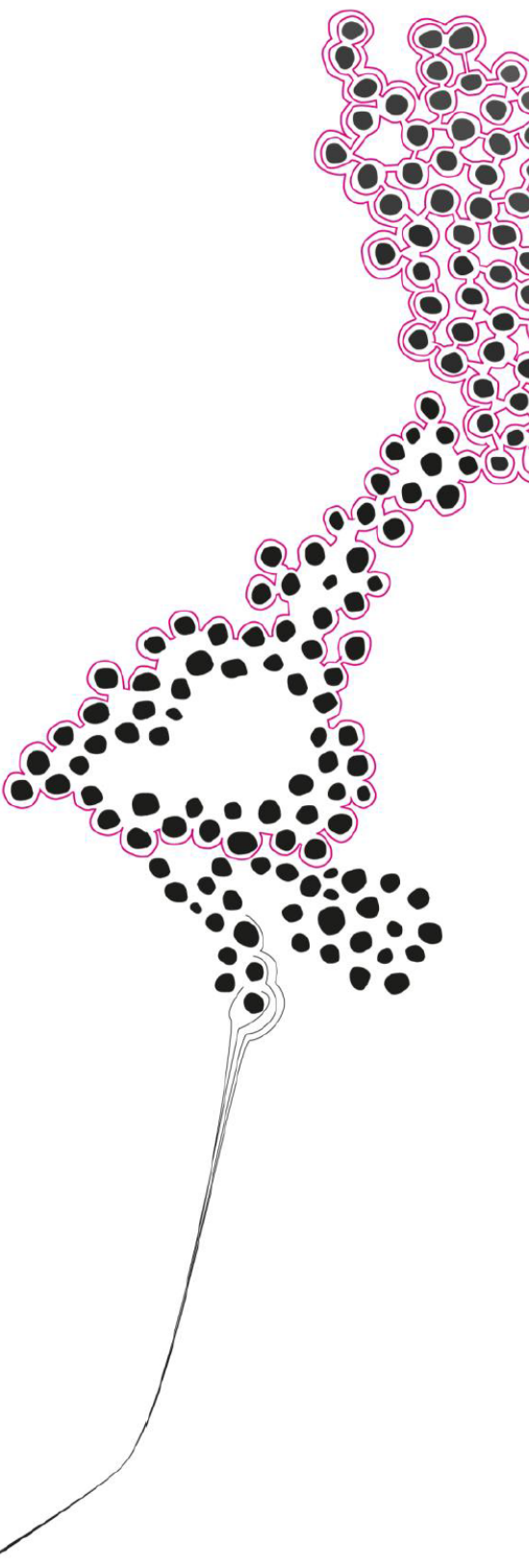




USING BUSINESS INTELLIGENCE FOR PERFORMANCE MANAGEMENT IN EDUCATION

Jelte H. Folkertsma

s1467131

MSc in Business Administration

FACULTY OF BEHAVIOURAL, MANAGEMENT AND SOCIAL SCIENCES
IEBIS GROUP

EXAMINATION COMMITTEE

First supervisor: Dr. Ir. A.A.M. Spil

Second supervisor: Ir. H. Kroon

DOCUMENT NUMBER

-

ACKNOWLEDGEMENTS

I would like to thank several people for their help during the entire process of conducting the research and writing the report. You will not all be mentioned by name, but you know who you are!

- My supervisors from University of Twente, for helping me both through academic problems, and personal challenges.
- My employer, who gave me the opportunity to pursue my goal of obtaining a master's degree purely for my own sake. And all of my colleagues whom I can always count on.
- My supervisors and colleagues at Landstede, for providing me a place to conduct the research.
- My girlfriend, friends and family for always being by my side.

ABSTRACT

This paper examines the possibility to use Business Intelligence for performance management in education. This topic was studied in a case study at a large Dutch school. A framework for performance management was necessary; therefore a Balanced Scorecard (BSC) was first developed by finding KPIs on the four perspectives (Financial, Processes, Customers, Learning) using a qualitative case-research approach. The resulting BSC was then compared to a similar school and academic literature on the topic, to create a BSC generally applicable in education. This general BSC was used to discover how schools can use the available Business Intelligence tools for performance management. BI tools offer new opportunities to find and present information, for example by enabling a shift of focus in management information from past to future. BI tools are also capable of presenting information in a more flexible way, and can be used for a more active approach in performance management while reducing workload.

The two overarching contributions of this study are i) a Balanced Scorecard generally applicable for performance management in education, and ii) Business Intelligence tools offer new opportunities for performance management in education.

Keywords: Performance management, education, professional organization, Business Intelligence, Balanced Scorecard

TABLE OF CONTENTS

Introduction.....	6
Business Intelligence and education	6
The model school	7
Research aim & questions	7
Theoretical framework.....	9
Performance Management	9
Business Intelligence	11
Framework for performance management	12
Focus in Dutch education	13
Methods	14
Research design.....	14
Sample	14
Data collection.....	15
Data analysis.....	15
Results	16
The Balanced Scorecard for Landstede	16
Analysis of results.....	18
Comparison to a similar case	18
Balanced Scorecard for the model school.....	19
Theoretical analysis	20
Discussion and conclusion.....	23
Validity of results.....	23
Generalizability of results.....	23
Conclusions & recommendations	23
Looking forward	24
Bibliography.....	25

Appendices	29
Appendix I: Overview of respondents.....	29
Appendix II – Methodology literature review	30
Appendix III – Short history of Landstede Group	32
Appendix IV – Guidelines for Design Science	33
Appendix V – The Balanced Scorecard for Landstede.....	34
Appendix VI - Research proposal	35
Appendix VII - Report Landstede.....	39

INTRODUCTION

In this section, the main topics of this research will be introduced. Furthermore, the topics are put into context, finally leading to the research question.

BUSINESS INTELLIGENCE AND EDUCATION

“Through BI&A 1.0 initiatives, businesses and organizations from all sectors began to gain critical insights from the structured data collected through various enterprise systems and analyzed by commercial relational database management systems.”

This is how Hsinchun, Chiang, and Storey (2012) describe the development of Business Intelligence (BI) in an issue of MIS Quarterly specifically dedicated to this topic. They show that BI is a topic that has been gaining interest quite quickly over the past decade. This is further backed up by, for example, the Tech Trends Report by IBM (2011), which states that business analytics is one of the four major trends in technology in the current decade. More recently, Assunção, Calheiros, Bianchi, Netto, and Buyya (2015) dug into the topic and conclude that:

“if one business is able to make sense of the information contained in the data reasonably quicker, it will be able to get more costumers, increase the revenue per customer, optimise its operation, and reduce its costs.”

While the aforementioned article focuses on the academic world in general, Business Intelligence and business analytics are especially relevant within schools. As government-funded organizations, schools need to properly govern themselves, whilst as a professional organization this self-governing is particularly difficult (Heijnsdijk, 1994). Following the conclusions of Branderhorst (2005), the management of information within the educational setting is of utmost importance. The government demands certain goals to be met by any school, but also students, parents and the public in general have high demands for schools. According to Branderhorst, Management Information Systems were not put to best use in Dutch schools in 2005 – and now, 10 years later, not much evidence can be found of schools doing much better. In the United States, a Key Performance Indicator (KPI) system for schools was developed, as described by Casserly (2011). This system can be seen as a BI tool that transforms the schools’ data into management information, and thereby shows that BI tools offer new possibilities even in an educational setting. These possibilities are further shown and backed by Infotopics, a big player in the Dutch BI market (Seidel, 2014). Considering the differences between the American and Dutch educational systems, research within a Dutch school could offer new insights. Adding up all these factors, it would be relevant to study KPIs within a Dutch school, and give some insight into how that school can best use their management information systems, thereby hopefully

setting up a 'model school' for others to follow.

THE MODEL SCHOOL

The educational institution Landstede Group offers secondary and vocational education at over 130 locations, in and around Zwolle, The Netherlands. Landstede serves approximately 22.000 students, equally divided over both types of education. Furthermore, the group recently expanded to include commercial services such as a daycare and second hand-stores.¹ However, the interest of this research is performance management in schools, and therefore the focus will be purely on the public school divisions of Landstede Group.

The school values every individual student. The education is focused on personal talent development and 'learning to learn'. This means many students have an individual learning trajectory, which complicates reviewing student statistics. Furthermore, information systems, e.g. for HRM and financial data, are well used and maintained, but are diffuse across the group. Possibly because of this host of different systems, the available data from all these systems is not presented in the most effective manner. All in all, Landstede Group feels that information from all these systems can be presented more effectively, and is therefore a very willing environment to research and implement the possibilities of BI tools for both presenting management information and using it for performance management.

¹ A short history of recent developments at Landstede Group can be found in Appendix III.

RESEARCH AIM & QUESTIONS

In order for top management within schools to function most efficiently, they need to be presented with the most crucial information. Therefore the KPIs need to be figured out, which can be used for performance management.

As Landstede is a school, BI could also be used to monitor academic performance of students. Learning Analytics is an upcoming field of scientific study and interest (Kennisnet, 2015). However, to create a clear scope for this research, it will focus mainly on the business operations rather than education.

The literature review will be done following the method described by Wolfswinkel, Furtmueller, and Wilderom (2013). An overview of the literature review can be found in Appendix II. Firstly, a definition needs to be found in order to start properly, leading to the first research questions:

1. What is performance management?
2. What is Business Intelligence?
3. What are key performance indicators?

After having this defined, a more narrow look should be taken at (academic) literature to find some answers to the following questions:

4. How does performance management work in an educational setting?

5. What framework can be used for performance management in education?
6. What are key performance indicators in education?
7. Which BI tools are available for use in education?

All smaller questions together should lead to an answer to the overhead question within this research:

How can Business Intelligence be used for performance management in education?

THEORETICAL FRAMEWORK

In this section, the main academic constructs used in this research will be described. Firstly, the concepts of performance management, Business Intelligence and key performance indicators are introduced. The section concludes with the selection of a tool to be used within this research.

PERFORMANCE MANAGEMENT

Any manager in an organization, big or small, should have some interest in how the people or machines they manage are performing. According to Lebas (1995), there are at least five reasons why management would want to measure performance. The importance of performance management is further shown by the abundance of literature found by Taticchi, Tonelli, and Cagnazzo (2010).

In order to measure performance, it is necessary to define what performance actually is, and what measures will be used to test it. In a broad sense, performance means how well something is going; in more managerial terms, it usually means whether or not certain objectives are being achieved. In the words of Lebas (1995): “performance is about deploying and managing well the components of the causal model(s) that lead to the timely attainment of stated objectives”, a view mostly shared by Otley (1999). In this work, performance will be used in this version: how well certain objectives are met. The authors mentioned before agree that performance is the positive outcome,

meaning that a firm performs when objectives are met adequately.

Moving towards performance management, Folan and Browne (2005) describe this as the outcome of performance measurement recommendations, a measurement framework and a measurement system. Choong (2014) adds the necessity of continuously updating the performance measurement; measures should be updated frequently, and the way performance is measured should be able to adapt to a changing environment.

This means that performance management is both measuring performance (as a control technique) and taking action to assure maximum performance, in a continuous cycle of measuring and managing.

KEY PERFORMANCE INDICATORS

We saw that in order to manage performance, it is necessary to define what performance is and how to measure it in the first place. Key Performance Indicators (KPIs) are a great construct to do this. KPIs were introduced by Daniel & Rockart from McKinsey as a concept to easily keep track of firm performance. Broadly speaking, they are the most important measures that indicate how well a firm is doing (note the word ‘key’ in KPI). KPIs are different from Critical Success Factors (CSF’s); a KPI is a quantifiable measure that shows how well something is going, while a CSF rather describes a prerequisite for a firm to perform well. Therefore, KPIs are preferable over CSF’s in this case.

As stated before, schools are professional organizations, according to the definition of Heijnsdijk (1994). Professional organizations are called such because they employ many well-educated, highly independent professionals, which makes managing them and measuring their performance rather difficult. Performance of employees and the school as a whole however is the performance to focus on, as the largest part of student performance in schools is explained by factors over which the school has hardly any control, such as socio-economic background of students (Mancebón, Calero, Choi, & Ximénez-De-Embún, 2012). This makes a school a challenging environment for performance management.

Sousa, De Nijs, and Hendriks (2010) further showed that not only the professionals working in educational settings, but also the managers overseeing them are not unanimously enthusiastic about performance norms, adding that performance management works best using a co-operative management style. This means that performance management in education always has to be done carefully; the professional's autonomy has to be respected.

TOOLS FOR PERFORMANCE MANAGEMENT

Even with all difficulties with performance management in education, Zhou, Wang, Han, and Zhang (2010) and Azis, Simatupang, Wibisono, and Basri (2014) show that an information system for

performance management can be used successfully in an educational setting, but only when it is correctly, contextually designed.

Several information systems have been developed specifically for this purpose, even in education, e.g. the American KPI tool as described by Casserly (2011). A disadvantage of most of these tools however, is standardization (Liss, 2013). Moreover, most schools do not work with proper management information systems; in fact, while management information is readily available at many schools, turning it into usable information for performance management is often a step too far for schools (Kennisnet, 2011). Furthermore, a custom-tailored system has the disadvantage that it may not cope very well with a changing environment, and we saw earlier that Landstede Group has been a quickly changing environment for the past few years, and probably for a few years to come as well². This view is backed by Bititci, Garengo, Dörfler, and Nudurupati (2012), who conclude after a rigorous literature review that tools for performance management often respond after changing trends, rather than being prepared for future changes. Related to this, the independence of professionals in education may call for a system that serves every professional in their preferred way; in other words, it is important to realize which information is communicated to whom (Choong, 2014). It therefore makes sense to look for more flexible and adaptive solutions; in other words, we need an information system that is capable

² See Appendix III.

of learning. To take this next step, the possibilities of Business Intelligence should be explored (Kennisnet, 2010).

BUSINESS INTELLIGENCE

DEFINITION

Information technology comes with many benefits, such as automation of processes, decreasing paper waste etc. Possibly even more important, several information systems to aid management were developed. Well-known types of these systems are management information systems (MIS) and enterprise resource systems (ERP) (Zeng, Li, & Duan, 2012). A trend in information systems as recent as the last two decades is Business Intelligence (BI). BI is all about gathering all available business data into one system to turn it into information. This is an important process; while data are just a collection of numbers or letters, information is a meaningful representation of data (Floridi, 2005).

Going to a deeper definition of BI, one could say it is “delivering the correct information in the correct format to the correct people at the correct time for decision-making purposes” (Zeng et al., 2012). To make sure that all data fits this description, data from all different systems has to be converted into uniform measures. That is the best way to ensure it can be used for taking important decisions. The information generated in this way then has to be presented to the right people; usually management. BI information is typically presented on a dashboard.

REQUIREMENTS

The basis for Business Intelligence is the management of data and data warehousing. The implementation usually requires more than just the installation of a software package, as the system needs to combine data from several sources within an organization. Hence, a BI system typically is not simple to implement within an organization; it requires (1) a proper technological infrastructure within the organization (Hsinchun et al., 2012; Yeoh & Koronios, 2010). This also means that (2) transparency within the entire organization is a necessity, because data from all sources has to be available. To keep it all available, (3) proper maintenance of the existing systems is advised. Lastly, and not unimportantly, (4) commitment within the entire organization, from all those responsible for the existing systems, is necessary to make sure all data used as input for the BI system remains reliable.

BI TOOLS

When all these requirements are met, BI tools are a useful way to analyze and present an organization’s data, as a BI tool can easily implement data from new and changing IT systems. Several BI tools are available for this purpose (Lapa, Bernardino, & Almeida, 2015). However, by consulting saMBO-ICT, a cooperative platform for all vocational schools in The Netherlands, we learn that Tableau and Qlikview are the most important players in the Dutch school market (saMBO-ICT, 2015). Once these tools know where to find all data, users can easily navigate through

the interface and create all kinds of visualizations, both of simple data and combined parameters from different data sources (Hsinchun et al., 2012). Information that previously took a lot of time, either by the professional or by an IT-department, now only take several clicks. This is a new opportunity for the independent professionals within a school to look at management information. Each can combine data sources as they wish, thereby creating information that is most relevant to them. One more advantage is that several different dashboards can be designed, such that top level managers can view different information than middle managers and so forth.

Both Tableau and Qlikview are even capable of finding more data from unstructured sources, so remembering the necessity of a meaningful representation of data to turn it into information, it becomes increasingly important to know what exactly makes available data meaningful. This last step is also one that is missing from Casserly (2011), which therefore does not serve as a great example. So all in all, we need to know which performance measures to present, and in which way, to successfully implement a BI tool: we need a framework for performance management.

FRAMEWORK FOR PERFORMANCE MANAGEMENT

To make sure that the choices made will still be relevant in the future, it makes sense to look for a framework that has already proved its worth. Several frameworks for performance management are available, with the numbers increasing

rapidly over the past few decades (Taticchi et al., 2010). The frameworks show some differences, but they all agree on one part: considering that how well an organization performs depends on what the organization actually wishes to perform, it logically follows that a firm's KPIs have to be linked to its strategy.

It is rather difficult to pick one specific framework. However, Landstede Group has previous experience with the Balanced Scorecard (BSC) first introduced by Kaplan and Norton (1992). One big advantage of the BSC is that it has a broader perspective than just financial measures, which are often very important, but do not show the full picture (Kaplan & Norton, 2005).



Figure 1 - The four perspectives of the Balanced Scorecard

The BSC looks at several indicators for performance, even if they may not seem obvious indicators at first sight, in four different perspectives, with vision and strategy taking the central role, as shown in Figure 1. Another advantage of the BSC is that it can be updated, should this ever be needed to adapt to organizational or strategic changes (Folan & Browne, 2005).

In each perspective, the relevant KPIs are placed, which thus need to be defined for

educational institutions in general and Landstede Group specifically. An important restriction in this case is on the number of KPIs; this has to be kept at an acceptable level (Bhagwat & Sharma, 2007). What exactly an acceptable number is, is not described, so it makes sense to aim for the 'Magical Number Seven' (Miller, 1956), or at least that order of magnitude. These KPIs should be those that have the greatest impact on following the vision and strategy of Landstede.

Balanced Scorecards have been successfully implemented in educational settings before (Rimar & Garstka, 1999; Tohidi, Jafari, & Afshar, 2010). One study even describes use of the BSC for teachers' academic performance management (Yu, Hamid, Ijab, & Soo, 2009); not the particular interest of this study, but interesting for further study. Whilst it is known that specific BSCs were created in Dutch schools (Kennisnet, 2010), a broad literature search did not provide a useful BSC, especially one with an acceptable number of KPIs. A further challenge in this research is that the BSC is not the desired final product, but rather serves as a step towards the use of BI at Landstede. However, this can also be seen as an advantage, because the right BI tool can help to quickly implement measures, which was a challenge in earlier use of the BSC in education (Rimar & Garstka, 1999). The resulting Balanced Scorecard will therefore be mapped to the desired situation with BI. It is possible to build the BI tool around the BSC (Peng, Wang, & Zhuang, 2008); whether or not this is desirable, remains to be seen.

FOCUS IN DUTCH EDUCATION

As mentioned in the previous section, academic literature does not provide a desired exemplary BSC. However, some information about performance measurement at Dutch schools is available. From the Kennisnet (2010) report, we learn that several schools use a management information system. These systems however are rather inflexible, and the information presented is often focused on the information the executive board needs for reporting and accountability towards students, parents and government. Examples of information presented at the studied schools are 'meeting the norm of instruction hours', 'solving complaints' and 'exam results'. The used systems seem to be checklists, rather than information systems. Kennisnet advises to use a broader perspective. The BSC, with its four perspectives, could help to take on this wider view.

METHODS

This section will explain the research design as well as the method used for data collection, including sampling.

RESEARCH DESIGN

With the lack of available academic literature directly relevant to this research, the first step of the research was to define a framework for one specific case. Therefore a case research approach was taken. Following the categorization of Bhattacharjee (2012), the research is both interpretive and qualitative, as conclusions are drawn from interviews.

Data analysis was done following the process described by Miles and Huberman (1994): 1) data reduction → 2) graphical representation → 3) drawing conclusions. The first step of this process will be discussed at the end of this section. The second and third steps are described in separate sections. In so far as the conclusions are transferable, the research also meets the guidelines as described by Hevner, March, Park, and Ram (2004) and can therefore be seen as design science-research³. To solidify any conclusions drawn from this case, the outcome of the case research was improved by comparing the results both to available academic literature and a similar case. By taking this approach, the results could be turned into conclusions.

³ A brief overview of these guidelines can be found in Appendix IV

SAMPLE

The goal of this research is to find KPIs for which management information can be shown. As can be seen in Appendix III, Landstede Group has several management layers. Furthermore, a clear organizational distinction can be seen between two types of education: secondary education and vocational education. Using the principles of sampling as described by Bhattacharjee (2012), the sampling frame in this case therefore consists of managers at all different layers, and from both types of education offered by Landstede Group. The participants at the highest and middle management layers were selected by means of expert sampling, after recommendation by the business architect of Landstede Group. Further using snowball sampling, the chosen experts recommended managers at the lower level, reporting to said experts. As the research is focused on operational performance, the director of the Planning & Control team - as responsible director for this topic - was included as well. Another two managers were added, to create a relevant sample size.

One more person was interviewed, to compare results. For this interview, a school was carefully selected looking at two criteria: 1) the school must resemble the profile of Landstede Group in terms of education offered and student population; 2) the school must be more experienced with implementing the possibilities of Business Intelligence for the purpose of

presenting management information. Using these criteria, the director of Planning & Control from Clusius College was added to the sample. The results of this interview will be presented separately, as they will be used for comparison to the found results at Landstede Group.

A full overview of respondents can be found in Appendix I.

DATA COLLECTION

INSTRUMENT

The data was gathered by holding semi-structured interviews in person. The four perspectives of the Balanced Scorecard formed the fundament for the structure of these interviews. For every perspective, several questions were formulated to guide the interview on that specific topic. As described before, a firm's KPIs have to be linked to its strategy. Many measures can be performance indicators, but the *key* performance indicators are those which contribute most directly to the firm's strategy. Therefore, a general section about the goal, strategy and vision of the company was added to the interviews.

COLLECTION PROCESS

Environment and context are important during data collection, according to the methods of phenomenology (Giorgi & Giorgi, 2003). Therefore, each respondent was interviewed for one hour in their own working environment. The interviewer recorded the interview and made notes of both textual and contextual nature. With this information, the interviewer created a transcription of each interview in key

words and phrases mentioned by the respondents, in such a way that it could be used for derivation of results.

DATA ANALYSIS

For the first step of data analysis, namely data reduction, the transcriptions were re-read to form a general idea. After reading, the common denominators and outliers were coded to form preliminary results (reduced data). These results were further analyzed to extract KPIs to form the BSC.

The common denominators were all described either as the resulting KPIs found in the next section, or as part of a KPI. The specific interests were either taken as part of a KPI, or considered not to be KPIs, as they were not mentioned often enough. In these considerations the position of respondents influenced decisions for inclusion: the CEO's opinion about organization-wide KPIs has more weight than that of lower level managers.

The results were first sent to the respondents for approval and/or further comments, before being accepted as final results, to make sure the interpretation of the interviewer matched the original ideas of the respondents.

RESULTS

In this section, the results gathered from the interviews will be presented graphically, thereby fulfilling the second step of data analysis according to Miles and Huberman (1994). As the Balanced Scorecard was used as basis for the interviews, this model is the basis for presenting the results. Furthermore, the results will be compared to the situation at a comparable educational organization, legal requirements and the theoretical framework.

THE BALANCED SCORECARD FOR LANDSTED

The KPI's found by analyzing the data were coded according to the different perspectives of the balanced scorecard and the general section related to vision and strategy: G (General), F (Financial), P (Processes), C (Customers), L (Learning). The results from the reduced data are visually presented in Appendix V, and are further explained below.

G1: TALENT DEVELOPMENT

In the strategy and vision of Landstede Group, talent development of students and individually suited education are very important.

G2: MATCHING THE PROFESSIONAL FIELD

The education offered at Landstede should match the wishes from the professional field to which the students will progress, such that students who graduate from a program offered at Landstede are well prepared for a job in their field. Therefore

the content of the study programs should be tailored to the wishes of potential employers, rather than just meeting government demands.

F1: CORNERSTONE RATIOS

The most important financial ratios that reflect the financial situation of Landstede Group: Solvability, Liquidity and Rentability.

F2: BUDGET AND EXHAUSTION

Managers at all levels prefer a closer view and more real-time information on finances. The budget and its exhaustion, including an alert for spikes/outliers in cashflow, provide a more detailed view of finances than the ratios.

F3: COST PER..

All respondents were interested in a certain 'cost per', e.g. cost per student, to compare across different study programs. With the specific wishes depending on their position within the organization, 'cost per' is the umbrella term for this KPI.

F4: FINANCIAL FORECAST

The goal of presenting management information is not only to inform, it is also presented for the purpose of performance management. Therefore the financial forecast comes up as a KPI: if the current trend continues, where will we be in 6 months / 2 years etc.? How does the organization's personnel planning influence the financial situation?

P1: INSTRUCTION HOURS

The Dutch government has set a minimum amount of hours of instruction to be offered at different levels of education (Rijksoverheid, 2015b). As the government is also the institution that provides the major source of income, and responsible for quality checks (Rijksoverheid, 2015a), it is important for Landstede to reach these goals. Therefore, this information should be monitored throughout the year.

P2: STUDY SUCCESS / GRADUATION RATES

As mentioned before, the education should be tailored to the students. However, there are also set goals to be reached, such as exams. And in the end, one would like every student to graduate. This study success should be monitored over time (a few years), and across different study programs.

P3: PROCESS MONITORING

Managers at all levels would like to be able to manage and influence different processes within the organization, e.g. the signing of an Education Agreement (Onderwijsovereenkomst) for students. To this end, it is necessary to monitor these processes in the first place. Seeing as many processes are not yet monitored, this is an important learning factor.

P4: PROCESS DESCRIPTION

This result was found only at top level management, but is nonetheless quite important. Process monitoring was found as a general wish from all respondents;

however, monitoring is only possible when processes are known and described. Therefore the description of the processes within the organization need to be monitored as well.

C1: STUDENT SATISFACTION

Every single respondent named students as the primary and most important customers. Organizations typically like to keep their most important customers happy (Simons, 2010). Therefore, student satisfaction is a great measure for customer happiness.

C2: RANKINGS

Different schools are commonly compared in different ranking systems. For vocational education, the 'Keuzegids' (independent selection guide, published annually (Keuzegids, 2015)) is widely used. Several managers at Landstede mention a good score in this ranking as KPI.

ANALYSIS OF RESULTS

In this section, the results found at Landstede will be compared to both a similar school and the theoretical framework.

COMPARISON TO A SIMILAR CASE

As mentioned before, an expert on the topic from a comparable school was interviewed. This expert has implemented the BI-tool Qlikview for Management Information purposes on two big schools: first at Clusius College, Noord-Holland; afterwards as consultant at Groene Welle Zwolle. The management reports produced at Clusius College were the basis of the interview with this expert.

SIMILARITIES

The management reports at Clusius College are divided in three clear areas: Finance & Control, Personnel & Organization and Quality & Education.

The first conclusion that can be drawn from the results of this interview is that many KPIs found in these three areas are the same for Landstede Group and Clusius College, especially in the area of financial information, for example financial ratios, budget and number of personnel. The reported factual information about students is also in agreement, e.g. graduation rates.

DIFFERENCES

Two main differences can be seen; firstly in the area of Personnel & Organization, where Clusius College reports more information on employees, such as employee satisfaction and responsibilities. The bigger difference is seen in Finance & Control, where Clusius mainly focuses on information they are legally obliged to report and information from the present and the past, while Landstede Group clearly wishes to be presented with expectations towards the future based on trends from the past.

LESSONS TOWARDS THE MODEL SCHOOL

The similarities between the results found at Clusius College and Landstede Group outweigh the differences between the two. However, these differences seem to indicate important differences between the two schools. Landstede Group clearly wishes to combine data from different sources to create new information, and to use trends for predictions towards the future. In other words, the managers at Landstede Group truly want to use the opportunities that Business Intelligence has to offer to take management information to the next level.

Another main difference is the focus on process following at Landstede Group. While this is another big difference between the two schools, this may not be related to the opportunities of BI and forward thinking of managers at Landstede Group, but rather reflect the recent past of

business operations at this organization.⁴ This means that process monitoring and process descriptions are not generalizable KPIs to be used in the model school.

Furthermore, Clusius College has a bigger employee focus in management information. This focus can fill the gap in the learning perspective found at Landstede. Using the information reported at Clusius as a basis, and combining this with another look at the data gathered at Landstede, yields two KPIs focused on employees:

L1: EMPLOYEE SATISFACTION

The employee satisfaction, typically measured in questionnaires, is a strong indication of how well the school serves its teachers.

L2: PROFESSIONALIZATION HOURS

As described in their collective agreement, teachers can use a percentage of their working hours for professionalization. The usage of these hours is a first indication of how much the teachers are investing to improve, and is therefore important management information.

The final observation of the results found at Clusius College shows one insightful tip: using threshold values in a ‘traffic light’-construction. For all KPIs, a traffic light value is shown in the management reports

at Clusius College. The thresholds for these values are determined beforehand, and consist of a target value and an acceptable bandwidth range. The values are shown as:

Green: reaches or exceeds target value
Yellow: within acceptable range
Red: outside acceptable range

This way of reporting provides a quick state of the business, and shows which areas require immediate action.

All in all, the comparison to Clusius College provides some useful practical insights, but does not call for serious revision of the results found at Landstede.

BALANCED SCORECARD FOR THE MODEL SCHOOL

Using the results found at Landstede, and further refining these with the results from Clusius, a Balanced Scorecard for the model school can be defined. This BSC includes most of the KPIs found at Landstede, except for P3 (Process Monitoring) and P4 (Process Description), as these were found to be specific to one organization. Furthermore, the KPIs related to Vision and strategy are excluded, as vision and strategy is organizationally specific as well. Two KPIs are added for the learning perspective, as found from the results from Clusius and revisiting the Landstede data. The BSC created in this way is shown here in Figure 2.

⁴ The recent issues in business operations are further described at the end of Appendix III.

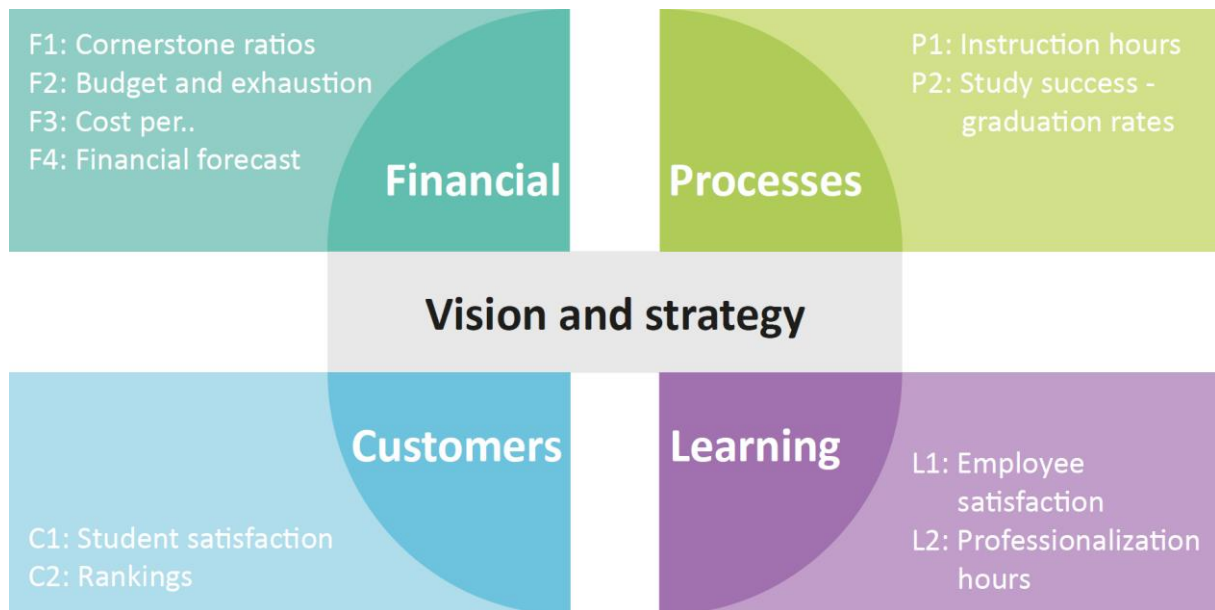


Figure 2 - The Balanced Scorecard for the model school

THEORETICAL ANALYSIS

We saw in the theoretical framework that the desired result would be a Balanced Scorecard with approximately 7 KPIs. With 10 KPIs in the four perspectives distilled from the interviews, this is an acceptable number.

Following the advice of Kennisnet (2011), the perspective of provided information should be broader than just a checklist of numbers demanded by government or parents. Looking at the final BSC, this objective has been realized; the desired information has a much less narrow focus than accountability. Of course, the information for the 'checklist' should also still be available, but most managers at Landstede saw the checklist as a necessary basis for a healthy organization, rather than information to be used for performance management.

We saw in the literature study that the translation from BSC to an information system can successfully be made. So all in all, the BSC should provide a valuable basis for a model school.

BUSINESS INTELLIGENCE

The BSC for the model school has now been defined. But what does Business Intelligence have to offer to improve performance management, using this BSC as the basis? This question can be answered for each of the four perspectives of the Balanced Scorecard.

FINANCIAL

The desired information demands the possibilities that newer BI tools have to offer. Several KPIs need information from different databases at Landstede. Consider for example *Cost per [student]*, which

requires financial data, data from the student administration system and data about the class structure at Landstede. Compared to earlier management information systems, BI tools combine all this data into desired information more easily, and are able to include data from other systems, should Landstede experience another merger. In this way, the right BI tool can definitely help to provide managers in education with better management information. Furthermore, and possibly even more important, the right BI tool can help to shift the financial focus from the past towards the future. From a simple drag&click environment, the BI tool can be used for automatically extrapolating trends towards the future.

PROCESSES

BI can be used to monitor processes within an organization more closely and more intuitively. The use of classrooms, for example, can easily be presented visually, helping managers to use the classrooms more efficiently.

CUSTOMERS

Rather than waiting for external rankings, such as the *Keuzegids*, a BI tool can be used to gather all data used for these rankings and calculate the score. This is comparable to the possibilities seen in the financial perspective; shifting the focus from the past to the future, by using recent data and watching trends rather than historic numbers, thereby enabling managers to watch these numbers continuously and take earlier action.

LEARNING

Comparable to the previous perspectives, the right BI tool can also be used to predict trends in employee satisfaction and other employee indicators, enabling managers to take earlier affirmative action.

OVERALL ADDED VALUE

We have now seen that a BI tool can definitely add value for presenting management information. Besides the way in which information is presented, another advantage is the timing. Most of the respondents would like to be able to access real-time information at any time; a desire that can be fulfilled with a BI tool that knows where to gather its data.

Apart from the presentation of KPIs, BI tools may have more to offer. The created BSC was based on desire for information by several managers. Once the BSC is translated to a BI tool with the necessary dashboards and presentation of information, the use of the tool can be monitored to measure how actively the information is used. This can answer questions about whether or not the managers actually use the information they asked for.

This tool however, is still the first step. The next step, towards performance management, still has to be taken.

PERFORMANCE MANAGEMENT

For performance management, Landstede can learn from Clusius College, and define threshold values for all KPIs. With every KPI visualized in the right way, a quick

inventory of state is possible. A manager can take a look at the BI tool, and quickly notice for which KPIs the school is performing well, and for which it is not. An even more drastic approach can be taken, by designing the BI tool such that it automatically and actively warns managers when certain thresholds are breached.

Whichever path is taken, from there on, it is up to the manager to interpret the values and take appropriate action, or in other words: using performance measures for performance management. In doing so, a careful approach should be taken by management, to learn from the advice of Storey (2002). It could help that the BSC that forms the basis for performance management, was created using input from employees throughout the organization.

DISCUSSION AND CONCLUSION

In this section, the validity of results will be discussed, conclusions drawn and recommendations made. By drawing conclusions, the last step of data analysis following Miles and Huberman (1994) will be fulfilled.

VALIDITY OF RESULTS

As the sample in this research was taken after recommendation by one person, using expert sampling, the validity of the results is uncertain. However, measures were taken to increase validity. For example, results were checked with respondents and changed where necessary, to reduce researcher bias. The results were compared with a similar case both to check the results and to increase transferability of the results.

GENERALIZABILITY OF RESULTS

After comparing the results at Landstede to those at a similar school and the theoretical framework, the resulting BSC should be generally applicable to other schools. All in all, most of the KPIs on the final BSC seem to be of general interest. One needs to keep in mind however, that the BSC should always be adapted to the organization in which it is used. The general BSC can provide a solid basis, but it needs to be adapted within the organizational context, for example to fit the vision and strategy of a specific organization. The adapted BSC can then be used for performance management with a BI tool, keeping in mind that it needs to be updated, as we learned from Choong (2014) that

performance measures should continuously be updated to make sure it still fits the organizational context, and the needs of the managers. This can either be done by updating the BSC, or by tracking the use of a BI tool to filter exactly which measures are often used, and which information can be used most effectively.

CONCLUSIONS & RECOMMENDATIONS

Deriving from the results and analysis, several conclusions can be drawn from the research.

BI tools can help to improve the provision of management information in education, as the information can be presented in more flexible ways, and can be continuously and automatically updated. However, it is still advisable to think of ways to actively present information to managers. The freedom of accessing management information could invite sloppiness, which is not possible in the more traditional approach of a management reporting cycle.

BI offers opportunities for more effective presentation of information, creating new opportunities to combine data sources to create new information.

Using the aforementioned possibilities, BI tools are capable of presenting information in a more flexible way, and can be used for a more active approach in performance management.

Another way to create new information is by using available data to predict trends, which aids effective performance management.

Effective performance management is also aided by setting threshold values, which help to present the most imminent information.

So ultimately, BI can be used for performance management in education. However, it is important to realize that BI offers the means, not the ultimate solution. Therefore, the right tool must be used, and proper research should show which information to present and in which way.

LOOKING FORWARD

The possibilities shown in this research are interesting, but they also raise new questions. Can a model school really be created? Is it possible to correctly implement a BI tool, based on the BSC presented in this research?

Once this is established, further research could be done into further developing the BI tool for performance management. Is the presented information actually used by managers? And which performance measures can be used most effectively for performance management - or in other words, are all KPIs presented here truly KPIs? Until such questions are answered, we can only hope that this report helps to improve education.

BIBLIOGRAPHY

- Assunção, M. D., Calheiros, R. N., Bianchi, S., Netto, M. A. S., & Buyya, R. (2015). Big Data computing and clouds: Trends and future directions. *Journal of Parallel and Distributed Computing*, 79–80, 3-15. doi:<http://dx.doi.org/10.1016/j.jpdc.2014.08.003>
- Azis, A. M., Simatupang, T. M., Wibisono, D., & Basri, M. H. (2014). Business school's performance management system standards design. *International Education Studies*, 7(3), 11-21. doi:10.5539/ies.v7n3p11
- Bhagwat, R., & Sharma, M. K. (2007). Performance measurement of supply chain management: A balanced scorecard approach. *Computers & Industrial Engineering*, 53(1), 43-62.
- Bhattacharjee, A. (2012). *Social Science Research: Principles, Methods, and Practices*.
- Bititci, U., Garengo, P., Dörfler, V., & Nudurupati, S. (2012). Performance measurement: Challenges for tomorrow*. *International Journal of Management Reviews*, 14(3), 305-327.
- Branderhorst, E. M. (2005). *Wat is er mis met MIS?* (PhD Dissertation), University of Twente, Enschede.
- Casserly, M. D. (2011). Seriously data-driven decision making. *Phi Delta Kappan*, 93(4), 46-47. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-83155172677&partnerID=40&md5=1874b582ffb33fd222938fae4bf4a9dd>
- Choong, K. K. (2014). Has this large number of performance measurement publications contributed to its better understanding? A systematic review for research and applications. *International Journal of Production Research*, 52(14), 4174-4197.
- De Stentor. (2014, 5 December 2014). Gebrekkig bestuur onderwijsconcern Landstede Zwolle. *De Stentor*.
- De Stentor. (2015a, 2 July 2015). Inspectie: positieve omslag bij Landstede. *De Stentor*.
- De Stentor. (2015b). Landstede nog lang niet uit geldzorgen *De Stentor*.
- Floridi, L. (2005). Is semantic information meaningful data? *Philosophy and phenomenological research*, 70(2), 351. Retrieved from <http://sfx.utwente.nl:3210/prod?sid=google&auinit=L&aulast=Floridi&atitle=Is%20semantic%20information%20meaningful%20data%3F&id=doi%3A10.1111%2Fj.1933-1592.2005.tb00531.x&title=Philosophy%20and%20phenomenological%20research&volume=70&issue=2&date=2005&spage=351&issn=0031-8205&openurl=http%3A%2F%2Fsfx.utwente.nl%3A3210%2Fprod%3Fsid%3Dgoogle%26auinit%3DL%26aulast%3DFloridi%26atitle%3DIs%2520semantic%2520information%2520meaningful%2520data%253F%26id%3Ddoi%253A10.1111%252Fj.1933-1592.2005.tb00531.x%26title%3DPhilosophy%2520and%2520phenomenological%25>

[20research%26volume%3D70%26issue%3D2%26date%3D2005%26spage%3D351%26issn%3D0031-8205&disable_directlink=true&sfx.directlink=off](http://dx.doi.org/10.1016/j.compind.2005.03.001)

- Folan, P., & Browne, J. (2005). A review of performance measurement: Towards performance management. *Computers in Industry*, 56(7), 663-680. doi:<http://dx.doi.org/10.1016/j.compind.2005.03.001>
- Giorgi, A. P., & Giorgi, B. M. (2003). The descriptive phenomenological psychological method.
- Heijnsdijk, J. (1994). *Vitale organisaties: integratie van organisatie- en informatiekunde* (4th print, 2000 ed.). Groningen: Wolters-Noordhoff.
- Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design science in information systems research. *MIS Quarterly*, 28(1), 75-105.
- Hsinchun, C., Chiang, R. H. L., & Storey, V. C. (2012). BUSINESS INTELLIGENCE AND ANALYTICS: FROM BIG DATA TO BIG IMPACT. *MIS Quarterly*, 36(4), 1165-1188. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=bsh&AN=83466038&site=ehost-live>
- IBM. (2011). The 2011 IBM Tech Trends Report: The Clouds are Rolling In...Is Your Business Ready? Retrieved from <http://www.ibm.com/developerworks/techtrendsreport>
- Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard--measures that drive performance. *Harvard Business Review*, 70(1), 71-79. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-0026494564&partnerID=40&md5=0eb367a57bc0f2e41d4571d425b2b36c>
- Kaplan, R. S., & Norton, D. R. (2005). The Balanced Scorecard: Measures That Drive Performance. (cover story). *Harvard Business Review*, 83(7/8), 172-180. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=bsh&AN=17602418&site=ehost-live>
- Kennisnet. (2010). Managementinformatie aan het stuur.
- Kennisnet. (2011). Van managementinformatie naar stuurinformatie.
- Kennisnet. (2015). Vier in balans-monitor 2015.
- Keuzegids. (2015). Keuzegids Mbo 2015: de gebruikte gegevens. Retrieved from <http://www.keuzegids.org/p1453>
- Lapa, J., Bernardino, J., & Almeida, A. (2015) Commercial business intelligence suites comparison. Vol. 353. *Advances in Intelligent Systems and Computing* (pp. 237-246).
- Lebas, M. J. (1995). Performance measurement and performance management. *International Journal of Production Economics*, 41(1-3), 23-35. doi:[http://dx.doi.org/10.1016/0925-5273\(95\)00081-X](http://dx.doi.org/10.1016/0925-5273(95)00081-X)
- Liss, J. M. (2013). Creative destruction and globalization: The rise of massive standardized education platforms. *Globalizations*, 10(4), 557-570.

- Mancebón, M. J., Calero, J., Choi, Á., & Ximénez-De-Embún, D. P. (2012). The efficiency of public and publicly subsidized high schools in Spain: Evidence from PISA-2006. *Journal of the Operational Research Society*, 63(11), 1516-1533. doi:10.1057/jors.2011.156
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.
- Miller, G. A. (1956). The magical number seven, plus or minus two: some limits on our capacity for processing information. *Psychological review*, 63(2), 81.
- Otley, D. (1999). Performance management: a framework for management control systems research. *Management Accounting Research*, 10(4), 363-382. doi:<http://dx.doi.org/10.1006/mare.1999.0115>
- Peng, Y., Wang, S., & Zhuang, L. (2008). *Balanced Scorecard-based Management System for Performance Evaluation of Organizations*. Paper presented at the Third International Conference on Pervasive Computing and Applications, 2008. ICPCA 2008.
- Rijksoverheid. (2015a). Inspecties. Retrieved from <http://www.rijksoverheid.nl/ministeries/ocw/organisatie/organogram/inspecties>
- Rijksoverheid. (2015b). Schooltijden en onderwijstijd. Retrieved from <http://www.rijksoverheid.nl/onderwerpen/schooltijden-en-onderwijstijd/normen-onderwijstijd>
- Rimar, S., & Garstka, S. J. (1999). The 'balanced scorecard': Development and implementation in an academic clinical department. *Academic Medicine*, 74(2), 114-122. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-0033050919&partnerID=40&md5=c66dc6943e5522d63bf5e1c220bdc774>
- saMBO-ICT. (2015). Gebruikersgroepen. Retrieved from <https://www.sambo-ict.nl/gebruikersgroepen/>
- Seidel, C. (2014). Inzicht in onderwijskwaliteit. Retrieved from <http://www.infotopics.nl/infotopics-tableau-blog/entry/inzicht-in-onderwijskwaliteit>
- Simons, R. (2010). Stress-test your strategy: The 7 questions to ask. *Harvard Business Review*, 88(11), 93-100.
- Sousa, C. A. A., De Nijs, W. F., & Hendriks, P. H. J. (2010). Secrets of the beehive: Performance management in university research organizations. *Human Relations*, 63(9), 1439-1460. doi:10.1177/0018726709357083
- Storey, A. (2002). Performance management in schools: Could the Balanced Scorecard help? *School Leadership and Management*, 22(3), 321-338. doi:10.1080/1363243022000020435
- Taticchi, P., Tonelli, F., & Cagnazzo, L. (2010). Performance measurement and management: A literature review and a research agenda. *Measuring Business Excellence*, 14(1), 4-18. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-77949318504&partnerID=40&md5=1a7453e93e27794e4f7874a277dba4c8>

- Tohidi, H., Jafari, A., & Afshar, A. A. (2010). Using balanced scorecard in educational organizations. *Procedia - Social and Behavioral Sciences*, 2(2), 5544-5548. doi:<http://dx.doi.org/10.1016/j.sbspro.2010.03.904>
- Wijnhoven, F. (2011). *Information services design: A design science approach for sustainable knowledge*: Routledge.
- Wolfswinkel, J. F., Furtmueller, E., & Wilderom, C. P. M. (2013). Using grounded theory as a method for rigorously reviewing literature. *European Journal of Information Systems*, 22(1), 45-55. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-84870279555&partnerID=40&md5=1694a8d3dd91f44978a0dd0180ff1ff6>
- Yeoh, W., & Koronios, A. (2010). Critical success factors for business intelligence systems. *Journal of Computer Information Systems*, 50(3), 23-32. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-77953017675&partnerID=40&md5=1c61f726334f6166f8aa79d4f25db51b>
- Yu, M. L., Hamid, S., Ijab, M. T., & Soo, H. P. (2009). The e-balanced scorecard (e-BSC) for measuring academic staff performance excellence. *Higher Education*, 57(6), 813-828.
- Zeng, L., Li, L., & Duan, L. (2012). Business intelligence in enterprise computing environment. *Information Technology and Management*, 13(4), 297-310. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-84868659656&partnerID=40&md5=d8525012d225f1aa05652f08bca037e0>
- Zhou, N., Wang, H., Han, X., & Zhang, X. (2010). *Constructing performance management information system for academic staff: A model for research-intensive universities*. Paper presented at the Proceedings of the International Conference on E-Business and E-Government, ICEE 2010.

APPENDICES

APPENDIX I: OVERVIEW OF RESPONDENTS

Respondent #	School within Landstede Group	Type of education offered at location	Position
01	Zwolle – Rechterland	Secondary / Vocational	CEO
02	Zwolle – Rechterland	Secondary / Vocational	Controller
03	Harderwijk B	Vocational	Director
04	Harderwijk B	Vocational	Employee planning & control
05	Zwolle C	Vocational	Director
06	Zwolle C	Vocational	Organizational manager/teacher
07	Ichthus College Kampen	Secondary	Director
08	Ichthus College Kampen	Secondary	Team leader
09	Groene Welle Zwolle & Clusius College	Secondary & Vocational	Employee resp. consultant planning & control

The literature review was done using Scopus as the main search engine. When unavailable through University of Twente, articles were sought using Google Scholar, which yielded several otherwise unavailable articles. Forwards citations were checked using Google Scholar.

PERFORMANCE MANAGEMENT

- searched for keywords: „performance management“ in social sciences & humanities
- selected document types: article and review
- sorted by number of citations
- selected top 5 articles dealing with definitions of performance management by reading abstracts
- to include recent literature: limited search to articles published 2010-2014
- selected top 2 relevant articles from abstracts

PERFORMANCE MANAGEMENT IN SCHOOLS

- Scopus: “performance management” AND professional [keywords]: 150 results,
- quick scan: no relevant results in top hits.
- Narrowed down to “Business, Management and Accounting” library, 24 results.
- Scanning titles and abstracts, 2 relevant results. Zhou et al. (2010) and Sousa et al. (2010).
- “performance management” AND school [keywords]: 44 results;
- many too narrow case studies; good results: Ploom (2013), Azis (2014), Mancebon (2012), Brown (2005). Ploom, Brown unavailable.

WHAT IS BUSINESS INTELLIGENCE?

Possible search term: decision support systems (DSS)

- searched for keywords: „Business Intelligence“ in social sciences & humanities
- selected document types: article and review
- sorted by number of citations
- selected top 3 articles dealing with definitions of performance management by reading abstracts
- to include recent literature: limited search to articles published 2010-2014
- selected top 2 relevant articles from abstracts

BI in education

- Business AND Intelligence: 3511 results
- 2 relevant articles found from abstracts in top 10 results

- Business AND Intelligence AND professional: 129 results
- 1 relevant result found from abstracts

BI Tools

- Business AND Intelligence AND tool (2356 results)-> recent results: Lapa (2015)
- Balanced AND scorecard AND school (52 results) -> Alamaelu (2014) no access; Pereira (2012) no access; Tohidi (2010); Story (2002); Rimar (1999)
- Balanced AND scorecard AND education (164 results) -> Chen (2006);

WHAT ARE KEY PERFORMANCE INDICATORS?

- searched for keywords: „key performance indic*“ OR KPI in social sciences & humanities
- selected document types: article and review
- sorted by number of citations
- selected top 3 articles dealing with definitions of performance management by reading abstracts
- to include recent literature: limited search to articles published 2010-2014
- selected top 2 relevant articles from abstracts

FORWARDS citations

Taticchi (2010): Bititci (2012); Massaro (2015) – no access

Casserly (2011): Liss (2013)

Tohidi (2010): no relevant results

Storey (2002): Yu (2009)

Foland & Browne (2005): Bititci (2015)→ Choong (2013), De Lima (2013)

The educational institution Landstede Group originated as a community college focusing on vocational education in several sectors, based in Zwolle, Netherlands. Over the past decade, several mergers led to an addition of several schools for secondary education. Furthermore, the group recently expanded to include commercial services such as a daycare and second hand-stores. However, the interest of this research is performance management in schools, and therefore the focus will be purely on the public school divisions of Landstede Group.

All in all, the dealings of the past decade have led to an organization with over 130 different locations and several management layers. In terms of education, a clear distinction can be made within the group between high schools and community colleges, both serving approximately 11.000 students each. However, as the result of merger upon merger, the educational part of Landstede Group is divided not in two, but in four separate foundations.

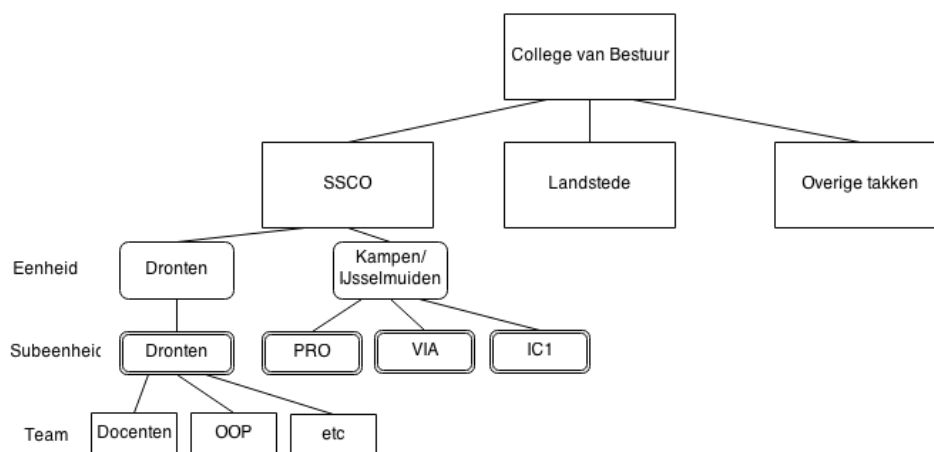


Figure 3 - organogram showing part of Landstede's complex structure

Within the four foundations, reporting basically happens on three levels. Top-down, these levels are: 1) unit (eenheid); 2) sub-unit (subeenheid); and 3) team. Ultimately, the unit manager reports to the board of directors. These reporting levels are most easily understood from the organizational chart (Figure 3). Therefore, part of the organization chart is shown here.

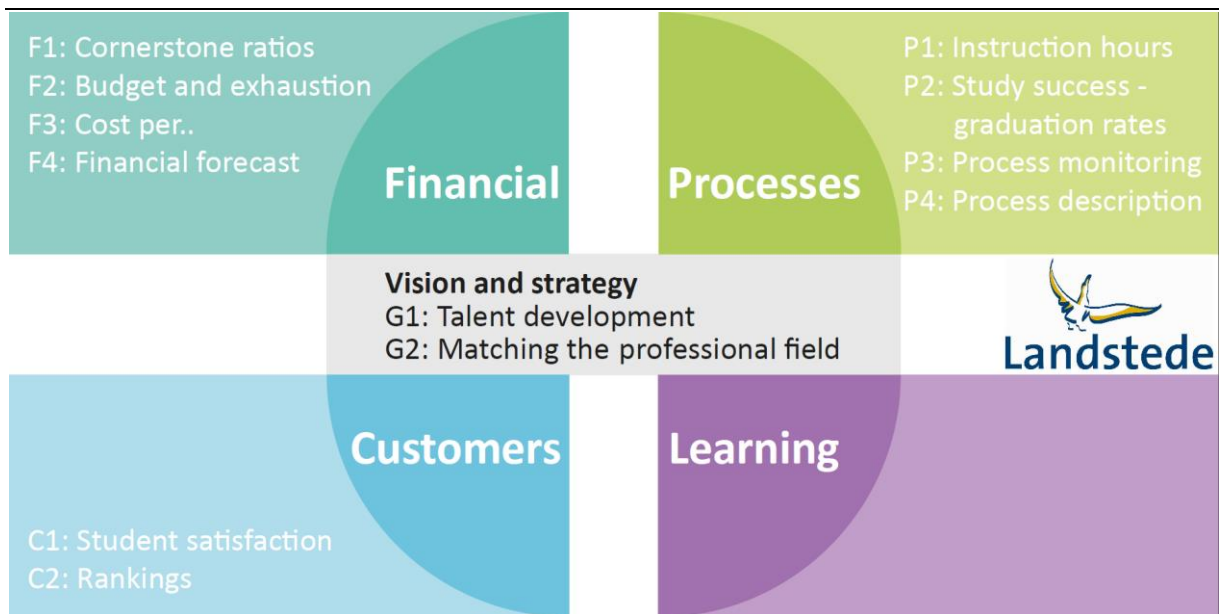
RECENT MANAGEMENT ISSUES

Landstede Group has recently been under stricter supervision of the education inspectorate, due to bad management (De Stentor, 2014). Two out of three members of the Executive Board left in 2014, and a new Chief Executive Officer was appointed. This new CEO had a clear focus on improving business operations, having clear responsibilities in management and following official rules and procedures. Only after these changes in management did the inspectorate regain trust in the future of Landstede Group (De Stentor, 2015a, 2015b).

The design science guidelines described by Hevner et al. (2004), shown as summarized by Wijnhoven (2011).

<i>Guideline</i>	<i>Description</i>
Guideline 1: Design as an Artifact	Design science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem Relevance	The objective of design science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

APPENDIX V – THE BALANCED SCORECARD FOR LANDSTEDE



Results found from reduced data at Landstede

Using BI for operational performance management in schools

University of Twente and Landstede Group Zwolle
Jelte Folkertsma – s1467131

Business Intelligence has recently been a hot topic in management information system-focused literature. MIS Quarterly, the journal with the highest impact factor in information management,⁵ dedicated a special issue to this topic as recently as December 2012, in which Hsinchun, Chiang, and Storey (2012) prove that the topic has gained a lot of interest since the turn of the millennium. As the authors say:

Through BI&A 1.0 initiatives, businesses and organizations from all sectors began to gain critical insights from the structured data collected through various enterprise systems and analyzed by commercial relational database management systems.

The article describes the basics of Business Intelligence & Analytics (BI&A) and analyses recent studies in the field, showing that BI&A is a topic that has been gaining interest quite quickly over the past decade. This is further backed up by, for example, the Tech Trends Report by IBM (2011), which states that Business Analytics is one of the four major trends in technology in the current decade.

While the aforementioned article focuses on the academic world in general, Business Intelligence and Business Analytics are especially relevant within schools. As government-funded organizations, schools need to properly govern themselves. Following the conclusions of Branderhorst (2005), the management of information within the educational setting is of utmost importance. The government demands certain goals to be met by any school, but also students, parents and the public in general have high demands for schools. According to Branderhorst, Management Information Systems were not put to best use in Dutch schools in 2005 – and now, 9 years later, not much evidence can be found of schools doing much better. It would therefore be relevant to research how a school can best use their management information systems, to set up a ‘best practice-school’ for others to follow. In the United States, Key Performance Indicators for schools have been defined, as described by Casserly (2011). These KPIs can be used to use the school’s Business Intelligence most effectively. A similar research for schools in The Netherlands cannot be found. This is clearly a lack in academic literature.

⁵ According to the Thomson Reuters 2013 ranking

The educational institution Landstede Group is a result of several mergers of (groups of) secondary schools, based in Zwolle, Netherlands. Furthermore, the group includes commercial services such as a daycare. This has led to an organization with over 130 different locations and several management layers/levels.

Because of all the mergers, the information systems for HRM, financial data etc. are diffuse across the group. The section of planning & control currently puts out monthly reports to the top management with data gathered from all these systems. These are to be replaced by a management board in the recently purchased software package Qlikview. At the same time, another unit is working on developing a data warehouse to combine all systems.

With all the possibilities to represent a wide variety of information in several ways, it is very important to assess which information is most relevant to present. Moreover, with the different management layers, it is important to assess which information should be available for which manager. This means that Landstede is currently a perfect institution for BI research.

Research design

In order for top management within schools to function most efficiently, they need to be presented with the most crucial information. Therefore the Key Performance Indicators need to be figured out, which can be used for performance management.

After a brief literature search, it becomes evident that the balanced scorecard as described by Kaplan and Norton (2005) may be a great tool to use in this research. The Balanced Scorecard looks at several indicators for performance, even if they may not seem obvious indicators at first sight. Either way, these should all be key performance indicators, which thus need to be defined for educational institutions in general and Landstede Group specifically. The challenge in this research is to design the balanced scorecard for an educational setting, and consecutively mapping that design to the most optimal use for Landstede BI. As Landstede is a school, BI could also be used to monitor academic performance of students. However, to keep the scope of this research at an acceptable level, the research will focus on the business operations rather than education.

Obviously, the research needs a literature review. This will be done following the method described by Wolfswinkel, Furtmueller, and Wilderom (2013). Firstly, a definition needs to be found in order to start properly, leading to the first research question:

1. What is performance management?
2. What is business intelligence?
3. What are key performance indicators?

After having this defined, a more narrow look should be taken at academic literature to find some answers to the following questions:

4. What information are schools required to provide?
5. What are key performance indicators within schools?
6. How does performance management in schools work?
7. What options does a school have to work with business intelligence?
 - I. Which tools are available for schools to use?
8. How can these tools be implemented within Landstede?

Research question

All smaller questions together should lead to an answer to the overhead question within this research:

How can a large school use business intelligence for operational performance management?

Data collection

With the institution at hand, a qualitative research design would probably be best. Landstede is not big enough an institution to create a sample big enough for a quantitative research. Furthermore, using a questionnaire may well focus too much on the existing situation, thereby limiting the possibility of improving the use of the Business Intelligence software. In interviews, managers can speak more freely about both the current situation and desires for future improvement.

The sample of people to be interviewed may consist of the following people:

- Experts on this topic (Branderhorst?)
- Top managers in the Landstede Group;
- Lower level managers in the Landstede Group;
- IT personnel involved in implementing Qlikview within Landstede Group;
- Managers from schools with proven 'best practices' in Management Information Systems;
- Representatives from software firms with rival software for Qlikview.

Project planning

Week	Work
36	Start of research project
36	Elaborating on research topic, research design
37-39	Literature search + review, setting up theoretical framework
45-48	Finalizing data collection method (interview questions? / determining sample / setting up meetings)
49-52	Data collection (interviews?) + start of analysis
1-3	Finalizing data analysis, writing manuscript
4	Revisions
5/6	Colloquium

Bibliography

- Branderhorst, E. M. (2005). *Wat is er mis met MIS?* (PhD Dissertation), University of Twente, Enschede.
- Casserly, M. D. (2011). Seriously data-driven decision making. *Phi Delta Kappan*, 93(4), 46-47.
- Hsinchun, C., Chiang, R. H. L., & Storey, V. C. (2012). BUSINESS INTELLIGENCE AND ANALYTICS: FROM BIG DATA TO BIG IMPACT. *MIS Quarterly*, 36(4), 1165-1188.
- IBM. (2011). The 2011 IBM Tech Trends Report: The Clouds are Rolling In...Is Your Business Ready? , 2014, from <http://www.ibm.com/developerworks/techntrendsreport>
- Kaplan, R. S., & Norton, D. R. (2005). The Balanced Scorecard: Measures That Drive Performance. (cover story). *Harvard Business Review*, 83(7/8), 172-180.
- Wolfswinkel, J. F., Furtmueller, E., & Wilderom, C. P. M. (2013). Using grounded theory as a method for rigorously reviewing literature. *European Journal of Information Systems*, 22(1), 45-55.

REFLECTION ON PROCESS

This research was conducted at Landstede Group. I was paired with a supervisor in the Personnel&Organization-team: the business architect, with a very broad academic background in Business Administration, Business Architecture and consultancy. At first, the research proposal was analyzed by the supervisor, and I started by further specifying the research proposal and focusing it on the Landstede setting. This also led to a narrower focus in the research topic: the focus now became purely on performance management, not including learning analytics.

This resulted in a specific project approach at Landstede:

Phase
1. Write theoretical framework
2. Translate theoretical framework to practical setting
3. Prepare interviews
4. Conduct interviews
5. Process/analyze interviews.
6. Compare analysis to theoretical framework
7. Submit report

Defining the theoretical framework turned out to be difficult. I was therefore offered a little help, picking the Balanced Scorecard as the leading academic construct. I could then focus on preparing the interviews, selecting and approaching the right sample of Landstede employees. Once the sampling was done, the interviews were quickly planned, with the desired respondents. The interviews and interview analysis were finished quickly. The last step in the process, turning the analysis into relevant conclusions and recommendations, again turned out to be difficult; however, with some help from supervisors, this was finally finished successfully.

The most important research question at Landstede was of a very practical nature: which KPIs should we present, to whom, in which way? The report written for Landstede was therefore much more practical and specific than the final research thesis. As this report was written specifically for use within the organization, the report was written in Dutch.

The difference was especially apparent in the KPIs, which were all described specifically for Landstede. An overview and explanation of the provided information for each KPI are given below.

The final advice how these KPIs can be used for performance management can be found in this final report.

LANDSTEDE REPORT – KPI FORMAT

KPI Title

Description: A specific description of the KPI.

Mentioned by: As mentioned before: Landstede is a large and complex organization, with several management layers. One part of the research question at Landstede was which information should be presented to whom. It was therefore relevant to know which information was desired by which manager.

How to measure: The desired information is formed from data. In this section, the data that is necessary to present the KPI is described. Furthermore, suggestions are given about the databases in Landstede where this information is stored; or otherwise, which data needs to be stored before the KPI can be presented.

Miscellaneous: This section contains all remarks from the researcher about the KPI; e.g. any additional observations from interviews, and interpretation of the importance.

How to visualize: Landstede already bought the BI tool Qlikview, and is planning to use this tool for presenting management information. Qlikview can present information in a very flexible way. Therefore a suggestion was made how to present KPIs. This included recommendations for presenting desired values, norms or threshold values, to easily compare the current situation to the desired situation.

To give an impression of the end result, the final presentation of the KPI 'Cost per' is shown as well.

Kosten per...

Omschrijving: Om verschillende delen (eenheden, teams, opleidingen, klassen, vakken etc.) van de instelling financieel met elkaar te kunnen vergelijken, is het praktisch om inzicht te hebben in de **kosten per leerling** van verschillende onderdelen van de organisatie. Hierbij gaat het niet alleen om geld: ook het aantal **fte per ..** en het aantal **leerlingen/studenten per ..** helpt bij het maken van een vergelijking. Deze gegevens kunnen gebruikt worden om te bepalen hoe rendabel elk deel van Landstede is.

Wie heeft dit genoemd: Breed gedragen, met verschillende specifieke wensen per niveau

Hoe meet je dit: Ook dit verschilt per niveau. Financiële gegevens komen uit Exact, gegevens over leerlingaantallen uit Magister, deelnemers uit Eduarte, fte uit Raet. Door de geavanceerde kostenplaatsindeling kunnen in elk geval relatief eenvoudig alle verschillende onderdelen in de kostenplaatsen met elkaar worden vergeleken.

Overig: Deze post kan op verschillende wijzen worden ingericht. Het kan puur als informatief systeem worden opgezet waarin iedere manager zelf door kan klikken en kan vergelijken. Het is ook mogelijk om een stoplichtsysteem in te bouwen, waarin overschrijding van bepaalde grenswaarden voor kosten per .. / fte per .. een waarschuwing geven. Op basis van de interviews is in eerste instantie vooral de eerste mogelijkheid gewild.

Hoe breng je dit in beeld: Bijvoorbeeld in staafdiagram, waarin (afhankelijk van het niveau waarop wordt gekeken) verschillende schooltypen / eenheden / teams / opleidingen met elkaar worden vergeleken.

