THE EFFECTS OF USES OF VERGI MODEL IN ERP ON BUSINESS PERFORMANCE

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ABSTRACT

The enterprise resource planning-systems are under a paradigm shift when it comes to the aspect of utilizing the recent technological innovations. The amount of transactional and analytical information added into the databases is increasing for enterprises, and it is necessary for software companies to reflect on how to deal with this large data volumes. SAP has released a new product alliance under the name SAP HANA, built upon an In-memory database. By combining the transactional and analytical environments within the same database, organizations are able to work under much greater performance environments.

This study aims to evaluate this solution from an academic point of view, identifying benefits from a technical viewpoint and further by analyzing the benefits that it may lead to for business use. Additionally there will be a discussion on how these benefits can influence future trends in both technical and business aspects.

To ensure the validity and reliability of this research, the evaluation is made using the VERGI-model combined with focus group interviews with experienced SAP consultants. A literature study was done in the extended background section to present information about central topics in this study; analytics in the business warehouse and technical grounds for in-memory databases and SAP's own products.

The results show that there is a range of technical benefits by adding the information systems on inmemory databases such as SAP HANA. The results show that both the analytical and transactional processing will experience large performance benefits and there is potential for

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simplicity in the ITlandscapes. However, the main advantages for businesses will come from learning to utilize these performance benefits efficiently and from learning to consummate this information to identify cost savings and innovations.

Keywords : SAP, HANA, In-memory, Business Warehouse, Enterprise resource planning, column-store database, row-store database,

1. Introduction

As the technological development is advancing rapidly in today's information technology market, former impossibilities are becoming reachable. Businesses need to act faster and make more accurate decisions to keep up with the market. As the cost of technology is continually decreasing, new solutions are becoming possible to develop. According to research made by Stonebraker et al. (2007) reit is time for a complete rewrite of an architectural era. New evolving technologies are resulting in large performance gains for database processing, which may impact the future. The German software firm SAP AG has developed an in-memory hybrid-store database, which they released together with their new solution SAP HANA appliance, where HANA stands for . The appliance consists of several applications including its main component the SAP HANA database. With the combination of a row and column-store in the main memory, the SAP HANA database is resulting in a significant faster approach for query analysis for real-time information access for businesses. SAP have made it possible to run two landscapes on the same platform, both the online analytical processing (OLAP) and the online transactional processing (OLTP) systems on the same SAP HANA database, (SAP, 2013c; SAP, 2012a). This approach of combining the analytical and transactional systems have been mentioned in several research articles, one made by the cofounders of SAP, Hasso Plattner in 2009, and further by Loos et al. (2011).

Although SAP HANA is a relative new offering, SAP proclaimed SAP HANA, at the SAP HANA one-year anniversary in 2012 (SAP, 2012a) as its fastest-selling product in history. Different versions of SAP HANA have been obtainable to the market for a number of years. The new groundbreaking solution, which the previous versions led up to, is the SAP Business Suite on SAP HANA, announced in the year 2013. SAP Business Suite on SAP HANA

combines all of the components of the SAP Business Suite on the SAP HANA platform. By using an academic model called the VERGI-model (Nilsson & Nilsson, 2011) the purpose of this research is to determine the technical and business benefits that this solution will generate.

1.2 Problem statement

Even though SAP has mentioned SAP HANA as the fastest-selling product in their history (McDermott, 2013), there are still a large amount of SAP customers who act with caution, to see how the market reacts before making their investments. The problem is that customer firms may feel insecure when implementing a new technology (Parasuraman & Colby, 2001). There have been several research publications made from various SAP related research institutes and by external researchers. Where most of these research papers are exploring and describing the benefits of technical SAP HANA preferences, such as the SAP HANA architecture, (Färber et al., 2012) and transaction processing (Sikka et al., 2012).

There is a lack of empirically supported research combining both technical and business point of views of this new product, where the product is evaluated from a systematic visibility model. The technical solutions are merely a tool to enhance business efficiency and business goals. Enterprise decision makers need to have a clear understanding of the values, effects, results, goals and indicators that this product will generate, this is why this research will evaluate the benefits of SAP HANA from these views.

2. Methodology

2.1 Introduction

The methodology was divided up into two different parts: the methodology for the literature study and the methodology for the focus group discussions. The structure used for the data collection, the data analysis methods to maintain validity and reliability, alternative methods and research ethics are discussed.

2.2 Choice of method

Our research methodology was structured as summative evaluation study. The reason for this was because Our research aim was to evaluate SAP HANA from an academic

perspective, aiming at identifying the technical aspects to find the business benefits that it leads to.

2.2.1 Evaluation Research

When evaluating an approach or program the researcher is assessing positive and negative effects, determining the impact, judging the value and comparing it to other subjects. Scriven (1967) established two general approaches for evaluation research, formative and summative. The formative evaluation has the primary objective of supporting or improving the subject. For example, identifying strengths and weaknesses for the topic, with the strategy of providing feedback for the product. On the other hand, the summative approach is determining the overall effectiveness of the product, with the aim to help decision makers reach their decisions (Scriven, 1967).

The evaluation research can be made from internal or external evaluators. Mentioned by Clarke and Dawson (1999) at Sage Research Methods on understanding evaluation. They refer to Feek (1988) and Love (1991) when describing the advantages and disadvantages of using internal or external evaluator and claims that the benefits with internal evaluators is that they may be more familiar with the issue and may be more likely to implement the evaluations. The disadvantages, however, are mentioned that it can have vested interest in the outcome, and they can be influenced by their commitment to the product or firm. The advantages with the external evaluators are that they can provide an independent and fresh perspective, and an objective approach to the topic. The disadvantages can be that they might act ignorant to internal matters and may not reflect on the complex reality, and be more easily misled by interested parties.

2.3 Scientific methodology

The methodology for this research will aim to assess the content of SAP HANA from a visibility model, known as the VERGI-model (Nilsson & Nilsson, 2011). Our purpose for using this approach was to get improved accuracy when it comes to assessing the use of SAP HANA combining a technical and business aspect. The VERGI-model is using a multi-level approach where each level is correlated towards each other; for example, the values are identified

using the outcomes from the effects. Applying this model enabled me to perform Our evaluation from an academic point of view, providing a range of levels to focus on for Our research.

To strengthen the VERGI-model for the purpose of our research, the design was modified to handle business and technical aspects, where the lower levels from the VERGI-model was considered as the technical ground and the upper levels as the business ground. Since one of the research questions was to identify how SAP HANA can influence the future trends, we used the findings from applying the VERGI-model on SAP HANA to discover the trends. The particular sections and
their relations towards each other of the VERGI-model are presented in figure 1.

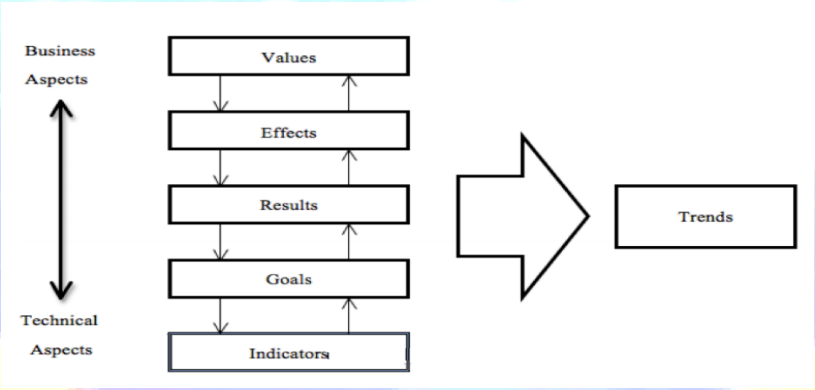

Figure 1: VERGI-model with a combination of trends

To apply and identify the five essential levels of the VERGI-model, We had to do an introductory literature study to identify the facts, categories and themes of SAP HANA. From these categorized themes, We could eventually distinguish the potential trends.

2.4 Data collection method

The method for data collection consisted of two general parts, the literature study and the focus group. The literature study was made to provide information for the identification of each particular VERGI-levels regarding SAP HANA. Whereas the focus group discussion was intended to give further strength and information for these levels but mainly considering the research question about the trends that SAP HANA can lead towards.

2.4.1 Focus group session

The focus group session was conducted with five members. When collecting Our informants We tried to get a variety of people with regards to experience, consultant role, age and areas of interest, and where all of them had an excessive knowledge base for the subject.

The focus group discussion was concluded after the main literature study was finished. The reason for this was that the purpose of the focus group discussions was to give our study an aspect of additional depth and value into the covered topics. Also, it is relevant to mention that the aim of the focus group discussion was to provide supplementary information to what information was found from the literature study, and to give the research a further impartial approach into evaluating the trends with SAP HANA. The focus group session was held at the office of the participants to make it as convenient for them as possible. The structure of the focus group sessions was that first We introduced the subject of Our research, Our research questions, Our methodology and aim for the focus group session. Then We let the participants discuss around the three questions in the list below:

1. What are the technical trends that you see with SAP Business Suite on SAP HANA?
2. What are the business trends that you see with SAP Business Suite on SAP HANA?
3. How well does the constructed VERGI-model for this research represent the benefits of SAP HANA, are they valid?

2.5 Data analysis methods

The aim of analyzing something is to, describe, explain and interpret the problem statement (Denscombe, 2010). Denscombe describes how an explanation look for rules and regularities that underlie the occurrence of a particular phenomena and the findings of cause-effect relationships in the data, why things happen and also predictions of how and when things may occur in the future.

Research tends to gravitate around the representations of two kinds of analysis categories, quantitative and qualitative research. Where quantitative research, tends to focus on numbers as the central unit for analysis and qualitative research, tends to use words or visual images (Denscombe, 2010). Our current role and Our work experience as a SAP BW consultant give us

an advantage to see things "in context" and to identify relationships between wide ranges of factors. That is why this study is conducted using qualitative analysis of qualitative data.

The goal with the analysis method for the focus group was to identify the underlying rules and structures of the conversation. The categorizations for the themes and sub-themes, for each level in the VERGI-model are displayed in Table 1, which is the main structure for the result section.

Table 1 Categorization of data into themes and sub-themes

Themes	Sub-Themes
Theme 1:	Values Cost savings
	New Business Innovations
Theme 2:	Effects Operational reporting and analysis
	Fast planning and consolidation
	Analytical applications on consumer devices
Theme 3:	Results Faster analytical processing
	Faster transactional processing
	Landscape optimization
Theme 4:	Goals Performance and agility
	Business process improvements
	Architectural simplicity
Theme 5:	Indicators Response time
	Throughput

3. Results

This research is an evaluating research of the new product alliance SAP HANA using the VERGI model (Nilsson & Nilsson, 2011). The aim of the study is to identify the benefits from a technical and business viewpoint and to reflect about the possible trends it can lead to. The emphasis of the evaluation is about the implementation form of SAP Business Suite on SAP HANA. The research is conducted using a summative evaluation research strategy

combined with focus group discussions, to give additional insights for the VERGI-levels and trends that SAP HANA can realize.

3.1 Process overview of the methodology model

The result section of this study is divided into five parts. Each of the five parts is based on the steps from the VERGI-model. Respectively the arrows between the parts shown in figure 1, demonstrate that every part is derived from the two parts surrounding it. For example, the effects and goals are both derived from the goals section, and vice versa. Also as seen in the figure 1, the higher sections of the VERGI-model used in this study are symbolizing the business aspects and the lower parts are symbolizing the technical aspects.

The process of the results section will start from the middle part of the VERGI-model with the section called "Results". Then it will continue downwards towards to the technical side where the section "Goals" and "Indicators" is located. The result chapter will eventually lead up towards the business site where the section "Effects" and "Values" is at the top. In each level of the VERGI-model there is an additional part included describing the focus group discussion related to that level.

Figure 2 displays the relationship in a graphical way among each theme and sub-theme explained in Table 1.

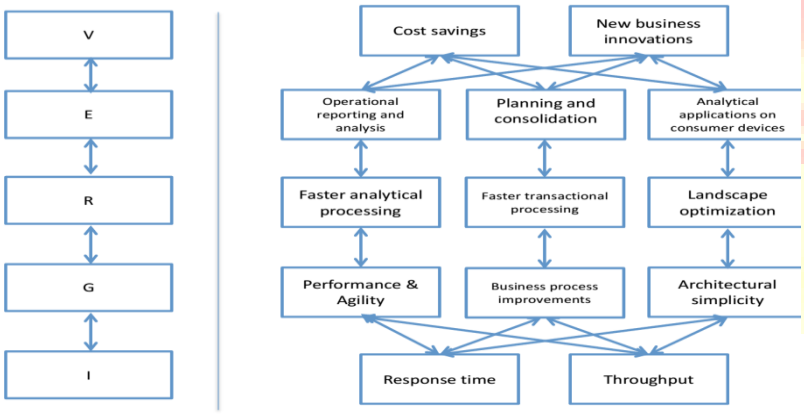

Figure 2: Relationship among the themes and sub-themes

3.2 Results Evaluation

The results section is aimed to discuss three resulting aspects that SAP HANA allows for businesses that implement this solution from a technical and a business point of view.

3.2.1 Faster analytical processing

SAP HANA is realizing the goal of faster analytical processing for enterprises by making use of the fast SAP HANA database. SAP released a whitepaper about the speed performance for SAP HANA in 2012 (SAP, 2012d). They demonstrated a 100 terabyte (TB) data set, running on a 16-node IBM X5 server, with a total of 8 TB random access memory. SAP explains that they executed approximately 20 different queries which all had a response time under 5 seconds.

This study has identified three main techniques that SAP HANA uses to benefit the analytical processing:

- By combining column-store and row-store databases
- Using massive parallel processing
- By enhancing the data load scenarios

3.2.2 Faster transactional processing

One of the main advantages of SAP Business Suite on the SAP HANA is faster transactional processing. Adding the ERP system on the in-memory database provides clients the advantage of translating real-time insights to immediate action according to SAPs website (SAP, 2013c). SAP Business Suite on SAP HANA also improves the batch processing and the reports within the SAP ECC (Enterprise Central Component).

This study has identified two main areas why SAP HANA can result in benefits for the transactional

processing for business applications:

- By using the unified table concept
- More frequently executed batch processing jobs.

3.2.3 Landscape optimization

SAP HANA can optimize the IT landscapes by eliminating instance redundancy which former architectures with legacy hardware and relational databases delivered. This new technology is possible at this time because of the fact that RAM-memory is becoming less

expensive and also since the columns-oriented data storage can take advantage of multi-core architectures. Plattner and Zeier (2012) mention that simplification of the architecture will reduce cost and due to this technology the IT landscape will require fewer layers and less components. Plattner and Zeier also state that by using in-memory technology the size of the application code can be reduced up to 75 %. When SAP released R/3 20 years ago, its current architecture for their ERP system, the database server was the limiting factor resulted in the fact that as many data loads as possible were handled in the application servers.

3.3 Values

It is important to remember that the concept of SAP HANA is relatively new. The use of IMDB for combining the OLAP and OLTP into one database is continually mentioned as a new paradigm shift in the in-memory management, mentioned by Professor Powell (Plattner & Zeier, 2012, p.vi). All of the values that SAP HANA may enable are most likely not known yet.

3.3.1 Cost savings

The reason why IMDB are possible to apply for enterprises is because the price of main memory has substantially decreased over time. The comprising functionality for information that SAP HANA database enables has made it economically sustainable to invest in such solutions. It is further necessary to mention once again that there are several versions of SAP HANA implementations. A large amount of customers has begun their initial investments in SAP HANA by adding the BW environments on top of a SAP HANA database. This is mostly a hardware investment combined with software licensing fees to SAP. The actual process of moving to a BW on SAP HANA implementation is not a lengthy process compared to regular ERP implementations. Migrating BW on SAP HANA database can be achieved in a matter of weeks or months. The implementation of adding the whole SAP Business Suite on SAP HANA will require more investments, due to the lengthier process of migrating the SAP Business suite on SAP HANA. The ROI that it generates however will much likely be higher than putting only BW on HANA. According to Zeckel (2013) an employee at the IT-company Infosys Limited, there are three possible cost saving areas that SAP HANA result in:

1. Labor - Due to the performance effects and streamline architecture, it is possible to make use of fewer developed objects and less maintenance in regards to a reduced amount of hardware components in the IT-landscape architecture, which eventually leads to reductions in the labor cost.

2. Hardware – The benefits of streamlined architecture and simplified database design, mentioned in the research by Färber et al. (2012) will eventually lead towards reduced hardware costs. The storage network is basically the most expensive part of the ERP system, mentioned by Plattner (2013) and the compression rate that SAP HANA enables for storage is one key indicator to the reduction of the TCO.

3. Software – The software cost, which is linked to license cost and space for data can be reduced by maintaining hot and cold data in an effective way. The cold data that are rarely changed can be moved to less expensive storage types like disk-storage and the hot data can be stored in the IMDB. The license cost is based on two factors, the volume of data that are stored in SAP HANA and the number
of users that interacts with SAP HANA (Schneider, 2012).

3.3.2 New business innovations

One of the primary values that SAP HANA could enable is the improved ability to discover new innovation for implementing companies. By taking advantage of all the positive effects that SAP HANA enables for the various business areas presented in the effects section. Since the values for new innovations will vary for every specific company, depending on their business type and branch, it is challenging to describe specific details for this. The following section will describe the potential innovations from a general point of view. Conversely this section will demonstrate possible innovations resulting from the chapter of effects.

Real-time business processes – Businesses can with faster performance take advantage of new types of insight into the processes, and eventually use methods to conduct faster inventory analysis to be able to decrease the risk of out-of-stock situations. Further methods to take

advantage of the speed for processes can result in improved analysis of inventory turnover, which eventually can lead to reducing of the inventory at hand.

These examples above are ways to use performance to enable new value delivering capabilities for businesses. In order to acquire a competitive advantage, SAP HANA offers access to better analytical capabilities, however the businesses need to consume this information in the right way to detect potential innovations.

4. Discussion and conclusions

The methodology was designed to answer the research questions of "What are the benefits from a technical viewpoint for SAP HANA?", "How can SAP HANA benefit businesses by taking advantage of these technical viewpoints?"

4.1 Evaluation of SAP HANA with the VERGImodel

This research is intended to evaluate the SAP HANA appliance from an academic point of view, which is the reason that the visibility model, labeled as the VERGI-model, designed by Nilsson & Nilsson (2011) was used.

The VERGI-model enabled the evaluation to be conducted from both a technical and business point of view. By dividing up the evaluation into five themes, where the lower themes, results, goals and indicators, focused on the technical aspects and the higher themes, effect and values, focused on the business aspects. The benefit of using this model was that each sub-theme from the themes was utilized to identify the following sub-themes for the themes that were interlinked. For example, from

the "result" theme, one sub-theme was "Landscape optimization", which eventually lead to the theme "Goals" and sub-theme "Less architectural components". This process of identifying the linkage between the themes and sub-themes lead to a better clarification and structure of this study.

One side effect with the VERGI-model is that it can cause confusion because a few of the themes can be seen as fairly similar to each other. For instance, when it comes to the two themes goals and effects.

To clarify these two themes, consider the following scenario:

A solution for the goal of better performance in a report used in BW is by not using any aggregates or formulas when doing the data transformations. The consequences of not adding these features into the transformation may result in inaccurate information. In other words, the aim of faster performance can in many cases be reached by simplification or not using data calculations but the results may not.

4.2 Conclusions from the research questions

All three-research questions for this research are interlinked. The conclusion from this study is that when dealing with information systems it is necessary to remember that the central goal is to bring improved value and effects for businesses. The results of the technical functionalities are merely a tool to reach this business-value giving aspect. When the market understands how to take advantage of these technical improvements it will lead towards new trends. The software companies, employees and consultants, need to understand that their clients are actually interested in how they can take advantage of performance improvements and not how many times faster the system performs. Each of the threeresearch questions is discussed below.

4.2.1 What are the benefits from a technical viewpoint for SAP HANA?

SAP HANA is taking advantage of new technological characteristics that was not possible too long ago. There have been many changes in computer technologies the past few years, where, for example, computer processors have evolved towards using multiple cores per CPU instead of increasing the clock rate, and the price for main memory is significantly lower now than previously. SAP HANA is built upon the in-memory database that is its primary concept.

4.2.2 How can SAP HANA benefit businesses by taking advantage of these technical viewpoints?

All of the recognized technical performance gains may ultimately lead towards that companies can experience a variety of benefits to make use of for critical business situations. This study identified possible circumstances such as operational reporting, analysis, planning and

consolidation that would gain from the performance improvements. Additionally this would lead towards improved possibilities for analytical application to be used on consumer devices.

This study have identified that the effects of improved business processes lead towards the values of cost savings and innovations. Many business areas will have the opportunity to benefit from the performance improvements that SAP HANA enables, this paper demonstrated a few examples of these areas in the results section. By utilizing the performance improvements and thereby reducing the amount of time required to perform certain analytical calculations, organizations can achieve cost savings. Also, the simplification of the technical landscape may reduce the hardware costs.

4.3 Limitations and its impact on the conclusions

The fact that SAP HANA is a new solution released by SAP and built upon a new technology makes the process of evaluating it more challenging. To implement a new ERP solution is a process that takes a considerable amount of time and the value that it generates takes even more time to point out and determine. These limitations of published announcements from customer companies regarding their experience of implementing the SAP Business Suite on SAP HANA made the literature study more problematic since the majority of the information was from SAP itself. This also limited choice of methodology for this study, since one way of gathering information about the business values that SAP HANA provides could have been by conducting a quantitative research by making several interviews with employees at companies that have implemented the solutions.

These circumstances could have a significant impact on the findings and credibility of the conclusion, since the information published by SAP (considering the business values for instance) can be biased.

However, to add more credibility to the findings of this study, the methodology included a focus group discussion with experts concerning the validity of identified results and additional trends.

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