP 2 Tab fill in the relevant letters or numbers as shown in the figures (Figure 15, Figure 16) below. On the MRP 3 tab (Figure 17), which needs to be checked whether the availability check is set to 02 correctly.

Figure 15 MRP 1 tab

Source: Screenshot of operating interface in SAP S/4 HANA system

Figure 16 MRP 2

Source: Screenshot of operating interface in SAP S/4 HANA system

  Finally, skip other tabs until Accounting 1 tab, select 3100 (Trading Goods) as valuation class and enter 33.5 into the blank of Per. Unit price.

Figure 17 MRP 3 and Accounting 1 tab

Source: Screenshot of operating interface in SAP S/4 HANA system

8.2. Instruction for operation step 2. in the practical part

  Open the application, firstly the thesis uses Create Own Item to input material information as shown in the figure (Figure 18) below.

Figure 18 Create purchase requisition of Material CHLK2001

Source: Screenshot of operating interface in SAP S/4 HANA system

  According to description of scenario and previous Chain Lock created, the valuation price
the thesis inputs the same one which is 32,00 USD as Chain Lock created. The delivery date
the thesis selects the day three months from today (19/9/2020). The requisition completed is
shown in the figure (Figure 19) below.

Figure 19 The finished purchase requisition

Source: Screenshot of operating interface in SAP S/4 HANA system

  After completing the purchase requisition, the system will automatically generate a number
for it, which is 10000011.

8.3. Instruction for operation step 3. in the practical part

  Open the application, enter AN (RFQ) as RFQ type and choose today in one month
(19/10/2020) as Quotation Deadline. The contents of Purchasing Organization, Purchasing
Group and Plant are US00, N00 and M00. Then get into the next interface, the thesis enters
information of material such as material number, RFQ quantity (300) , which will be relevant
to the RQFs. The final screen is shown as the following figure (Figure 20), all item
information has adopted in to the RFQ (15, p.23).

Figure 20 Create relationship between RFQ and purchase requisition

	Pur. Req.	Item	Material	Short Text	Plnt	SLoc	I	A	Cls	Qty		Un	C	Deliv. Date	Rel. Date
✓	10000011	10	CHLK2001	Chain Lock	MI00	TG00			☐		300.000	EA	D	12/19/2020	12/13/2020

Source: Screenshot of operating interface in SAP S/4 HANA system

  Later, in the Create RFQ: Supplier Address screen the thesis searches 2 vendors numbers and enter them individually. After clicking Save, the thesis gets 2 RFQ numbers which is related to 2 vendors required. The RFQ number of The Mid-West Supply is 6000000004 (Figure 21), for Dallas Basic Bike is 6000000005 (Figure 22). The creation of two requests for quotation is finished.

Figure 21 The RFQ number and information of The Mid-West Supply company

Source : Screenshot of operating interface in SAP S/4 HANA system

Figure 22 The RFQ number and information of Dallas Basic Bike company

Source: Screenshot of operating interface in SAP S/4 HANA system

At the beginning of the second part, in the RFQ field the thesis uses the RFQ numbers of two requests for quotation separately. The RFQ numbers are 6000000004 for The Mid-West Supply (Figure 23) and 6000000005 for Dallas Basic Bike, which are got from the first part. Then in the Maintain Quotation: Item Overview screen, enter 32.50 USD as net price for The Mid-West Supply (Figure 24) and set the Valid to data to 3 months from today (Figure 26).

When it comes to vendor Dallas Basic Bike, the operations are same except the net price is entered 36.00 USD (Figure 25).

Figure 23 Initial screen of maintain quotation from vendor The Mid-West Supply

Source: Screenshot of operating interface in SAP S/4 HANA system

Figure 24 Enter 32.50 USD as net price for vendor Mid-West Supply
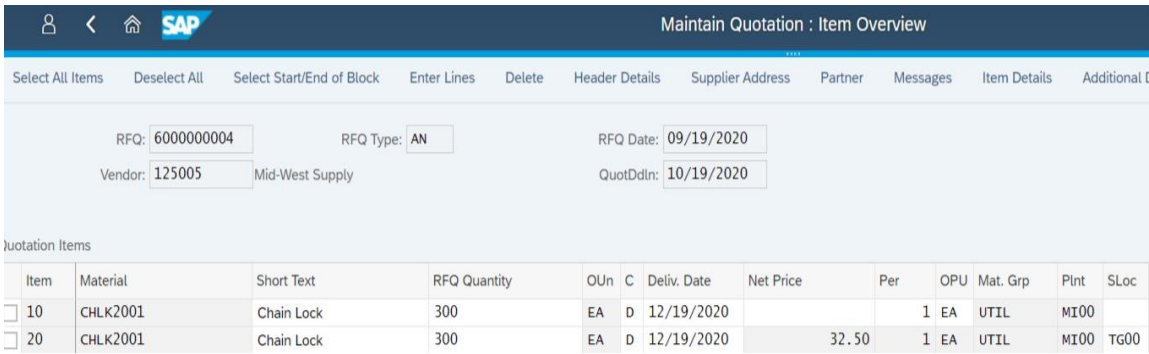
Source: Screenshot of operating interface in SAP S/4 HANA system

Figure 25 Enter 36.00 USD as net price for vendor Dallas Basic Bike
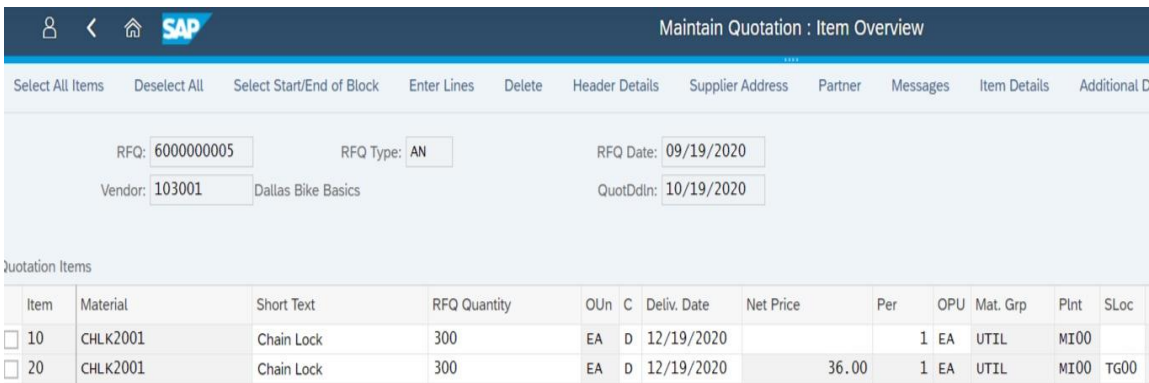
Source: Screenshot of operating interface in SAP S/4 HANA system

Figure 26 Validity period setting for vendor Mid-West Supply
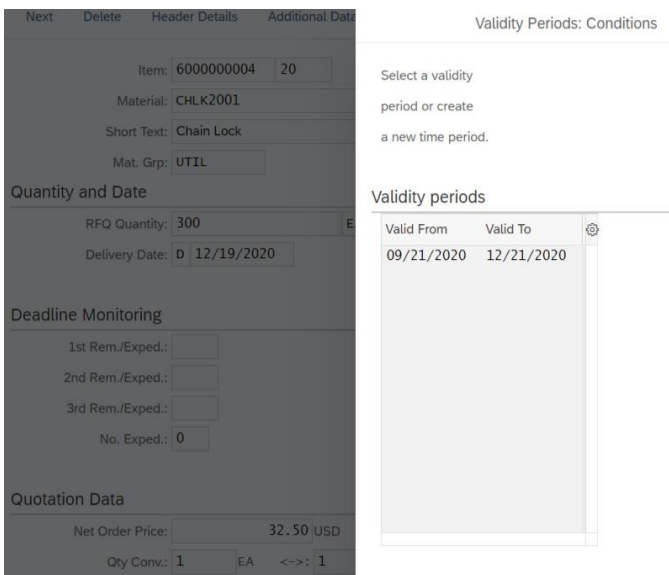
Source: Screenshot of operating interface in SAP S/4 HANA system

8.4. Instruction for operation step 4. in the practical part

Get into the initial screen of the application, enter the relevant code in the designated location, as shown in the figure 27. Then execute the price comparison (Figure 28).

Figure 27 Create price comparison list

Source: Screenshot of operating interface in SAP S/4 HANA system

Figure 28 Price comparison list of two RFQs

Source: Screenshot of operating interface in SAP S/4 HANA system

By comparing the results shown in Figure 28 and the best choice mentioned above will be the one with the lowest price. For this reason, the thesis chooses the vendor on the left side with number 125005 (West-Mid Supply) by rejecting the other one 103001 (Dallas

Basic Bike). To do so, double-click on 36.00 USD and in the screen Maintain Quotation: item 00020 chooses the checkbox for Rej. Ind to confirm rejection of this quotation (15, p.32) (Figure 29). Finally, click on Save button and Yes to keep the rejection.

Figure 29 Reject nonoptimal quotation 6000000005

Source: Screenshot of operating interface in SAP S/4 HANA system

8.5. Instruction for operation step 5. in the practical part

To create a purchase order, the thesis uses the application "Create Purchase Order – Advanced" in SAP S/4 HANA system.

Firstly, open the application and click on button Document Overview On, then choose Requests for quotations to open screen Purchasing Document (Figure 30) and enter the material CHLK2001 and the RFQ number 6000000004 in relevant fields as shown figure below.

Figure 30 Screen Purchasing Document

Source: Screenshot of operating interface in SAP S/4 HANA

After setting the conditions, enter the document overview and check whether the information such as material number, quantity, delivery date and net price are same as the number settled in precious steps.

Figure 31 RFQ details in screen Document Overview
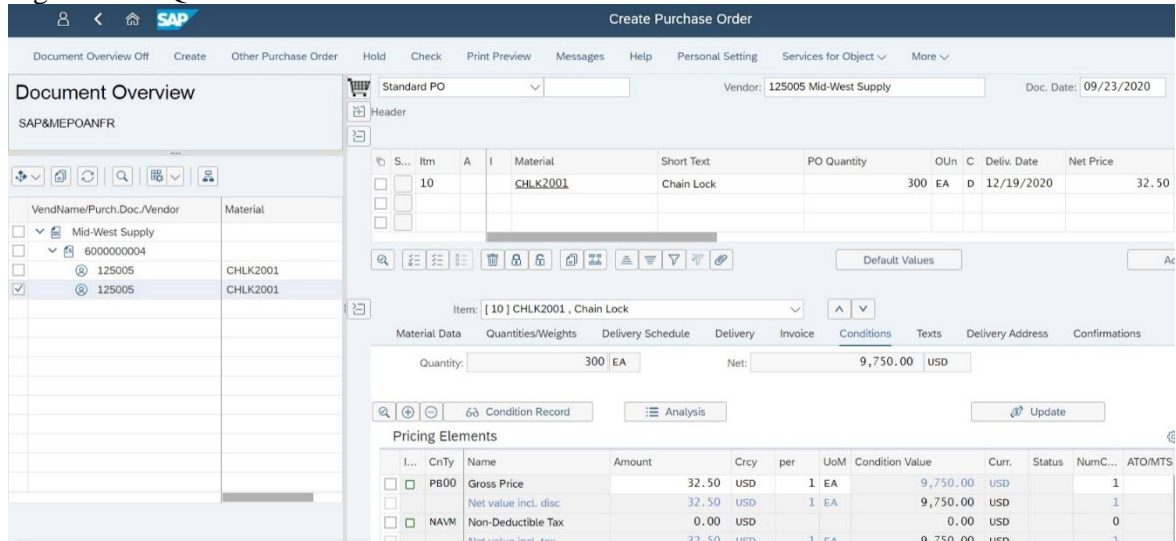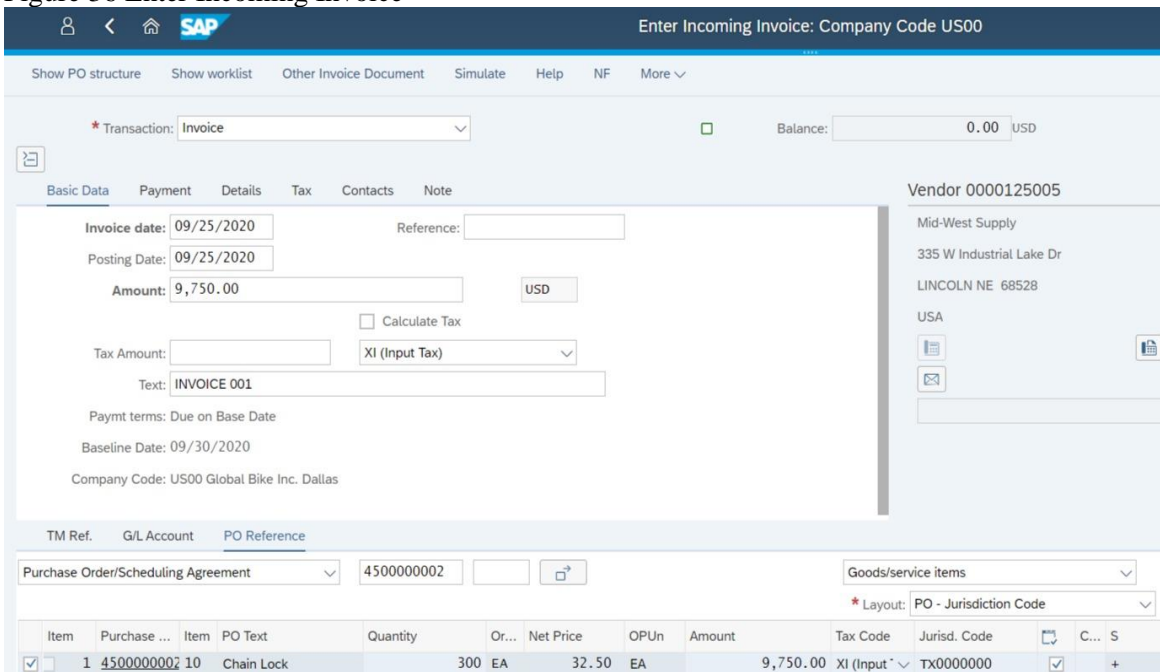

Source: Screenshot of operating interface in SAP S/4 HANA

8.6. Instruction for operation step 6. in the practical part

First of all, Click the application tile and enter 4500000002 which is gained from previous step in the field Purchase Order (Figure 32), then the screen displays the order item (Figure 32) and click on it. The details of purchase order (Figure 33) will be shown, find the checkbox of Delivery Completed and click on it, then click on button Apply.

Later, keep the order item marked and post good receipt. The receipt document number (5000000020 2020) is created by system automatically.

Figure 32 Purchase order item of Mid-West Supply
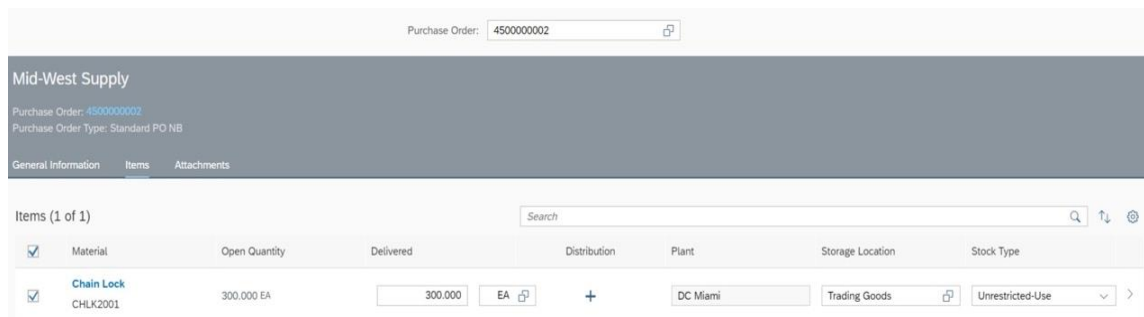
Source: Screenshot of operating interface in SAP S/4 HANA

Figure 33 Details of purchase order in relation to Mid-West Supply
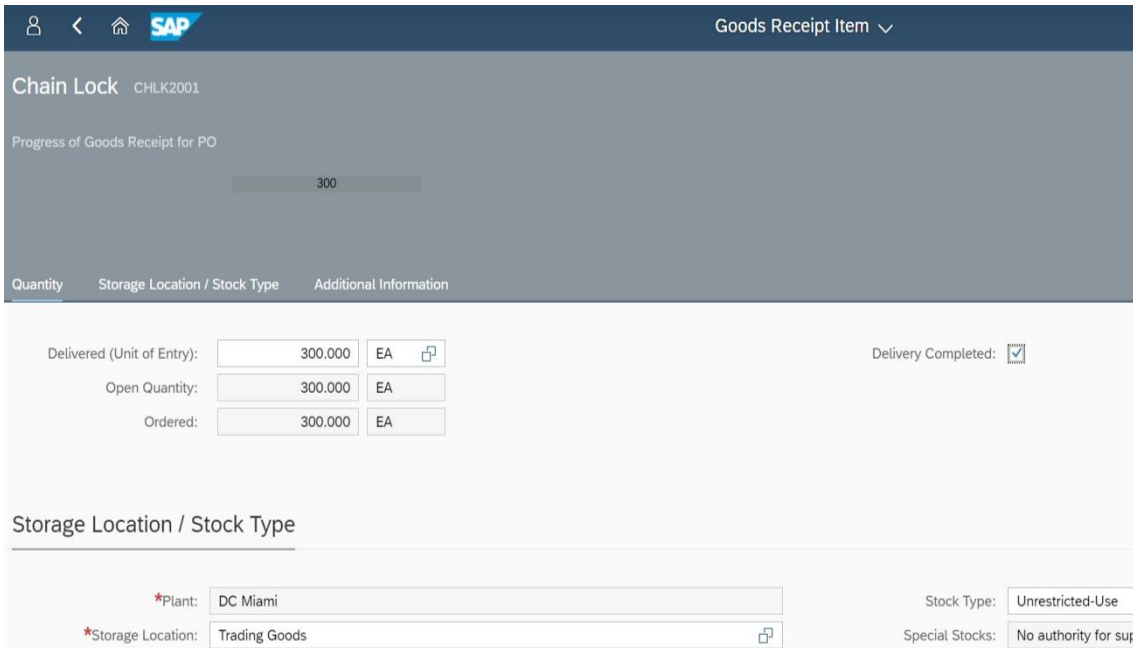
Source: Screenshot of operating interface in SAP S/4 HANA

Secondly to start with application "Manage Stock". Display the material CHLK2001 information through opening the application Manage Stock, enter the material code CHLK2001 and then choose the button Stock-Single Materials to see specific information about the inventory of Chain Lock (Figure 34).

Because the purchase order has been sent and vendor has delivered the goods, the quantity of inventory will change as delivery required (Figure 35).

Figure 34 The Chain Lock overview of material CHLK2001

Source: Screenshot of operating interface in SAP S/4 HANA

Figure 35 Stock change in Stock History
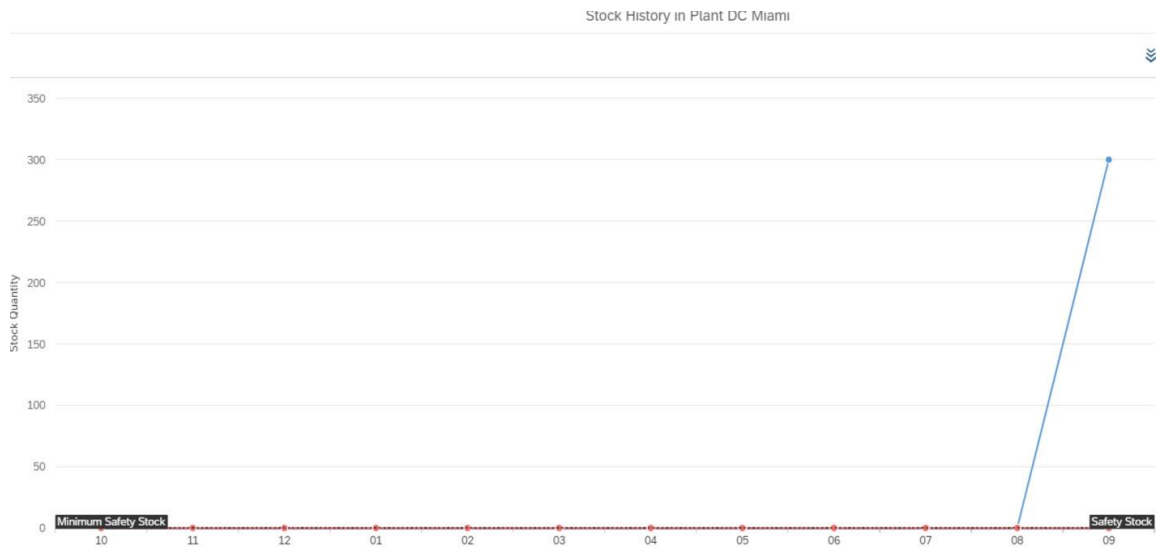
Source: Screenshot of operating interface in SAP S/4 HANA

8.7. Instruction for operation step 7. in the practical part

Open the application tile and enter company code US00 (subject Global Bike Inc.) to the initial screen of Enter Incoming Invoice. Choose today's date (25/9/2020) for Invoice Date and enter 9,750 as the amount of the invoice. Otherwise, input INVOICE 001 in the text blank and press Enter (15, p.65).

In the lower section choose PO Reference, enter PO number 45000000002 which got from previous step. After getting the overview of purchase order, change Jurisd. Code to TX0000000 and mark check box for Booking OK. Later click on button Stimulate. The result screen of operations is shown as figure 36 and figure 37 below.

Figure 36 Enter Incoming Invoice

Source: Screenshot of operating interface in SAP S/4 HANA

Figure 37 Stimulate Document in USD

Source: Screenshot of operating interface in SAP S/4 HANA

Finally, post the document of stimulation and the system will generate a unique document (Figure 38) for using in the future.

Figure 38 Document number generated

Source: Screenshot of operating interface in SAP S/4 HANA

8.8. Instruction for operation step 8. in the practical part

In the initial screen Post Outgoing payments enter codes and number as figure below (Figure 39). Choose today's date (25.09.2020) for Posting Date and Journal Entry Date (15, p.68). Then click on button Show Items.

Check the details of item in the tab Open Items and then click on button Clear to pay it (Figure 40) . Now the balance has been cleared as 0 USD.

Figure 39 Enter relevant information in the screen Post Outgoing Payments

Source: Screenshot of operating interface in SAP S/4 HANA

Figure 40 Clear the payment

Source: Screenshot of operating interface in SAP S/4 HANA

At last, click on button Post to pay invoice to vendor Mid-West Supply. The system gives a Journal Entry Number of the payment (Figure 41). After this, choose Display can see the Journal Entry(Figure 42).

Figure 41 Journal Entry Number of the payment gave by system

Source: Screenshot of operating interface in SAP S/4 HANA

Figure 42 Entry view of Journal Entry 1500000002

Source: Screenshot of operating interface in SAP S/4 HANA