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Customers' Expectations and Needs in the Business Intelligence Software Market

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ABSTRACT: This paper aims to find out what companies desire when choosing a Business Intelligence (BI) system. We look at what their needs are and what they expect and understand from this software system, which can make them work more efficient and gain better knowledge about the business they are in. A web questionnaire was used for 67 Swedish companies from various industries. The results are summarized and analyzed in cross tables for comparison. A model called *The PET-model of BI implementation* was created as a result of the theoretical findings. The model is used to finalize the results and the conclusions of the paper. The paper provides an argument for and an analysis of what is expected from a valuable BI Software Solution. It provides relevant facts about companies' BI usage habits, which again is a guideline for BI software product development.

Keywords: Business Intelligence, Software, PET-model, customers' expectations

1. Introduction

In the world of today the access to information is greater than ever. Company leaders and other decision makers are trying to overcome this problem by investing in various sophisticated computerized solutions, also known as Business

Intelligence (BI) Systems. The popularity of the term "Business Intelligence" or "BI" has increased rapidly in the last decade. BI is today a multifaceted term that refers to processes, techniques or tools to support the making of faster and better decisions (Pirttimäki & Hannula, 2003). BI systems do not only help decision makers to make better and more efficient decision but also helps the entire organization to improve Return on Investment (ROI), gain new customers and suppliers, as well as employees, and increase overall satisfaction. Eckerson (2004) points out that if *one* BI system is implemented throughout the entire company, there is a *single version of truth* which helps the company to avoid misunderstandings and get everyone going in the same direction. However, expectations of what a BI software is supposed to perform, or accomplish, is differently understood by the users. BI software is used as an effective reporting and analyzing tool to better understand a company's organizational surroundings and environment, which gives managers basic data for decision making. By a way of quantitative research, this paper explores enterprises' expectations and needs of BI software.

2. Literature Review

BI tools are a part of a broader market sometimes referred to as business analytics, as illustrated in Figure 1. The market for BI tools includes both standalone packaged software and embedded BI

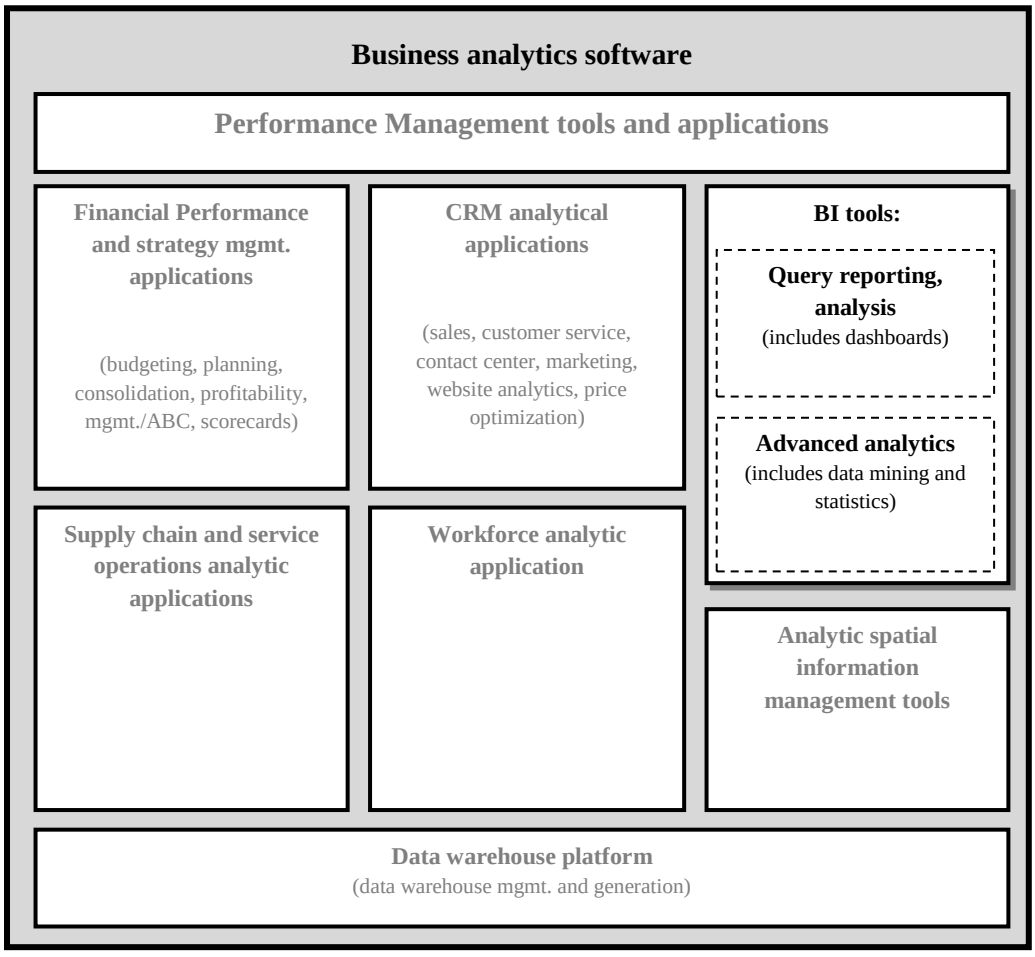

Figure 1 – Classifications of BI software (Vesset and McDonough, 2007)

tools provided by database management software vendors (Vesset and McDonough, 2007). The BI tools market is divided into two market segments, *Query reporting analysis* and *Advanced analytics.* These are also the two areas

of BI tool applications that this paper is concerned with.

In Figure 1, these areas are illustrated with two dash-boarded rectangles.

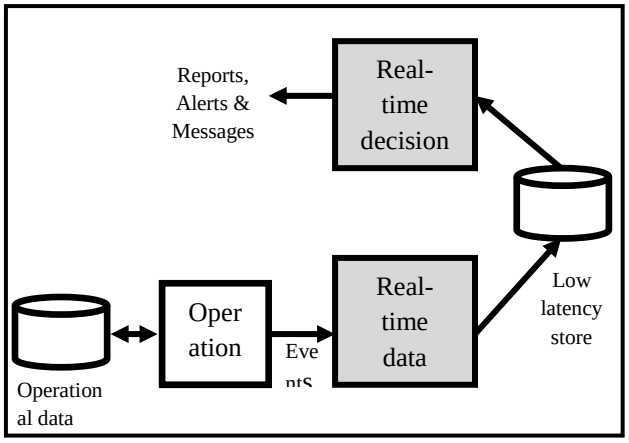

Figure 2 - Real-Time BI Processing components

Query Reporting Analysis (QRA) software includes *ad hoc* query and *multidimensional analysis* tools as well as *dashboards, scorecards* and *production reporting* tools. These tools are designed specifically to support ad hoc data access and to report building by either IT or business users. These do not include other applications or tools that may be used for report building (Vesset and McDonough, 2007). Yet they are justified as *multidimensional analysis* tools which include both *online analytical processing* (OLAP) servers and *client-side analysis tools*, that provide a data management environment which is used for modeling business problems and analyzing business data. *Packaged data marts* are also included in this function. These data marts are preconfigured software used for combining data transformation, management, and access in one single package and are usually presenting the results in various business models (Vesset and McDonough, 2007).

The main occupation of advanced analytics software is *data mining* and *statistics*. Technologies that are used are neural networks, rule induction, and clustering, among others, in order to discover relationships in data and then make hidden, not apparent or complex predictions for reporting and to do multidimensional analysis (Vesset and McDonough, 2007). In this sector there are technical, econometrical and other mathematical operations, which provide libraries with statistical algorithms in order to process and analyze the data. Common functions are frequencies, cross-tabulations and chi square, but there can also be other specialized and sophisticated functions focusing on the functional area such as industrial design, clinical trial testing, exploratory data analysis, and high-volume and real-time statistical analysis (Vesset and McDonough, 2007).

An analytical application, like Business Intelligence, is difficult to define and many professional programmers and users of BI tools will have their own definition when explaining the tool, the technology or the architecture. In this paper, the authors use a definition that will hopefully satisfy most of the analytical application industry's "pundits": "An analytic application consists of a series of logically integrated, interactive reports, including dashboards and scorecards, that enable a wide range of users to access, analyze, and act on integrated information in the context of the business processes and tasks that they manage in a given domain, such as sales, service, or operations." (Eckerson 2005, P. 5).

Generally an analytical application consists of elements which purpose it is to build a business logic, which will take the user through a series of interactive reports. There, it will be possible to access, analyze, and take necessary action to optimize the activities in a specific business domain. Analytical applications are, therefore, not about randomly created reports that a user can upload from an "inbox" or from a "my reports" folder, but about the interactive and dynamic play where the user is given the possibility to utilize something, which is valuable for his or her company's endurance (Eckerson, 2005).

The first part of a BI analytical application is called *logical integration* and is about stepping the user through different series of interactive reports and views of dimensional data, which will lead to the important point of action or to the request for more information. Different users have different knowledge or know-how when it comes to usage of analytical applications. The *navigational logic* is important when a user wants to navigate through different reports on the "reports page" to effectively analyze data and make decisions. Interactive *dashboards* and *scorecards* are used to inform the user of what metrics or data to examine. Another logic of a BI

analytical tool is therefore *offering of recommendations* (Eckerson, 2005). The user, novice or professional, should be given the best possible overview of the data, to make sure that important information is not missed or neglected.

The key to interactive reports is giving the user the opportunity to interactively search through the reports for additional information by simply "drilling" from a top-level view to a lower level. Reports should be unfixed and possible to change into tables, charts, or other transactional data. Some technologies worth mentioning, which are used for delivering interactive reports, are OLAP cubes, parameterized reports, linked static reports, advanced visualization techniques, dashboard or scorecards, and numeric searches (Eckerson, 2005).

Various data and information from different sources should be put in analytical applications and then stored in one single warehouse where all data is processed and analyzed once again. Large companies, like Continental Airlines, have different analytical applications running against one single enterprise data warehouse where all data, for example tracking flight process, fraud detection, or revenues management, are put through one large analytical procedure. Integrating the information will help managers avoid problems when seeking one consistent version of the enterprise information (Eckerson, 2005).

Different business areas (domains) such as sales, service, or manufacturing, have different information requirements and analytical applications are defined by those requirements. A sales analytical application may monitor a production line performance or other sales representatives and regions or it can examine the sales and contact history. It is the interconnection of these domains that must be used and placed within a logical model since several business areas represent the same company (Eckerson, 2005).

3. Types of Business Intelligence Systems

In a *model-driven* BI system, the information or intelligence is often presented thorough a series of different models. The user can access and modify financial, optimization and/or simulation models of various kinds (Hedgebeth, 2007). The basic function of the model-driven BI system is the provision of quantitative models.

In *data-driven* systems the basic functional level occupies search tools that access simple file systems (Hedgebeth, 2007). Here the user has access to and can modify real-time internal and external data.

In *communication-driven* systems, different networking technologies drive decision-based collaboration activities. Examples of these are video conferencing, groupware and computer bulletin board systems (BBS) (Hedgebeth, 2007).

Via computer storage and processing, a *document-driven* retrieval is made. Here, via a search engine, the user may access documents, policies, images, sounds, and scanned documents (Hedgebeth, 2007). In *knowledge-driven* systems, trained and professional users with knowledge are used to solve various problems.

Intelligence from a *web-based* system is presented via a web browser and TCP or IP (Internet protocol suite) (Hedgebeth, 2007).

Another BI system that is not mentioned under the previous heading is called *Real-Time Business intelligence system*. This system is about organization's ability to react in time and become more alert and more responsive to various changing business conditions (White, 2003). In order to make effective decisions, accurate BI is required. The problem with accurate intelligence is that it takes time to collect and deliver it to the right users and it also takes time for the users to act on this information. As shown in the delay between a business event occurring, and the action being taken, this is when the value of the information is to be determined. The technology used to deploy a Real-Time BI application must aim to reduce a user's reaction time if the information value is to be as high as possible (White, 2003).

A Real-Time BI system consists of two operational components (Figure 3). One is for data-integration and the other one is for decision-making. The data integration component captures business events from operational systems and then integrates them into the low-latency store.

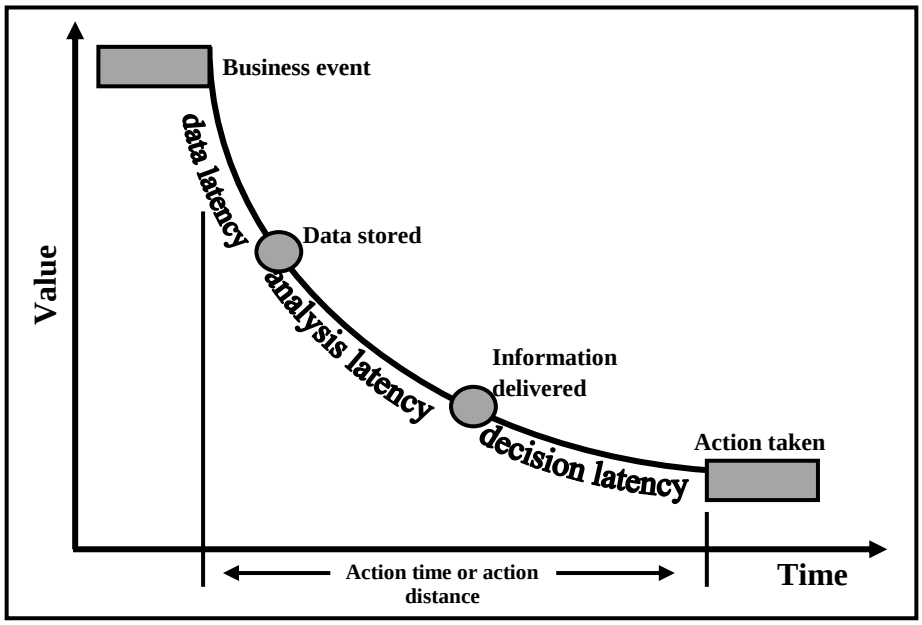

Figure 3 – Latency in Business Intelligence decision making (Hackerthorn, 2003)

The decision-making component, on the other hand, supports real-time performance management and other real-time analysis and reports (White, 2003).

As illustrated in figure 3, a business event's road to become an action consists of three latency periods, *data latency*, *analysis latency*, and *decision latency* (Hackerthorn, 2003). The result of the three latencies is called *action time* or *action distance* and the central objective of a real-time BI system is to reduce the action time as much as possible to respond to a business happening. If the problem is in data latency or the analysis latency, the time gap can be reduced by improving the technology used. If the problem is decision latency, then the latency depends on the user. Therefore, the information that is provided to the user must be improved to solve the decision latency problem.

Another solution could also be an *automatization* of some BI processes that will automatically take action on behalf of the user (White, 2003). Hackerthorn (2003) describes how decision latency may be reduced by applying three requirements to the system; *alerting*, *information* and *guidance.* Hackerthorn (2003) finds that the system should be configured in a way, which alerts the user if some unusual business situation occurs. The system should be able to show situational-specific business information in order for the user to get an understanding of the business environment he or she is working in. The user should also be guided by the system that suggests the most suitable action for the specific situation.

Another aspect in realizing the benefits when working with Real-Time BI is recognizing that the Return on Investment (ROI) depends on two factors. The first is the time it takes to reduce an action and the second is the organizations ability to modify its business practice.

Figure illustrates that there is a point (exploration threshold) beyond which reducing the action time any further has no value to the business. The smaller the action time required, the bigger the Information Technology (IT) costs are (White, 2003).

Figure 4 combined with show us that a shorter action time gives higher value to the intelligence, but it also increases the costs for the investment in the required Information Technology. After a certain time (at the *break-even threshold*) the costs for the Information Technology will become so low that ROI becomes positive.

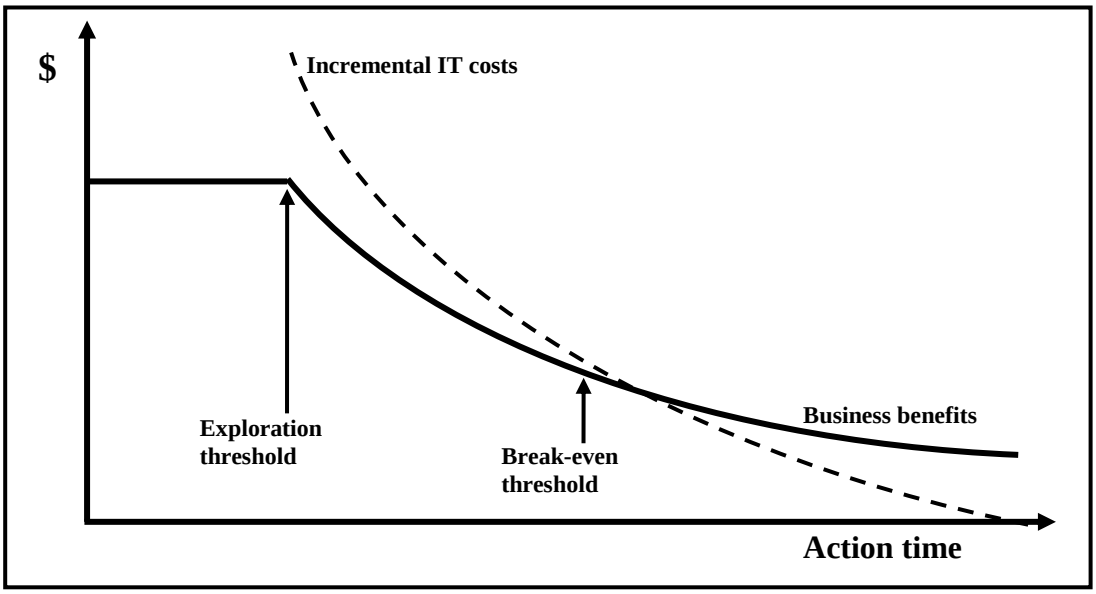

Figure 4 – Real-Time BI; Action time vs. IT costs (White, 2003)

4. The different user-groups of BI

Different users necessitate different intelligence and a BI tool's main priority should be to provide the right user with the right intelligence system, as shown in Figure 5. On the bottom axis, different user groups can be identified with specific intelligence presentation requirements (on the vertical axis). Executives tend to have little or no time to read long reports and are therefore only

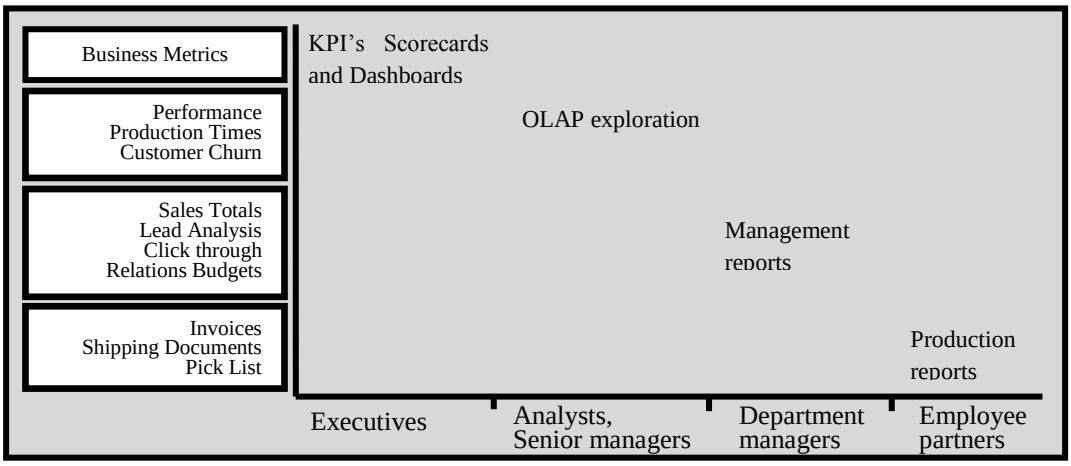

Figure 5 – Different BI user needs in the hierarchy (Solberg Søilen, 2008)

interested in fast figures or in "executive summaries". These can be presented in Scorecards or Dashboards shown as Key Performance Indicators (KPI). Analyst or Senior managers on the other hand prefer to work with advanced online analytical processes and explore different ways of making analysis. Longer reports are more in the interest of department managers. They are interested in reading and analyzing compiled text reports such as, sales

analysis and budgets. This will give a basis for making correct decisions. Workers on lower levels in the organization work more with tactical documents such as invoices, shipping and logistics.

5. Categories of BI Tools and Enterprise Expectation

Most companies today use a set of different BI tools, instead of focusing only on one. The reason for this may be that different users prefer different types of BI tools. The tools may differ from reporting, ad hoc queries and OLAP. BI tool vendors strive to meet all these requirements allowing organizations to standardize by using one single tool and on one single vendor (DM Review and SourceMedia, Inc., 2005). Below, a list of some major categories of BI tools is presented (DM Review and SourceMedia, Inc., 2005):

1. *Production Reporting Tools:* Used by professional developers to create standard reports for groups, departments or the enterprise.
2. *End-User Query and Reporting Tools:* Used by end users to create reports for themselves or others and require no programming.
3. *OLAP Tools:* Enable end users to "slice and dice" data dimensionally to explore data from different perspectives and time periods.
4. *Dashboard/Scorecard Tools:* Enable end users to view critical performance data using graphical icons and drill down to analyze detailed data and reports if desired.
5. *Data Mining Tools:* Enable statisticians or business analysts to create statistical models of business activity.
6. *Planning and Modeling Tools:* Enable analysts and end-users to create business plans and simulations against BI data. Planning 'tools supply dashboards and scorecards with targets and thresholds for metrics.

A research conducted in 2005 by *Better Management* (division of a SAS institute Inc. which does researches about business management issues around the world) showed that only nine percent of BI software users were *always* provided with all the necessary information from the BI software in order for them to make effective business decisions and only 45 percent of the users did *sometimes* get all the information they needed (Miller, Bräutigam, and Gerlach, 2006). These numbers indicate that many corporate leaders have high expectations of a BI software before purchasing it, but the decision makers will less often rely on the information extracted from the software. What was instead demanded, or needed, by the companies, according to the survey, were the following (Miller, Bräutigam, & Gerlach, 2006):

1. Improved quality of information available to the companies.
2. Access to relevant information in easy-to-use reporting interfaces for ad hoc reporting.
3. Assistance with interpreting and drawing conclusions from the information.
4. Access to relevant information in standard reports.
5. An overview of which data is available for analysis.
6. A formal assessment of the companies' information needs.
7. Training on how to use BI tools.

Based on the theory presented in this paper, the authors have created a research model or plan that can improve production requirements. With the *PET model of BI implementation*, the idea is to create a plan or model that will cover most of the areas of BI and investigate them strategically. For an enhanced overview and for the sake of simplicity the model is divided into three main *blocks* (Figure 6). Every block consists of several *areas of investigation* and each area is included in the questionnaire in form of various questions specific for each area.

The first block of the research model provides a profile of the investigated companies. The block consists of five areas of investigation; *Company size*, *Company type*, *Industry*, and for the sake of validity and reliability of the research, a *Job level* of the respondent and his or her *Job function* in

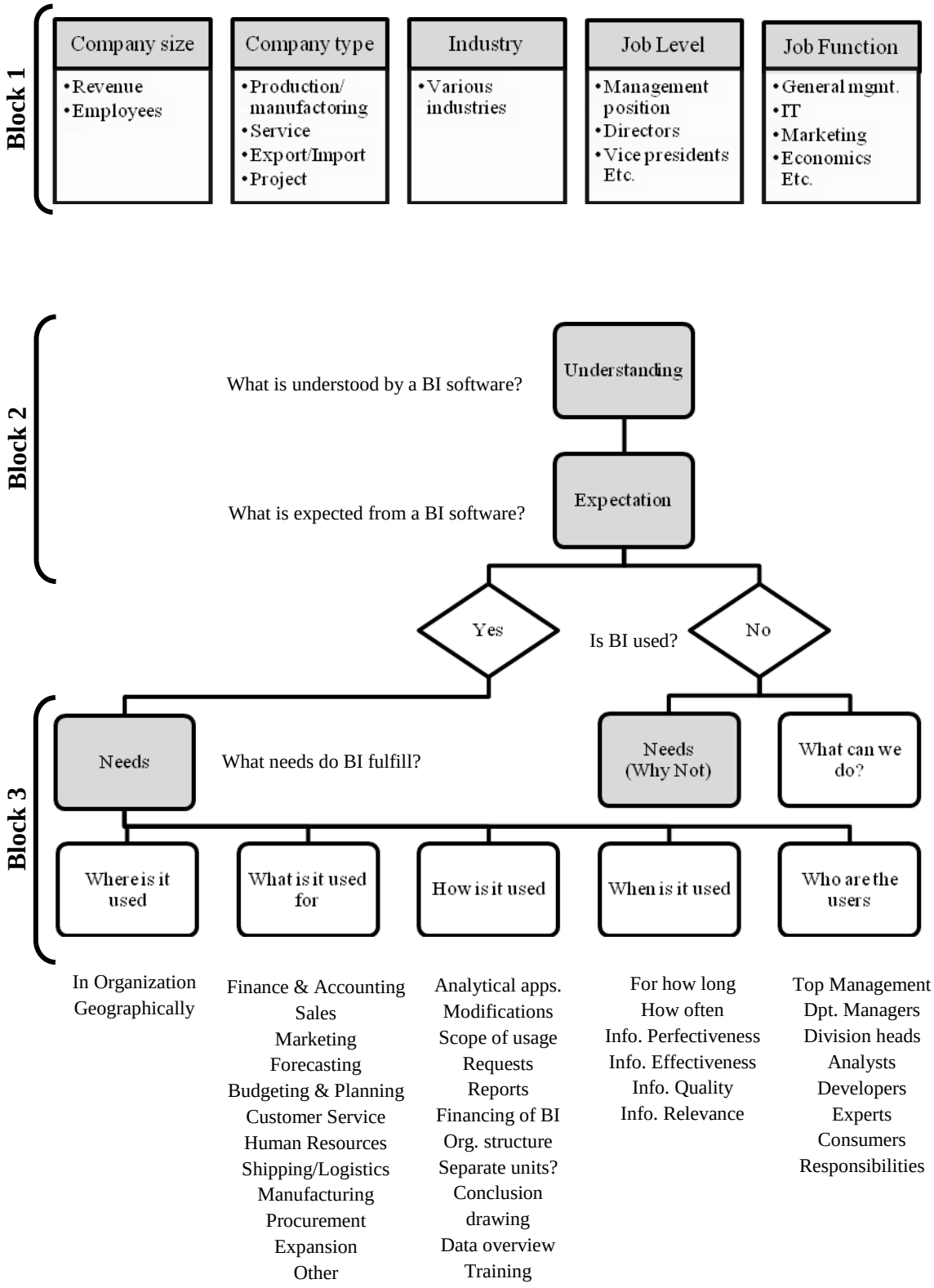

Figure 6 – PET model of BI implementation

the company. The second block consists of two large areas of investigation, *Understandings and Expectations.* The uses of strategically formulated questions are aiming at finding out what companies understand and expect from a BI software.

After observing how companies relate to BI and whether or not they use it, a third research block is created. This block consists of one main area of investigation; *Needs.* This is the part of the research which requires the most work. The *Needs*-area is segregated into five sub-areas, (*Specific Needs*-areas) which try to find out what kind of specific needs the companies have when using BI. Examples of the *Specific Needs*-areas questions are: *Where in the organization is BI use? What is BI used for? How is BI used and for how long? Who is using the BI?* The *Needs*-area is also taking into consideration those who do not use BI, trying to detect the reason for that and also to detect what can be done to make those companies use BI.

A BI research plan can be embedded into the *PET model on BI implementation* so that the two are completing each other. From the *Purchase* and *Employment Layer* the companies' understandings and expectations can be extracted, and from the bottom *Task Layer* the companies' needs can be extracted.

The following research questions are analyzed:

1. What understandings do Companies in Sweden have about Business Intelligence Software? For this question it is necessary to follow the respondents' reactions in the early stages of the contacting process. It is of importance to notice the responses received from various companies when approaching them with the questionnaire. Later, an effort in analyzing the answers from the Purchase and Employment layer in the PET model is made.
2. What are the Swedish Companies' expectations of a Business Intelligence software? Here, the main effort will be put in the analysis of the mean values. In this case, the Purchase and Employment layer in the PET model will be examined.
3. What needs do Swedish Companies have for a Business Intelligence Software? The main effort in this question is again to an analysis of the mean values. In this case, the Task layer in the PET model is examined.
4. How can the test system ("Subsoft") be improved to meet these expectations and needs? According to the survey, Subsoft's characteristics will be compared to those that are extracted from the questionnaire.

6. Methodology

Today, many companies use an *info@* e-mail address, which is often used as a "first contact" point for secondary information about a company when we are not sure who we need to contact. There is a possibility that the email will be forwarded to the right person. The risk with an *info@* address is that the response time is long and in many cases there is no response at all (Saunders, Lewis and Thornhill, 2007). For this reason, and for the reliability and validity of the research, it was important to find the right person in the company, who had insight about the company. The method used to collect "good" e-mail addresses was to visit each company's web page and look for specific information via the "contact" page. From 850 companies' homepage addresses, 408 "good" addresses were found. The e-mail-collection gave a result of about 25 companies in each industry. The rest of the contacts were either *info@* addresses or phone numbers. Due to time restrictions, both *info@* addresses and the phone numbers were neglected in the research.

6.1 Data collection

Data can be collected in several ways, through observations, interviews and questionnaires (Saunders *et al*, 2007). A positivistic philosophy with a deductive approach is used in this paper. A survey was conducted. The research strategy was a web based questionnaire. This allowed for quantitative data to be compared

In the book *Business Intelligence Competency Centers, A Team approach to Maximazing Competitive Advantage* written by Miller, Bräutigam and Gerlach, (2006) there is an example of a web based questionnaire. This was used as a starting point and as a template of the first draft of the questionnaire, later to be modified. After completing the e-mail collection, a web questionnaire was created and published online. Then an e-mail with an explanatory text and the link to the questionnaire was sent to all 408 contacts. The duration of the survey was set to 19 days. A limit, or goal, was set to between 100 – 120 responses. This limit was thought to provide a good base for empirical analysis. 23 e-mails of 408 were directly sent back with the notice that the contact person was not available or was on holiday, business trip, et cetera. 67 responses were received, generating a 16.4 percent response rate. According to Braun Hamilton (2003) a total response rate of an online survey is approximately 13.35 percent, but he points out that the response rate may vary from survey to survey depending on a variety of aspects. According to Saunders (2007) a cover letter e-mail and a good design of the questionnaire will help to increase the response rate. For the questionnaire design, a Windows application called "E-mail Questionnaire", created by CompressWeb Company, was used.

Industry (n)	n	BI System	%	n	Motive	%	n	Purpose	%
Manufacturing	15	Excel	83	2	Better Coordin.	11	7	Sales	39
(18)	1	OEBIS	6	3	Rev. Cust. Grow	17	2	Scorec. Dashb.	11
	2	Qlikview	11	3	More Ef.Process	17	17	Finance & Acc	94
				1	Faster reaction	6	4	Forecasting	22
				4	Better Str. Plan.	22	8	Manufacturing	44
							3	Budg. Planning	17
							2	What if scen.	11
							3	Shipping Log.	17
							1	Expansion	6

Table 1 – *PET Model's* Purchase Foundations in the Manufacturing industry

7. Data Analyze and Research Findings

From the 67 respondents of the survey, 11 different industries were represented. The industry that returned most answers was the *Manufacturing* industry with 18 respondents followed by the *Consulting or Professional Services* with ten and *Information technology* industry with nine respondents. Since the vast majority of industries returned a low number of responses, it was not possible to carry out any tests as to generalization of the industry as a factor. All answers combined are important for other tests though. For example, the value of an answer on each question can be measured and put in a table for comparison between different industries. Since the manufacturing industry had the most respondents, it was used to exemplify how one can interpret and compare data from the survey.

Figure 7 gives an overview of the Manufacturing industry's BI system implementation. Here, the first three foundations from the *PET model* are shown: *BI system*, *Motive*, and *Purpose*. As shown in Figure 7 there is a total number (n) of 18 respondents from the manufacturing industry. In the BI system foundation, 15 are using Excel, 1 is using Oracle Enterprise BI Server (OEBIS) and 2 are using Qlikview. In this industry, 83 percent of the 18 companies use Microsoft Excel for BI. This might not be the only BI system these companies use, but they do use it for some BI purposes.

According to four of the companies (22 percent) the motive, independent from the previous foundations, is that they use their BI system in order to improve their strategic planning. 17 percent answered that they experience Revenue and Customer growth as

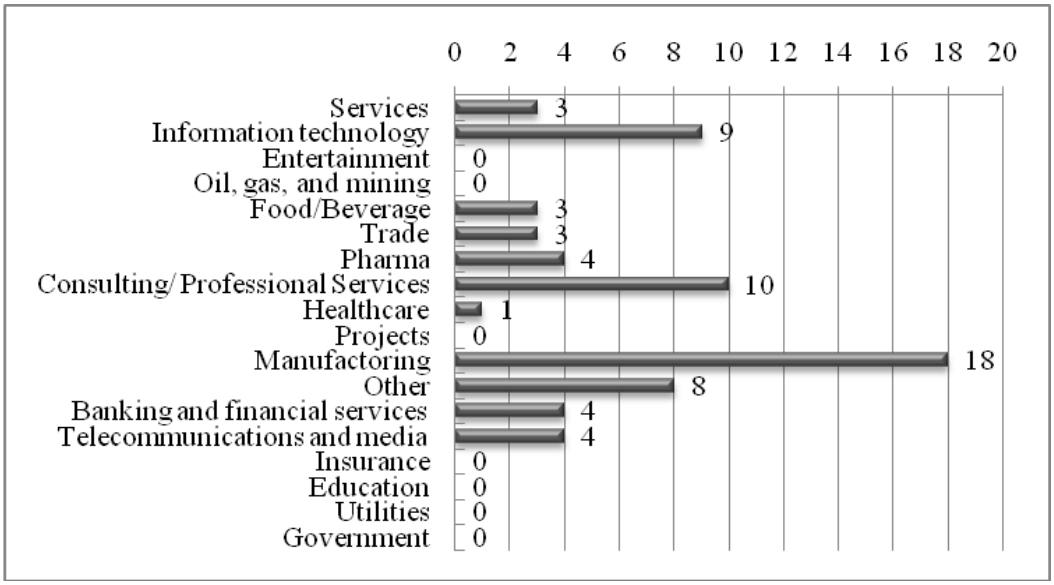

Figure 7 – Survey respondents represented from different industrie

well as more efficient business processes. Some answered *Do not know* on the *motive* question and they are, therefore, not represented in the figure. In the Purpose foundation, more than one alternative could be selected. The majority of the respondents answered that Finance and Accounting is the biggest reason for them to work with BI systems. Thereafter, they use BI for manufacturing (44 percent) and sales (39 percent). In Table 2 the same type of data is presented, but with all the industries combined. The statements in the "foundations" are also tested against each other and an average value has been produced. To start with, 15 of 67 respondents in the survey said that they do not use any kind of BI tool or system in their business or organization. 69 percent of all respondents say that they use Microsoft Excel when they work with BI. They might use Excel as a permanent standard system in their organization or they might just use it for some occasional BI work. Excel is used frequently throughout all the industries which took part in the survey. 13 percent of the respondents also say that the system they are using is not listed as an alternative in the questionnaire. The second most popular system in the list is Qlikview. It was mostly used in the Service and Manufacturing industry.

The motives that the companies had for using a BI system were especially high with regard to one statement: *Greater visibility into the business*. 28 percent of the respondents say that a BI system is helping them to better understand their business and its environment. 18 percent say that a BI system is a helpful tool for strategic planning. It is not clear what specific tool these respondents use, but 38 of 67 respondents described their job level as manager

Industry (n)	n	BI System	%	n	Motive	%	n	Purpose	%
11 industries (67)	46	Excel	69	19	Greater visibility	28	30	Finance & Accou	17
	9	Not Listed H	13	15	Do not use BI so	22	29	Sales	16
	4	QlikView	6	12	Better strategic p	18	19	Forecasting	11
	4	Do not know	6	9	More efficient pr	13	18	Marketing	10
	2	Business Ob	3	7	Do not know	10	16	Budgeting & Pla	9
	1	Analysis Serv	1	6	Faster reaction to	9	15	Do not use BI so	8
	1	Oracle Enterp	1	5	Revenue/ custom	7	11	Scorecarding/ Da	6
				2	Better coordinati	3	9	Shipping/Logistic	5
				1	Better execution	1	9	Manufacturing	5
							6	Customer Service	3
							6	Expansion	3
							3	Human Resource	2
							3	"What if" scenar	2
							3	Other	2
							3	Do not know	2
∑	67		100	76		100	180		100

Table 2 - *PET Model's* Purchase Foundations in all industries combined

and there is a possibility that these managers use BI tools for strategic planning as well as a supportive tool in decision making. 13 percent of the respondents said that a BI system helps processes to become more efficient. Some respondents states that they react faster to certain events and that the coordination among groups is better thanks to the BI system.

In the discovery of how the respondents use their BI systems, there seem to be four major areas of usage. 17 percent said that they use BI systems in Finance and Accounting, 16 percent answered that they use it in Sales, 11 percent said that the BI tool is a Forecasting tool, and ten percent use BI tools for Marketing. Nine percent of 67 respondents use BI tools for budgeting and planning while only six percent use a BI system for supervision of the business through Dashboards and Scorecards. Some users use BI tools for Shipping and Logistics as well as in the production and customer service. Eight of nine respondents who said that Manufacturing was their purpose for using BI tools came from the manufacturing industry. A low number of respondents use any kind of BI tools when expanding their business.

In Table 3 the Employment of a BI System is presented. More than 30 percent of the respondents answered that reduced increase in decision-making speed was the main benefit they experienced. The second largest benefit was Increased Business User Satisfaction. 18 percent of the respondents selected this. Ten percent of the respondents said that increased usage of BI tools is a benefit, closely followed by those (nine percent) who said that Better understanding of the Value of BI is a benefit. 22 percent like to place a BI system as an integrated intelligence tool used by everyone in the organization. 13 percent believed that only trained professionals should use BI systems. All respondents are from the Manufacturing industry and the Banking industry. In the Food or Beverage industry and in the Trade industry there is a belief that a Top Down placement is applicable, while in the Consulting Professional Services industry the Down Up model was preferred.

More that 30 percent had used their BI system between one to five years and approximately 30 percent has used the system for more than five years. A large minority had worked with BI for less than a year.

Industry (n)	n	Benefits	%	n	Placement	%	n	Time Usage	%
11 industries (67)	25	Increased d	3	15	Integrated	22	23	1 year to 5 year	34
	15	Do not use I	1	15	Do not use BI	22	19	more than 5 yea	28
	14	Increased b	1	9	Professiona	13	15	Do not use BI	22
	8	Increased u	1	9	Do not know	13	7	6 months to 1 y	10
	7	Better unde		6	Departmental	9	3	1 to 6 months	4
	7	Do not kno		4	Spec Departm	6			
	4	New ways c		3	Advisory	4			
				3	Up down	4			
				3	Down up	4			
∑	67		100	67		100	67		100

Table 3 - *PET Model's* Employment Foundations in all industries combined

Industry (n)	n	Functions	%	n	Areas	%	n	Analysis	%
11 industries (67)	15	MS Office In	19	15	Do not use BI	15	30	Trend/Scenario a	20
	15	Do not use B	19	13	Analytics	13	25	SWOT analysis	16
	9	Fixed or stan	11	13	Customer relati	13	15	Cost analysis	10
	9	OnLine Anal	11	12	Do not know	12	15	Do not use BI sol	10
	7	Predictive an	9	9	Business-relate	9	14	Do not know	9
	6	Do not know	7	8	Help desk	8	12	Forecasting	8
	5	Portal	6	7	Data warehousi	7	9	Statistical analysi	6
	3	Business que	4	6	Inegration proc	6	8	Questionnaire	5
	3	Dashboards	4	6	Technincal con	6	7	Focus Groups	5
	3	Custom Deve	4	6	Systems manag	6	7	Early warning an	5
	3	E-mailed rep	4	3	Knowledge ma	3	5	Benchmarking	3
	2	Access to var	2	3	Contracts mana	3	3	Spread sheets	2
	1	Scorecards	1	1	Free software u	1	3	Scenario analysis	2
∑	81		100	102		100	153		100

Table 4 - *PET Model's* Task Foundations in all industries combined

In Table 4 the three last foundations from the *PET model*: *Important functions*, *Functional areas* and *Analysis* are presented for all the industries combined. When it comes to the important functions of a BI system a majority said that Microsoft office integration is important. Four out of nine respondents from the IT industry say that this is the case. They also believed, together with the Consulting Professional Services industry, that the Fixed or Standard reports function is important. Online analytical processing (OLAP) was also a function appreciable in the IT industry as well as in Trade and Manufacturing industry. Nine percent of the respondents would like their BI system to make predictive analysis. A BI system's functional area should, according to the respondents, be Analytics and Customer Relations Management. 13 percent of the respondents answered that these were the functional areas that their BI system was used for. Business related consulting and HelpDesks were important in Pharmaceutical industry, Food, and IT Industries.

The analyses that the respondents in various industries believed to be important were mainly Trend or Scenario analysis and SWOT analysis. While the SWOT analysis was outspread evenly over the industries, the Trend or Scenario analysis had the most responses in the IT and Manufacturing industry. All four respondents from the Bank or Finance industry answered that Trend or Scenario analysis together with Forecasting was the most important analysis. In ten percent of the respondent's BI systems, and almost in every industry, Cost analysis was used. Statistical analysis was more often used in the Health care industry, the Food or Beverage industry and in the Consulting Professional services industry.

8. Main Findings

In order to answer the first research question for this paper: *What understandings do Companies in Sweden receive by a Business Intelligence Software?* it must be said that when the questionnaire was sent out, there were companies who requested extra information about the "term" Business Intelligence. Only after the extra information was presented to them, did some choose to participate in the survey. Later it was found that 15 of 67 respondents did not use any BI system at all. This is an indication that the Business Intelligence-term is not known in some organizations. This also confirms the conjecture that BI is still in its early development stage for companies in general. We see in particular that there is a positive correlation between company size and knowledge and usage of BI systems.

Some of the alternatives in the questionnaire received a high response rate (over 25 percent). This signals that more than a quarter of the respondents had the same opinion on a number of questions. Those alternatives that received a response rate over 25 percent were; *Increased Decision Speed* (31 percent) and *Greater visibility into the business* (28 percent). This

indicates that there is a common understanding of what BI software is. A conclusion is that the companies see a BI software as an instrument that will improve their decision-making speed and gain knowledge about the business environment they operate in.

The second research question is about the companies' expectations of a BI software. Expectations are related to Understanding because when a person understands how something works, in this case a BI system, the expectation is instinctively based upon that specific understanding. Since expectations are also about performance and mean values, the overall expectations of how a BI software shall perform, according to this survey, are spread and divided. By looking at the answers more closely, divided by the PET model's *Purchase* and *Employment Layer* and by each industry, a mean value of each answer can be extracted (as presented in Tables 3 - 4). Besides the expectations that a BI system should improve decision-speed and give an insight in the business environment, the main expectation is that a BI system should perform as a Finance and Accounting system. In addition to that, Sales, Forecasting, and Marketing functions are the expected tasks which a BI system should perform, according to the survey.

Based on the understandings and the expectations firms have of BI system, specific needs can be structured. Throughout all industries there was one particular function or need that seemed to be of importance, a Microsoft Office integration function. There was a need for having a BI tool that could write Fixed or Standard Reports. Other needs, as the Analytical function of a BI system as well as the Customer Relations Management function, were also desired. As far as analyses are concerned, SWOT analysis and Trend or Scenario analysis were the most desirable ones.

To illustrate what has been said and concluded in this chapter as well as to point out the most important of BI system understandings, expectations, and needs, the *PET-Model of BI implementation* was developed (figure 7).

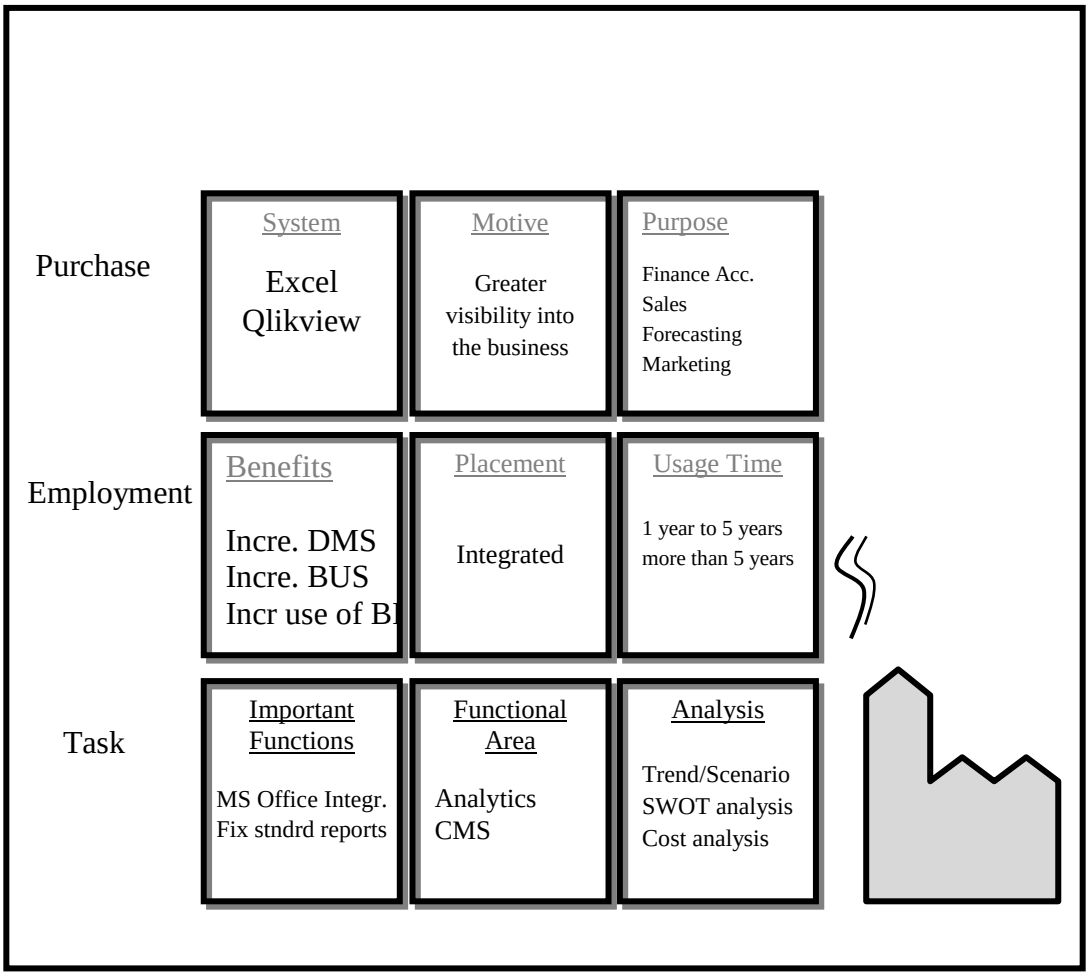

Figure 7 – PET Model after the analysis

8.1 Implications for the test software

According to the findings in the research and as far as the test software cover the technical functions and areas of a BI system, "Subsoft" can be improved in a number of ways. Currently it consists of many functions similar to those found in Excel such as spreadsheets and the possibility to create diagrams, calculate costs et cetera. But compared to a software like Qlikview the test software is mostly a text-analytical software. There are no Dashboards or Scorecards.

The greatest motive for purchasing a BI system according to the survey was to gain a *Greater visibility into the Business*. The sole purpose with the test software is based upon this idea. Therefore, this is a positive finding confirming that the test software can be applicable in most industries. The three biggest purposes when using a BI system is Finance & Accounting, Sales, and Forecasting. On this point, Subsoft has yet to be improved. Although it contains some of these functions, such as Forecasting analysis, further improvements need to be done. As shown in the analysis of the research the majority of respondents thought that a BI System should be placed where it is possible for everybody in the organization to use it. This is also another positive finding for Subsoft, which allows any kind of user with specific rights to access the system. On the other hand the software does not support any function allowing integration with Microsoft Office. However, it does write fixed or standard reports as many of the respondents requested. Subsoft is an analytical tool. This is also the functional area that got the highest mean value among the respondents.

9. Contribution and Future research

Many actors on the BI market can profit from the results of the research in this paper. Many applicable facts about companies' BI usage habits are uncovered. Vendors may use the results to build or improve their software. The paper is an introduction to BI for new users and those who are planning to use BI in their organization. The empirical data collected in the survey contain more than one company profile. *Industry* was used in this analysis as one company profile. If other profile figures are analyzed they could reveal valuable information about the relation between Swedish companies and BI.

The number of respondents is of importance when conducting surveys where generalizations are made. For this paper, there were 67 respondents in total and as many as 18 from one specific industry. In any industry there might be hundreds even thousands of companies even in a small country like Sweden and a higher sample size would have helped to make better generalizations. Perhaps longer survey duration would have helped to collect more responses.

One idea with the questionnaires' results was to test the significance levels between certain answers. For that to be possible, the questions should have been asked differently in the questionnaire. Every question could have been ranked on a Likert scale from one to five so that the real importance level could be measured and some significance levels calculated.

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