Specific Management Applications Inside a SAP System for Oil and Gas Company

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Abstract – **The accounting activities environment, the business itself is changing on a daily basis and the technologies are in constant update. The beginning of the discussions, for this paper, goes to how we can extract data from an ERP system, how we can calculate KPIs (Key Performance Indicators) based on these data and how we can adapt and create one tool in this respect. According with management's decision of the oil and gas company the old KPI tool will be moved to SAP – ZKPI application. The Functional and Technical Specification was adapted for SAP (System, Applications and Products) environment, because this new tool will be adapted in this system. For ZKPI tool, the programming language used was ABAP (Web Dynpro technologies). In this article, it is presented a concept (a particular one) which is already used in oil&gas industry, a model of collecting data from an ERP (invoices, orders, data from papers regarding fixed assets, etc.), and how we can use these data for KPI's. Why do we need these collected data? In order to reach the target for accounting employees and managers regarding personal development goals – PDS, these data are used. One of the major aspects in an accounting department is the number of data entered in one SAP ERP system, based on team composition, as well as knowledge of economic activity and SAP knowledge. All accounting activities in a calendar month are monitored and counted in order to meet certain KPI's agreed with superiors at the beginning of the year. In the following, we will present, contextually, the data that led to the implementation of this application.**

Keywords – IaaS, PaaS, Key Performance Indicators, SAP, SaaS, ABAP, o Data, ERP - Enterprise Resource Planning, WebDynpro technologies

I. INTRODUCTION

The main target of this article is the extension and the development in SAP of a software module (ABAP code) within an ERP system. SAP is an ERP (Enterprise Resource Planning) system, so we will discuss how the systems have evolved over the years [1]. The evolution of ERP systems is described in the following figure, so we will not get in detail very much. What we want to discuss, from the very beginning, is that this term, ERP, has been brought for the first time in 1990, by the well-known consulting firm, Gartner Group. This concept, ERP, has improved everything that involved the management of an economic entity, and not only, has ordered / grouped, the stages underlying a business with everything that encompasses it [1], [2], [3], [4]. The evolution in time of ERP systems (concepts) is shown in Figure 1.

As far as SAP is concerned (System, Applications and Products), this system appeared in the world of ERP systems back in 1972, and the five former IBM employees produced the first module, being an economic module. The SAP R/2 product has been launched in 1980, becoming one of the most widely used IT products, bringing SAP AG among the top ten players over the years. SAP combines the functionality of several information systems, all transactions are in real time. Much more, all current information is available to all divisions belonging to a company, regardless of the location where are placed those who use such a software system [5]. SAP has been constantly evolving, so in 1992, for the first time, the "R/3" concept - client architecture - standardization of standard software solutions, the company becomes the world leader in delivering standard solutions. What brought this new solution was that the problem of compatibility with many hardware platforms and operating systems has been resolved (AIX, Linux, HP-UX, IBM, Solaris, z/OS, Microsoft Windows) [6].

In terms of business-related software, SAP has introduced a new success phase so it has passed from using mainframe (meaning that all components of the SAP system are on a single machine-server) to an architecture with three layers (one layer for the database, another layer for the SAP application, and the last layer for the application-user relationship - SAP GUI). This solution has brought SAP Company to the top of global firms since the 1990s, so SAP R/3 has been the business software solution that can be easily adapted to any sector of the industry. Back in the 1990s, SAP became the world leader in business software solutions [7], [8,] [9]. In 1996, SAP comes with its first version of SAP R/3, meaning 3.1 that enabled in that period the concept "Internet-enabled", solution that will be standard in all SAP versions / software applications / solutions starting with that year.
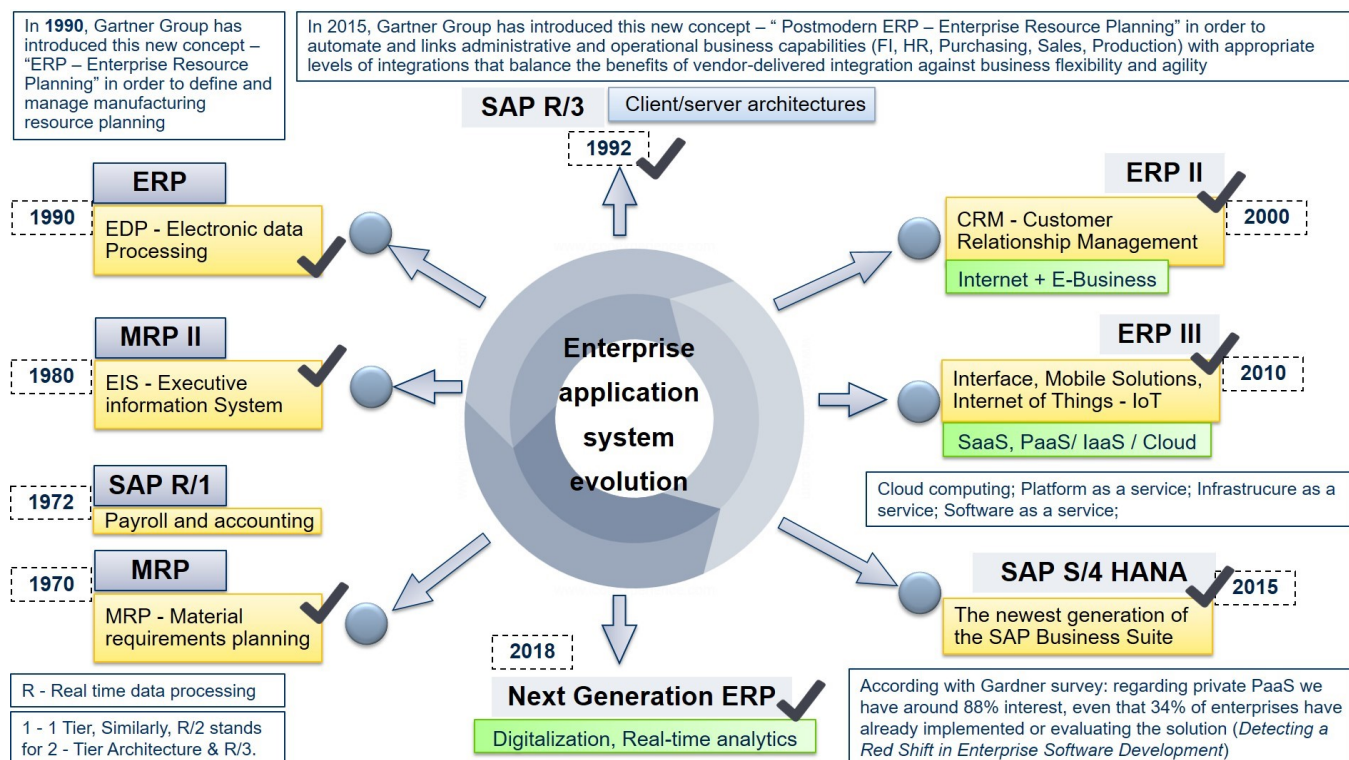
Fig. 1 ERP / SAP – transformation of the IT configuration

In the 1990s, a new challenge arises for SAP users: mySAP.com. SAP Company introduced the "SAP Web Application Server" concept that allowed programs to run using "ABAP" or "Java Engine (J2EE)". A number of "Web-service" benefits, since that time, were used in SAP solutions based on that new technology. The SAP NetWeaver solution is the SAP product that currently uses this architecture. This SAP NW known solution as the "web-based" solution and it is used in all software solutions provided by the SAP company [10].

The SAP NetWeaver Integrated Platform contains four integrated components: Application Platforms, Process Integration, Information Integration and People Integration as described in Figure 2. SAP offers two types of modules that are used in daily activities, namely functional modules and technical modules [11]. All of these modules are functionally interconnected, thus providing a complete business solution. We want to highlight here some of the active SAP modules used in O&G Company: SAP FI - Financial Accounting, CO - Controlling, TR - Treasury, SAP-SD - Sales & Distributions, MM – Material management, PP – Production planning, QM – Quality management, PM – Plant maintenance, HR – Human resources, PS – Project systems, WF – Workflow, IS – Industries solutions [12], [13], [14] and [15].

II. SOFTWARE REQUIREMENTS SPECIFICATION - TECHNIQUES USED FOR CALCULATION OF KPI'S

This study aims to explain the KPI's methodologies and techniques used in the economic departments of an oil and gas company and to adapt them to a local module / application

within an ERP system, namely SAP. More than that, this ZKPIs module / application will be used via SAP Portal, for mobility via SAP Fiori or using SAP Cloud. Our desire was to be able to adapt in SAP, using the ABAP programming environment - using the latest WebDynpro technology - a solution for KPI's purposes. The development of this application, ZKPI tool, has been thought from the beginning, thanks to the experience accumulated over time, to be created so that it does not restrict work in it, only at the office. The use of applications needs to be expanded every single day, technology is evolving, so the use of a tablet or of a mobile phone is becoming a paramount necessity.

In this article we want to discuss about the activity performed in the Central Master Data Management (CMDM) department, inside of Business Unit Finance division, our main goal is to interpret all data collected, using ZKPI tool:

- Customers: "Total number of created customers";
- Master Data: "Total MD creation/changes per FTE;
- Vendors: "Total number of vendors created";
- Materials: "Materials & Safety data sheets"; "FTE" – means full time employee.

Internally, different opinions appeared and the arguments that have been used in order to develop such an application, in the detriment of buying a similar product software from the market, were the follows:

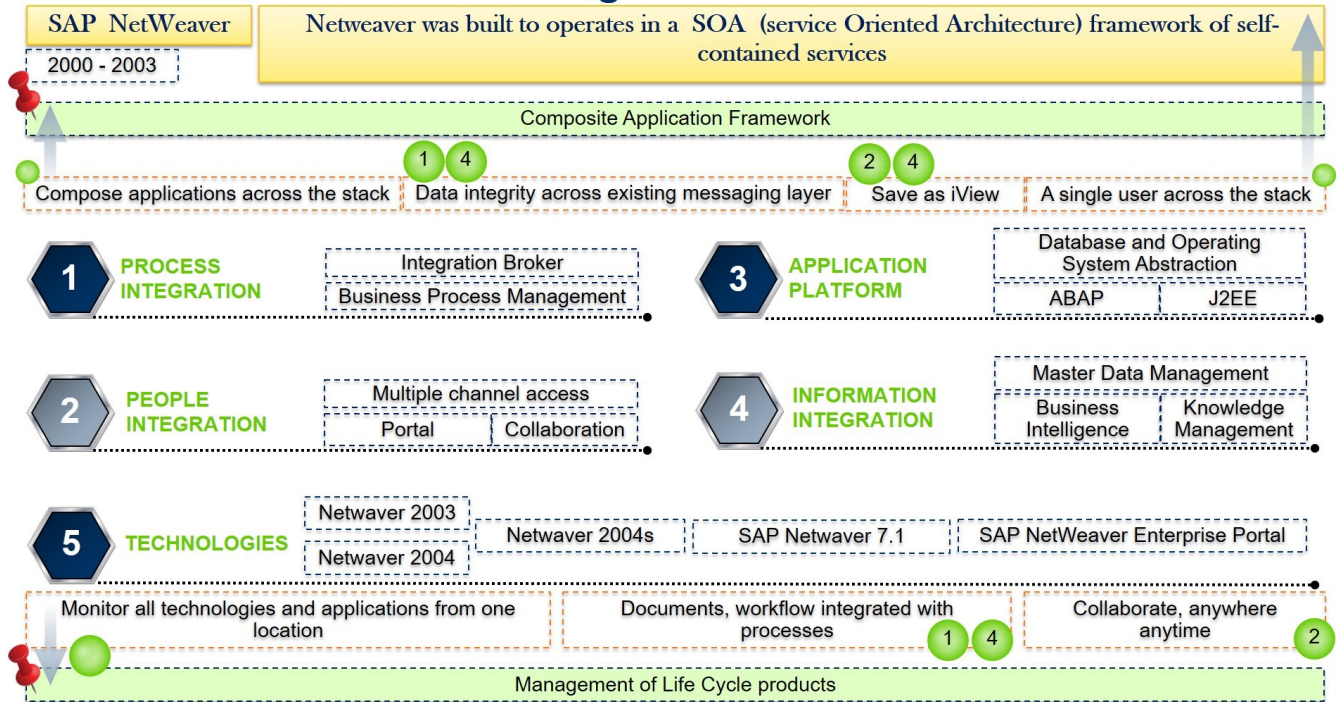# SAP NetWeaver Product Integration Architecture

Fig. 2 SAP NetWeaver integration / architecture

- The main argument: it will be integrated into SAP;

- In-house (inside the company) development (maintenance can be done without additional costs);

- KPI and programming (ABAP + Finance knowledge) – performed internally, this means that the requirements of application are maintained and tailored according to the colleagues from accounting department/division who actually need this, in line with business analysis as described.

The data collected over several years and used for this study are from an oil and gas company, and the following KPIs are used (some of them are presented in this paper), (the following abbreviation are used: AR - Accounts Receivable; Inv. - Invoices; PP - Payments Proposal; FA - Fixed Assets; CMDM - Central Master Data Management). (The convention FTE means Full Time Employee.):

- For AR department: KPI issued invoices: *Number of issued invoices in AR*; KPI issued invoices: *(Number of invoices) / FTE*; KPI issued invoices: *% Automatic AR invoices*; KPI on incoming payment processing: *Number of incoming payments*; KPI on incoming payment processing: *(Number of payments) / FTE*; KPI on incoming payment processing: *% Automatic incoming payment*; Cost KPIs: *Cost / FTE*; Cost KPIs: *Cost / payment*; Cost KPIs: *Cost / invoice*; FA / Capitalizations: Number of document lines-capitalizations

- For FA department: KPI Capitalizations1: *(Number of documents) / FTE*; KPI Capitalization2: *Number of document lines-capitalizations*; Costs: *Costs/FTE*; Costs: *Cost / Capitalization*

- For CMDM department: KPI for Customers (number of customers / day / month / quarter / year); KPI CMDM1: *Total MD creation/changes per FTE*; KPI for Vendors: number of vendors/ day / month / quarter / year); KPI for Materials & Safety data sheets.

The functional and technical specifications have been performed inside Finance Division, mainly in our scope: CMDM department. Together with the department manager, I searched and found the best criteria for counting the activities performed, in order to achieve the data collection /numbering coming from SAP system. As well, all necessary formulas were created (based on the discussions) in order to be afterwards adapted in the created application.

We have also taken into account the goals of each manager / employee for current year, so the results of this application to be part of their future / final evaluation. Each employee has to achieve the objectives of current year, meaning that based on this tool they will see the daily situation in terms of achieving their goals. In this way, we have made the application intensively used either by adding data manually or by automatically collecting data from the SAP system, of course after performing posting activities in the reference system [22].
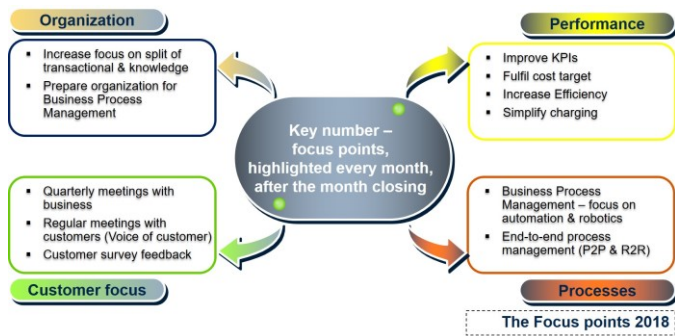
Fig. 3 The ZKPI main Focus points

A number of key points, focus points, have to be highlighted every month, after the month closing, including the KPIs described above. Figure 3 describes these aspects.

In the next table, Table 1, we will present KPIs types. In the application we have the same formulas,but customized/adapted considering the requirements:

TABLE I – Agreed formulas

Solve Order	Item	Formula
1	'CMDM customers'	='CMDM customers' - collected/introduced in SAP system
2	'Total CMDM MD creation / changes per FTE'	='(CMDM Customers + CMDM Vendors + CMDM Material&Safety data sheets)' / 'FTEs'
3	'CMDM vendors'	='CMDM vendors' - collected/introduced in SAP system
4	'CMDM Materials&Safety data sheets'	='Materials&Safety data sheets' - collected/introduced in SAP system
5	'FTEs'	='('CMDM customers' + 'CMDM vendors' + 'CMDM Materials&Safety data sheets')' / 'Total CMDM MD creation / changes per FTE'

We have to take into consideration that, in our tool Z-KPI application, the following points (criteria) are established:

- Data will be validated by the last processing according with rules and principles;
- We can do some modification on cells containing data, using some functionalities of our tool.

TABLE II – Data collection

Invoices	2016 Q.Av.	2017 Q.Av.	Q4/16	Q1/17	Q2/17	Q3/17	Q4/17
Customers	4.593	4.010	3.725	3.623	4.661	3.862	3.895
Total MD creation/changes per FTE	1.627	1.723	1.467	1.683	1.597	1.710	1.901
Vendors	5.878	7.378	6.328	6.405	6.377	7.353	9.375
Materials& Safety data sheets	7.423	8.260	6.079	8.481	7.338	8.468	8.753
FTEs	11,25	11,40	11.00	11.00	11.51	11.51	11.58

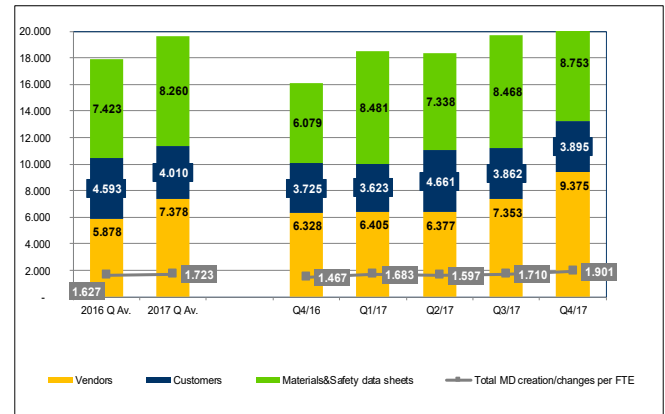Based on the above data, we have the above graphical representation (Figure 4).

Fig. 4 Representation of CMDM KPIs - results

We can conclude (as a remark) that the number of CMDM MD Materials&Safety data sheets are higher than in 2016, with significant deviation in Q1, Q2, Q3 and Q4 based on incorporation of other SAP systems, the ISA systems, which means additional work. Another remark is that we automatized some processes, based on which many master data will be automatically created, as we can see in Q3 and Q4, so it is a major advantage for the company, because some manual work disappears (templates, jobs, webmethods interfaces).

III. INFORMATICS APPLICATION
THE DESIGN OF Z-KPIS SOFTWARE MODULE

Enterprise resource planning - ERP - as it is known is coming with many advantages in terms of modeling and managing existing processes in the company. Our company uses ERP-SAP. This integrated system came with a new technology (for this research we used ABAP programming language for ZKPI tool, and WebDynpro (WD) facilities were used for Web displays). This new technology is applied in the business environment in order to help the business management team to reach the KPIs target [16], [17], and [18]. Many companies use SAP as an integrated system. The SAP Company wished, over time, to help customers with innovative technologies. Thus, when WD launched, the desire was to display the data in web environment. The business environment has received this innovation very well and has put it into practice in most of the applications (they can create UI's - Web User Interface), that have been developed over time.
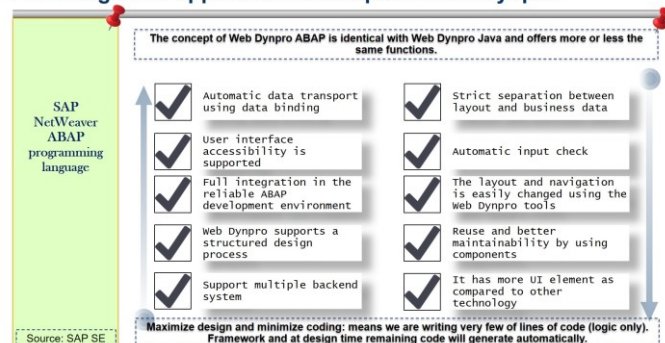

Fig. 5 WD - some hints about this technology

Above, in Figure 5, we can see how many relevant aspects of this new technology.

For a company that wants SAP benefits come after some time from installation and usage. The SAP system is auditable; this means that the future developments, ABAP developments, used for business needs, come with the same authorizations and rights, as is in our case for ZKPI application module. Over time, there has been a series of discussions on what we can improve in the SAP ERP system. A number of technologies have been accepted to give life to software modules, as in the presented case: ZKPI. This has led to this development where our input from a technical point of view has made ZKPI's implementation a successful group-wide achievement. Our goal is to grow this module in the future, as well as its ability to adapt to SAP Portal and SAP Fiori (mobility).

IV. KEY PERFORMANCE INDICATOR – ZKPI IMPLEMENTATION CONCEPT

The ZKPI's application developed in SAP by us, using WD technology, is show in Figure 6. This figure contains the ZKPIs application structure. The ZKPI module has been developed internally, using ABAP, our programmers using new technologies adopted by SAP: WebDynpro [19]. This programming environment was made by SAP, a German company, as we can find in the technical specification. This programming language was developed since 1980 and it is a 4GL programming language. It was used starting with SAP R/3 concept situation. We have included the concept of LDBs (Logical Databases), and this concept is included in one of the first programming language – ABAP. This means that the concept regarding abstraction perspective is included in the database [19]. Everything mentioned above is included in the latest version of ABAP programming language. More than that, starting with 1992's this language is used for creating programs in R/3 product [20].

SAP NetWaver platform/concept supports ABAP and Java in terms of development, all three components: business applications, the operating system and the databases, have an abstraction component. This means it helps SAP not to be directly dependent regarding machines, servers, databases, so we can conclude that we can move (install) from one platform to another.

Regarding out ZKPI tool, other components are introduced, such as Company codes (Company code, Company code name, Legal entity, Country, Division, Segment (Corporate, E&P, etc.). We also have: Start date, End date, Category and Type of service (Transactional services, fully serviced, fully serviced w/o statements, not serviced /small activity, Serviced by OGS, Transactional services)). Even Customers (Customer list, Customer data, Customer products (product name (GSFIN – ACCOUNTS PAYABLE, GSFIN – ACCOUNTS RECEIVABLE, GSFIN – STOCK ACCOUNTING, etc.), company code, and logical system)) are used. At the end, we have KPI master, Products, Units of measure, Users and Service Lines.

As we have mentioned, the data that comes in the ZKPI application can be manually and automatically added (through internally created programs to which we attach a job to run them in certain times).

Fig. 6 ZKPI tool – adding / modifying forms / application interface

In terms of SAP ABAP technology, the following picture (Figure 7) shows the used package from SAP:
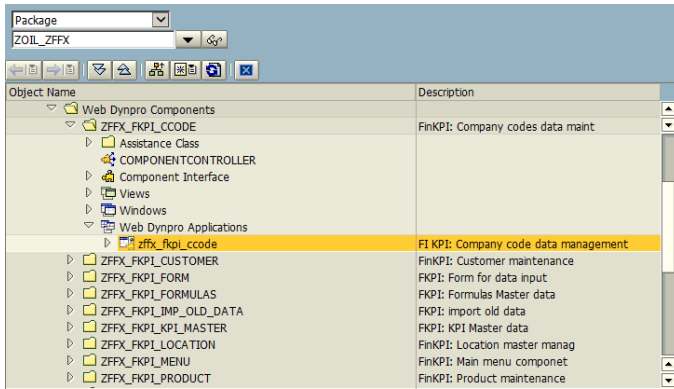

Fig. 7 ZOIL_ZFFX KPI Package

For this application, we used standard and customer tables, all connected and used for KPIs management processing. All used transactions refer to the Web Dynpro technology / pool and to the initial screen. For our application/module software, all components / programs are written using ABAP code / methodology and WD concepts. Everything was made using a development guideline for software developments; there are some clear rules, which guide the developer to create a structured application.

V. CONCLUSION

In this article, we want to highlight the possibility of adapting an integrated SAP system to the needs of the business environment so that the data from the system can be used for other purposes as well. The study is a starting point for those who are interested in how to adapt an application, using an integrated system - SAP - the programming language - ABAP - WebDynpro technology.

Other things that have to be mentioned: this module was created using low costs, knowledge about business environment - KPI – has been preserved inside and modifying the application can be very easily done. Our desire was to create an accepted model for both business and IT so that data comparison can be automatically done and to highlight the efficiency of those working with an ERP system.

For those who are studying this area – Key Performance Indicators - such a study can be used by management to standardize each department within financial accounting, meaning efficient staff, so that any new requirements can be supported (number of employees / SAP objects / efficiency at work). The ultimate goal of this research was to find common ground on how to extract, count, analyze, and make decisions about existing data in an ERP-SAP system, so each department / team has a maximum yield.

Contextually, one of the main findings of this article concerns the current state of knowledge based of KPI management implementation in big organizations. In fact, it relates to the understanding of how data can be used using an integrated ERP SAP system in a big oil and gas company, in Romanian company's / industry oil and gas sectors.

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