Retail Analysis Dashboards based on Point of Sale Information

MBA Thesis

A thesis submitted in fulfilment
of the requirements of the degree of

MASTER OF BUSINESS ADMINISTRATION
(International Business)

Certificate of the Mentor

Signature:…….

Mentor's full name:

Date:……

Faculty/School:……..

Declaration

I hereby do solemnly declare that the work presented in this thesis has been carried out by me and has not been previously submitted to any other University / College / Organization for an academic qualification / certificate / diploma or degree.

The work I have presented does not breach any copyright.

Signature: .....

Student's full name:

Date: .....

Faculty/ School: .....

Acknowledgement

Table of Contents

Abstract

Retailers are in the need of knowledge. Facts evaluating operational performance of point of sale (POS) activities are often time-consuming to prepare or simply lack. In search of setting oneself apart or one step ahead of competition, strategic information to support positioning and differentiation is mostly collected sporadically and isolated.

Dashboards, as a result of business intelligence (BI), aim towards providing meaningful and easy-to-grasp information out of a company's set up of information systems and massive data conglomerations. Dashboards are meant to provide knowledge by presenting key figures correlated with dimensions via well visualized and flexible analytical schemes.

Retailers, who implement, align and use state-of-the-art dashboards supported by steady management commitment can achieve strategic advantages in the following ways: First, performance becomes measurable and enables to evolve unique and optimized business processes. Second, companies can differentiate by turning analytics itself into their distinctive capability and aim towards making the smartest and fastest business decision possible.

It takes some steps to design an initial, status-quo-conform retail dashboard. As a start, an intensive benchmarking process has to be performed. It delivers a compilation of general dashboard fundamentals, such as its standard components, design principles, refresh mechanisms as well as POS-related key figures, dimensions, analysis techniques and methods to structure a retail dashboard. Additionally, predicted trends in BI, as for example, mobile BI or integration of buying power data should be contemplated when designing a retail dashboard.

But for all that, in order to fully utilize BI potential, retailers must not forget to adapt contents, fundamentals and the overall application of a POS dashboard to their individual, organizational direction. Ultimately, retailers should emerge towards further using their closeness to the customers by integrating own market research activities into their dashboards or by generally taking chances in innovative data collecting to combine them with BI.

List of Abbreviations

BI	Business Intelligence
BICC	Business Intelligence Competence Center
BSC	Balanced Scorecard
CRM	Customer Relationship Management
DWH	Data Warehouse
ERP	Enterprise Resource Planning
ETL	Extract, Transform, Load
IT	Information Technology
KPI	Key Performance Indicator
POS	Point of Sale
RFID	Radio Frequency Identification
SCM	Supply Chain Management
SKU	Stock Keeping Unit
SaaS	Software as a Service
VM	Visual Merchandizing

List of Figures

1 Introduction

"Do we sell more discount brands than quality brands since the beginning of financial crises? How is the proportional sales distribution of brands compared to previous times?"

"How are sales of XL jackets developing in East Asian countries and what is their stock quantity kept in stores? Do we have an adequate sell through rate?"

These scenarios are only two examples that could arise in businesses retail departments while discussing the enhancement of point of sale (POS) activities in order to boost sales or profit. Even though decisions and the actual process optimization which results from answers to such questions should be the time consuming task, retail controllers often need days to provide the analysis to these scenarios. Considering Gartner's 2009 retail research agenda which expects the store (POS) to be the dominant selling channel in the nearer future[1], it is decisive for retailers to continuously meet the customer desire. Product assortment, pricing, promotion and place (locating) need to be optimized rapidly leaving the retail back office no time for long lasting report "assembling".

Even though organizations use progressed ERP systems in all departments collecting precise data input, there is still a lack in providing meaningful and easy to use "data output" to non technical users in the need of information.

This master thesis deals with retail analysis dashboards, which are, among other things, today's solution to time consuming and manually prepared reports. Dashboards enable business users "[…] to measure, monitor and manage business performance more effectively"[2] by visualizing data and calculations via, for example, gauges, tables, charts or coloring and by providing selection as well as navigation possibilities. Technically, dashboards are automated information systems built up on a solid data integration infrastructure.

[1] Hung LeHong and others, *Key Issues and Research Agenda for Retail, 1H09* (Gartner, 2009), 2

[2] Wayne W. Eckerson, *Performance Dashboards* (Hoboken: Wiley & Sons, 2006), 10

The target of this master thesis is not only to demonstrate how dashboards can be useful in day-to-day situations of information deficits as described above. It is also, to highlight dashboards as enabler of performance measurement allowing the evolvement of optimized and exceptional business processes. Furthermore, this thesis aims to outline how a mature POS dashboard or the pursuit for extraordinary analytical capabilities can provide a retailer's basis for achieving a competitive advantage. Lastly, retailers shall be encouraged to be innovative in combining external subjects like research on market or customer trends with BI.

At the same time, the master thesis serves as a general guideline to reach a "default" set up of a dashboard on POS data. It presents general dashboard components as well as POS-related elements like common key figures, dimensions and analysis methods. Therefore, the thesis can be consulted by retail business units to formulate a requirements definition on retail dashboards.

The course of the master thesis is conducted as follows:

After the introduction, the second chapter in short describes barriers companies face nowadays when it comes to data and information management, outlines the role of business intelligence (BI) and exemplifies who benefits from overcoming information barriers.

The third chapter discusses retail BI to clarify what stands behind dashboards. It emphasizes the need to align BI to business objectives and reveals how analytical capabilities can become a strategic element.

Part four explains how retailers can benchmark the industry wide standard of POS dashboards, but, on the other hand, advises against straightly relying on them.

Then, an extensive fifth chapter describes a status-quo-conform POS dashboard and details its design, components, dimensions, key figures, analysis techniques and suggests a way to structure the retail dashboard.

Section sixth outlines suspenseful trends for "dashboarding". These can be fundamental for retailers in order to stay analytically competitive.

A conclusive seventh chapter explains and reveals why the integration of own market research activities into retail BI is recommendable and under what premises this can be conducted.

2 Challenges and Beneficiaries of Information Management

The aim of information management is to bring some sense and information content into an organization's "tangled mass" of data. This "post introductive" chapter explains why information management is indeed a challenge, it introduces the "tool" of BI to overcome this challenge and, after that, mentions those benefitting from "tidiness" of retail information.

2.1 Common Challenges in Information Management

Companies constantly increase their reliance on enterprise systems which rapidly leads to a collection of enormous data amounts. All internal and external interactions, budgets, historical transactions or market data are entered into systems for further operation and access. Despite all the available data, it is still a challenge for managers or analysts to get ad hoc insight into essential business information.

Typically, enterprise wide systems differ in holding for example one or more POS systems, one or more traffic count systems, a central ERP system, a planning system and connections to third parties. Within each system, information might be stored in different formats and semantics might vary. Therefore, simply acquiring and afterwards accessing standard consolidated reporting applications that match on every company's system landscape while simultaneously fulfilling individual objectives, strategies and urgent business information is not possible.

The "science" or tools that enable companies specific and system-wide data integration and thus enable "management" across data is called business intelligence (BI) or BI tools, respectively.

2.2 The Function of Business Intelligence

"Business intelligence consists of the processes, tools and technologies to turn data into information and information into knowledge […]"[3]. Yet, the path

[3] Wayne W. Eckerson, *Performance Dashboards* (Hoboken: Wiley & Sons, 2006), 49

to reach “knowledge“ is long and difficult due to integration scenarios and the adaption of standard BI software to a company’s individual conditions.

The technical challenge within BI lies in the collection and extraction of key data from different source systems and its reasonable organization and transformation. Thereby, data passes several physical storage layers while being aggregated into data store objects. Such technical framework, often called data warehouse, is an indispensable foundation within BI requiring specialized knowledge of software packages and interface programming.

As a further component of BI, dashboards or cockpits which set up on the data warehouse foundation are the information edge to the user. Besides dashboards, further front ends such as static reports or printed lists could be used. However, because of interactivity, flexibility, visual elements or fast response times, dashboards represent today’s most innovative interface, operable even for casual business users.

Dashboards in the way they are designed today are significant as they finally present plentiful, contextual, even playable information absent from any technical constraints. This is of immense importance, since at the road’s end, it is the (non-technical) business that analyzes, derives knowledge and thereof initiates effective business activities. Accordingly, analytics represent the final stage of BI.

2.3 Beneficiaries of a Retail Analysis Dashboard

Generally analysis dashboards represent an information base to business units whose employee teams strive to drive analysis, performance management and sales. A dashboard intends to prevent situations such as non-advancements and frustration when analysts have certain ideas about a scenario to examine or managers request overviews on certain KPIs. Conclusively, the main beneficiaries are business unit professionals and managers in order to analyze, research or make fact based decisions.

Within retail the following business processes are the focus for being optimized by the use of analytics: Store operations, merchandise assortment planning, retail controlling, location management, customer loyalty and supplier assessment, if prioritized.

For example, the store manager would make use of a retail dashboard as he or she could derive measures from a customer frequency or best seller analysis such as changing the shop floor design or outlay. A strategic buyer using a “Merchandise Assortment Planning Software” needs input of an integrated retail dashboard for being able to achieve the lowest possible inventory while enabling the customer to find every product on the outlay. Likewise, the location manager uses analytics to choose the best locations to open up point of sales, the CRM manager utilizes customer data to identify loyal and profitable customers and the retail controller rapidly finds his profit or contribution margin in the dashboard.

On strategic level retail managers make use of dashboards in the way that subordinates provide information faster or by using aggregated views of dashboards themselves. Still, the precondition enabling to benefit from dashboards and analytics is, that managers “have enough commitment to analytics to develop the idea further”[4] and support all phases that are needed to realize BI.

[4] Thomas H. Davenport and Jeanne G. Harris, *Competing on Analytics* (Boston: Harvard Business School Publishing, 2007), 16

3 Strategic Drivers for Retail BI

BI competencies and, thus, analytical abilities can result in distinctive strategic benefits for organizations. Before elaborating why, how and on which premises retail BI can lead to strategic advantages, the first step in this chapter is to clarify the term of retail business.

3.1 Definition of Retail

Retailing is carried out by companies that sell products to final customers. These companies can either be retailers who purchase goods from other organizations, such as for example Macys, Peek and Cloppenburg (apparel), Carrefour (food) or Obi (hardware) or manufacturing companies who incorporate retailing in their own distribution structure, such as for example H&M, Esprit (apparel) or LEGO (toys). Retailing comprises services associated to the sale of goods but usually does not include any transformation of the goods. Services in retailing include all tasks concerning "4Ps" as, for example, merchandise assortment planning, pricing, sales advising, visual merchandising, advertisement or stock keeping.

From a supply chain perspective retailers carry out the last step in the distribution of products. From the marketer's perspective, retailers are closest to the customer. This advantage of being at the customer "front" entails the opportunity to better measure and research customer behavior and market trends than a producer or supplier who is further behind in the supply chain. Retailers have the possibility to directly collect information at the point of sale and have hereby developed potential in recent years. This has been demonstrated by inventions such as loyalty cards, traffic counting, (additional) ecommerce shops, customer surveys or "intelligent fitting rooms". By properly using extended analytics or business intelligence on the gathered data, retailers are better able to effectively interact with customers, derive appropriate market strategies or align and optimize business processes. Beyond striving for differentiation within these named functions, the smart management of POS analytics itself can either support or constitute strategic differentiation.

3.2 Gaining a Competitive Advantage through BI

In order to differentiate from market rivals, companies strive to acquire or sustain their competitive edge. This part outlines how an analytical mind set can shape such competitive edge, which premises a company has to implement to successfully compete on BI and why, after all, analytical based decisions do cut the mustard!

3.2.1 Analytics as Distinctive Capabilities

Today's situation on the consumer market is a hard one. For the time being, it is unsettled by the current economic recession leading people to economize and be more thoughtful and selective when it comes to spend money. Then, there is the general "redundancy" on the market meaning that many companies sell similar products with similar price ranges, use equal manufacturing technologies or offer the same service quality. Due to high competition, price pressure is high and the leeway for product differentiation is marginal. Retailers are forced to differentiate by business process optimization.

In their book "Competing on Analytics" Davenport and Harris (2007) argue, that what is left as a basis for competition and stands behind all process optimization is to make the smartest and fastest business decision possible[5]. Since fact based decisions must be founded on good business intelligence, companies can differentiate by turning analytics into their distinctive capability. BI or analytics are the enabler to evolve unique or best-in class business processes. Being best, fast and distinguishing by possessing a wide (or very specialized) pool of extensive, integrated data, statistical methods and quantitative analysis and, above all, knowing how to use these analytics can develop a unique business process capability that enables a company to achieve a competitive advantage in its market position.

The following passage demonstrates two examples of retailers who "intelligently" use analytical competencies and thereby can set themselves off by high-performing operations:

[5] Thomas H. Davenport and Jeanne G. Harris, *Competing on Analytics* (Boston: Harvard Business School Publishing, 2007), 9

India's most popular department store chain "Shoppers Stop" represented by 13 stores all over India refuses to build up store stock. Instead, stock matching algorithms setting up on detailed POS data run daily at 10:30 and ensure replenishment from central warehouses. Shoppers Stop uses analytical or BI capabilities to minimize tied-up capital and to maximize sales floor while ensuring product availability.[6]

Another very advanced player using analytical capabilities is Starbucks Coffee. All of Starbucks strategic moves base on a sophisticated use of analytics. Its successful inner-US expansion strategy that obviously adapted the radius every customer needs to go to reach a Starbucks directly proportional to the population density of the area the customer lives in, could not have been realized without the application of geographic and demographic analysis. A different, more specific example of how Starbucks makes use of analytics is behind its selective sale of music. By analyzing CD sales on shop level, together with customer's email requests on the music played, Starbucks is able to evaluate if customers agree with their music. The company is able to derive small measures to improve the relaxing and pleasant atmosphere in their cafés as well as to acknowledge and adapt to local preferences. [7]

Both of the mentioned companies provide the impressions to be one-of-a-kind. However, it is not their business processes that truly characterize these retailers. It is their analytical practices and BI capabilities enabling them to reach a persistent competitive differentiation. Their competitive advantage - or at least one of it - is their analytical capability.

The expectations among retailers who invest in BI and analytics respectively are high. According to a 2006 study on BI in Retail the common business process capabilities retailers strive to optimize by applying business intelligence are:

1. **The need for a more rapid response to consumer demand**
2. **To become more operationally efficient**

---

[6] Jonathan Reynolds and Christine Cuthbertson, *Retail strategy. The view from the bridge*, (Oxford: Elsevier Butterworth-Heinemann, 2004), 270-274

[7] *Starbucks' growth strategy: locations, locations, locations,* Washington Post, 3 September 2002. Retrieved on 30 April 2009 from http://www.sptimes.com/2002/09/03/Business/Starbucks__growth_str.shtml

3. **To mange demand across multiple channels**
4. **To improve store performance**
5. **To stern the tide of price deflation and eroding gross margins**[8]

This demonstrates that retailers seek to improve operations and put high expectations in BI. Yet, it is crucial to understand that there is a difference between striving for analytical competition and using statistics functionally or purpose oriented. It is a difference whether a retailer implements an integrated analytical approach which is visible and perceptible for executives, shareholders and customers or if a retailer has some BI tool installed in order to, for example, display and evaluate best sellers by its contribution margins.

Generally, both approaches help to become more efficient, either within a small, particular scope or within an overall strategic extend. Nevertheless, the focus in this chapter is to emphasize that analytical capabilities can contribute to or constitute a retailers competitive advantage.

3.2.2 Key Attributes of Analytical Competitors

The next question arising is if every retail company suits to build up substantial analytical competencies or what would be the prerequisites to achieve them. Davenport and Harris (2007) found several key aspects companies should hold in order to qualify as "analytical competitor"[9]. Those will be outlined an exemplified in the following passages:

Analytics to Support Strategic, Distinctive Capabilities

A distinctive capability is what an organization considers as its attribute setting it apart from other market players. Having one or several strategy aligned business processes or practices making up a company's distinctive capabilities are a prerequisite to compete on BI. Without them there are no definite "pathways" to boost and optimize through extraordinary analytical capabilities.

---

[8] Greg Belkin, *Business Intelligence in Retail*, (Boston: AberdeenGroup Inc, 2006), 3

[9] Thomas H. Davenport and Jeanne G. Harris, *Competing on Analytics* (Boston: Harvard Business School Publishing, 2007), 23 -57

For “analytical competitors”, performance measurement on critical business processes is the primary focus. However, it is essential that a company’s method of dealing with measures and figures is innovative in itself. It is not enough to exploit existing reports or KPIs. Companies need an explorative mindset to go through the data, to dig into them, to rearrange structures or dimensions, to derive new figures while keeping in mind the primary analytical target which are the business processes that make a difference. [10]

An enterprise level Approach to and Management of Analytics

The readiness of a business for becoming analytical-centric depends on its overall attitude towards analytics and its willingness to integrate them at every significant aspect. Analytics should not be assigned to one group or several isolated analysts, they must be managed commonly across the organization. Realizing a common information management implies that central analyses are broadly accessible throughout the company. Information availability and broadcasting can be based on a company-wide requirements assessment. The result retrenches employees’ barriers to information gathering, stops them from preparing individual, fault-prone spreadsheets and drives a “fact based” way of thinking. Data and analytics must be handled effectively; facts should not be derived from too limited data sets, but from data that are correct and bore several perspectives. After all, analytical competitors need to build up the underestimated capability to take changing measures from “diagnostics”. Project teams must know how to develop methods and take actions, how to initiate and successfully go through projects while focusing on the target process and monitoring its underlying analytics.

A further important aspect is the organizational structure behind managing key analytics: Who is responsible for architecture, development, administration, roles, support, training or promotion of analytics? There are several approaches, for example to establish a separate IT team or built up an analytical service unit. Yet both ways bring about dangers. One is a too technical driven BI approach and the other could be an IT excluding

[10] Notice: A general approach on aligning BI to a retailer’s strategy can be found in chapter 3.3. However, in that case strategic alignment of BI will not aim on becoming an analysis driven market leader but to generally support strategy with appropriate information.

approach leading to less functionality and, thus, less efficiency. According to SAS Institute, Gartner and Information Management Magazine (2007), organizations should establish a BI Competence Center (BICC) that "[…] comprises cross-functional teams from IT and business."[11] BICCs are considered as optimal to support "the goal […] to shift the organization from data reporting to analytical insight."[12]

Senior Management Commitment to Analytics

An organization holding a culture of analytical based management must, of course, be run by senior executives who commit to analytics and empirical decision making. Being led by personalities who, most of the time, come to decisions based on their instincts or experience does not encourage a company wide culture praising analytics. Such culture requires executives who are willing to immerse into BI applications and general analytical methodologies and who are able to share discussions with quantitative specialists. They must bring a constant energy to push others to think and proceed analytically. By demonstrating and challenging the mindset of "Do we think this is true? Or do we know? "[13], they expect and direct team leaders and members to substantiate their concepts and ideas by facts.

In addition, BI-dedicated executives acknowledge and support the necessity to invest in manpower, software, trainings and hardware. Above all, they are aware of the time it takes to evolve and adapt a BI driven approach. Thus, acceptance exists to set up long term plans comprising years to grow towards turning into an analytical competitor.

Large Scale Ambitions

The scale, amount, and the quality of deliverables from analytical initiatives should be great enough to influence the fortune of the business. BI driven

---

[11] IM Editorial staff, "SAS Study reveals BI Competency Centers are Key to Effective Information Management", *Information Management Online*, 25 April 2007 (Brookston: Information Management and SourceMedia, Inc). Retrieved on 28 April 2009 from http://www.information-management.com/news/1082213-1.html

[12] Peter Graham, "Organizational Considerations for Information Empowerment", *Information Management Magazine*, 1 June 2008 (Brookston: Information Management and SourceMedia, Inc). Retrieved on 28 April 2009 from http://www.information-management.com/issues/2007_48/10001347-1.html

[13] Thomas H. Davenport, "Competing on Analytics", *Harvard Business Review, Special Issue on Decision Making* (January 2006), 98-112

companies should strive for notable incentives, first, by systematically refining and setting apart business processes, but, above all, by targeting measurable, monetary enhancements. These can be cost savings, increased revenues, profit, customer retention or market share, all leading back to raised efficiency.

In summary, analytical competitors must set themselves high, measurable targets and bring about a passionate ambition to achieve them.

Out of all four characteristics, there is none that can objectively be regarded as the most important. Of course, companies vary in their opinion on this matter due to different, initial strength and weaknesses, organizational cultures or habits.

Yet, one thing is certain, to-be analytical competitors have to accept and commit to the following - fifth - aspect: All four characteristics are interdependent. In order to become a successful analytical "locomotive" on the market, organizations cannot succeed by only partially following these principles.

3.2.3 The Adequateness of Analytical Based Decisions

There is one general question still to be discussed in order to enforce BI and analytics as basis for better decision making: Are decisions based on data (or analysis) better than those based on intuition?

Opinions on this topic vary between researchers and many of them have investigated in decision making theory. In his article "The secret of good choice"[14], Willenbrock (2008) presents an "ode" to intuitive, emotional driven choices. By bringing up the acting of firemen, sportsmen or army pilots as successful professional examples using intuition, Willenbrock tries to validate the scheme of following the subconscious voice.

However, when imagining, for example, an air force commander, isolated on some air craft carrier who stands under pressure to come up with a tactic to bomb the opponents. Wouldn't he make a better decision if he had "analysts"

[14] Harald Willenbrock, "Das Geheimnis der Guten Wahl", *Geo, 08/2008,* (Hamburg: Verlag G+J), 112

reporting to him on the position of the enemy or the upcoming weather conditions? Certainly, the commander would decide better having supporting figures at hand.

For sure, in extensive time pressured circumstances, such as a pilot choosing the right moment to fire, professionals have to decide intuitively to act their best. Yet, these situations settle on “quick wins”, they are not about forming an organizational strategy or a permanent competitive advantage. Furthermore, intuition must not be regarded as a “miracle alternative” to fact based decision making, it is a skill evolving from extensive experience or talent. Even if a decisive moment can intuitively be mastered in short time, developing good intuition requires long time beforehand and does not necessarily teach to master different, unaccustomed situations.

The trend within organizations definitely emerges to more analytical based decision making. The number of supportive BI tool providers on the market increases and the amount of storable data rises, due to for example, customer loyalty programs, RFID or, for instance, the intelligent fitting room. In the crises year 2009, Schlegel et al. (2008) predict that information based management and insightful decisions integrating business and market metrics will deliver greater business value.[15]

To remain analytically competitive, means to be ahead of competitors by knowing more facts and to stay analytically innovative. This requires “[…] continual development of new measures, new algorithms and new decision making approaches.”[16]

3.3 Alignment of Retail BI to Business Strategy

In many cases organizational strategy and BI are two separated areas of responsibility within a company. BI is used only for daily challenges or operational support, like in-stock reporting or supplier assessment, without developers or executives having a definite idea how it can play a role in

[15] Kurt Schlegel and others, *Predicts 2009: Business Intelligence and Performance Management Will Deliver Greater Business Value, 18 December 2008* (Gartner, 2008), 4

[16] Thomas H. Davenport and Jeanne G. Harris, *Competing on Analytics* (Boston: Harvard Business School Publishing, 2007), 16

achieving strategic objectives. Then, BI initiatives entail risks and may result in dissatisfaction. If the full analytical potential is not exploited, BI might be regarded as "wasted investment", holding greater costs than the expected business value. Furthermore, analytical culture and BI applications might be as considered optional by both employees and executives and, thus, evolve without dedication.

In order to use BI as an instrument to improve profit or further business objectives, analytical capabilities must be optimized. Therefore a clear picture of the opportunities that can yield and manage information supporting the business strategy is needed. Getting such a "picture" is one of the most extensive and probably unpopular tasks to accomplish at the beginning of every BI project. Yet, it must not be neglected. Not setting up the requirements-gathering strategy aligned is the first step to not fully utilize BI potential. Structured, strategy oriented BI approaches decrease barriers and mainly contain the following key steps, which were reiterated in "the Profit Impact of Business Intelligence" by S. and N. Williams[17] (2007):

1. **Comprehend the company's strategic drivers, intentions and targets**
2. **Find out the business questions to be answered in order to accomplish those targets**
3. **Determine tools, practices and analytical schemes to measure organizational performance and drive decisions**
4. **Provide the information the company needs to take actions that improve performance and push the targets**

To grasp a better understanding of what concrete strategic alignment looks like, two examples of retail strategies are introduced in the subsequent passages and then, constitute the basis to derive analytical opportunities. To perform a goal oriented BI opportunity analysis, a simple and high level scheme[18] is used covering one, two and partly three of the introduced key steps. Step four and partly three are matters of the way a company carries

[17] Steve Williams and Nancy Williams, *The Profit Impact of Business Intelligence* (San Francisco: Elsevier 2007), 17

[18] Steve Williams and Nancy Williams, *The Profit Impact of Business Intelligence* (San Francisco: Elsevier 2007), 27, 145

out project management, its commitment to analytics and its scope of analytical ambitions (see 3.2.2). Therefore, these last steps are not incorporated in the following illustrations.

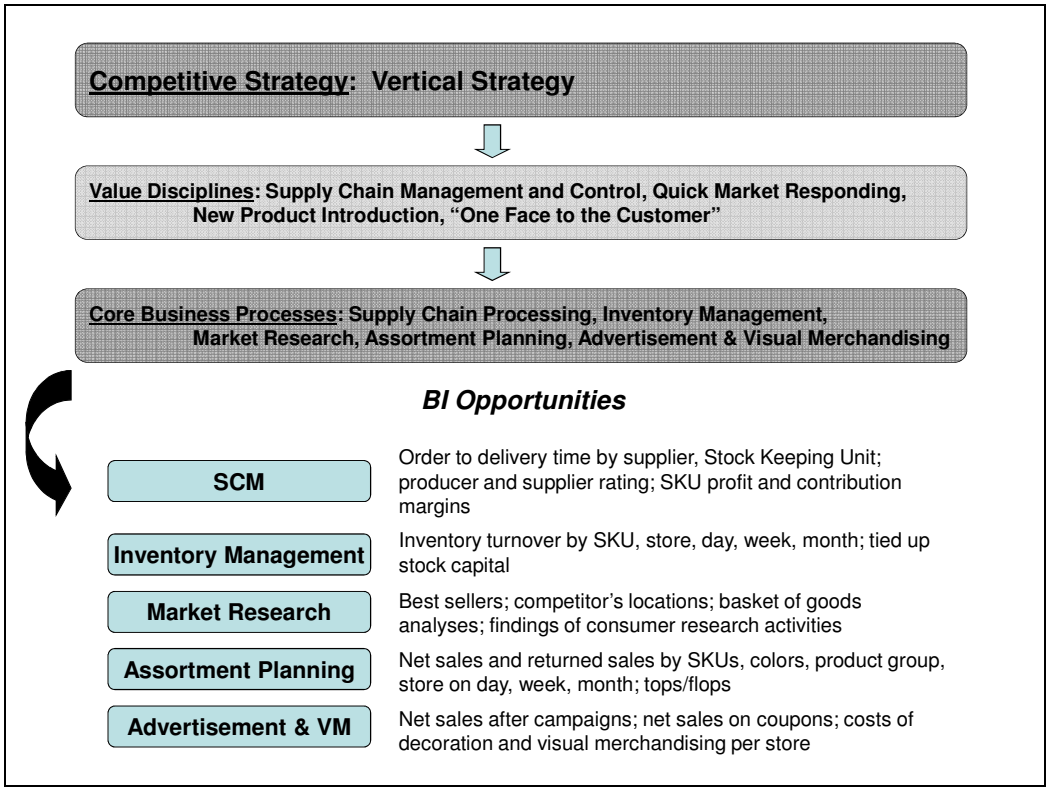
Vertical Strategy

Vertical retailers not only sell products to end consumers, they carry out all steps from design, manufacturing to distribution. Recognition value is based on their consistent image holding identical core products and similar shop floor design at all point of sales, region-wide uniform branding and advertising. However, the basic point of differentiation of strong verticals is their power over the supply chain. With this control, verticals are able to "[…] quick reactions to changes in consumer behavior […], launch new products faster and quickly produce supplementary volumes […]."[19] Examples of real vertical market players are H&M, Zara, Ikea, but companies such as Esprit or S. Oliver also follow the verticalization tendency. This becomes apparent through the efforts to gain more control in wholesale distribution by new "shop-in-shop" or "concession" concepts enabling themselves to equip and manage the shop floor.

The link of business strategy, business processes and business intelligence for a vertical retailer could be structured as shown in Figure 1. The scheme demonstrates a general top down approach. Of course, in real BI resolutions, core business processes and measures must be further detailed, adapted to a company's individual strength and weaknesses, prioritized and divided into subprojects.

[19] Joachim Zentes, Dirk Morschett and Hannah Schramm-Klein, *Strategic Retail Management* (Wiesbaden: Gabler, 2007), 61

Figure 1: BI Opportunities for Vertical Retail Strategy



[Source: Based on the framework of: Steve Williams and Nancy Williams, *The Profit Impact of Business Intelligence* (San Francisco: Elsevier 2007), 145]

Retailing out of Recession

In response to the financial crises 2008 / 2009 many retailers are in the need to launch a plan to overcome the downturn. Even though such program is rather an emergency plan than a visionary strategy, it has potential to spawn distinguishing capabilities to the business. In 2009, Favaro, Romberger and Meer came up with "Five rules for retailing in a recession"[20] presenting some smart tactical moves to manage and even gain during a decline. All five principles call for extensive support by analytics. To understand why and what the rules aim at, here is a quick explanation of them.

1. Identify and Gain your "Headroom"[21]

The idea is to regain the lost market share due to cuts in spending by focusing on "switchers": Those customers who are neither loyal to the own company nor to the competition. Retailers must find out what makes them

[20] Ken Favaro, Tim Romberger and David Meer, "Five rules for Retailing in a Recession", *Harvard Business Review, Voume87, Nr. 4* (April 2009), 64-72

[21] Definition Headroom": "Market share you won't have minus market share you won't get."[20]

consume at close competitors. Favaro, Romberger and Meer (2009) refer to a fashion retailer who detected that their loyal consumers were mostly “fun” and “value” consumers whereas their opportunity lies in the “everyday trendy dressers”.

2. Fill the Needs-Offer Gap

Retailers face the situation that many clients could leave more money in the store than they do. To change this, a business has to figure out what customers seek and cannot find and adjust its merchandise mix.

In such case, innovative, “extra organizational” BI is a key enabler. The danger of conventional as-is sales analyses is that the focus is set on product-mix optimization for existing customers instead of targeting “could-be” customers to achieve growth.

3. Go after non-value adding costs

While becoming more cost efficient, retailers have to analyze and separate their expenditures into customer benefitting costs and those costs that do not affect the customer. This way, companies protect margins and do withdraw anything the client is ready to pay for. For instance, a retailer could verify whether extensive store cleaning does make a difference to the customer or not.

4. Cluster stores

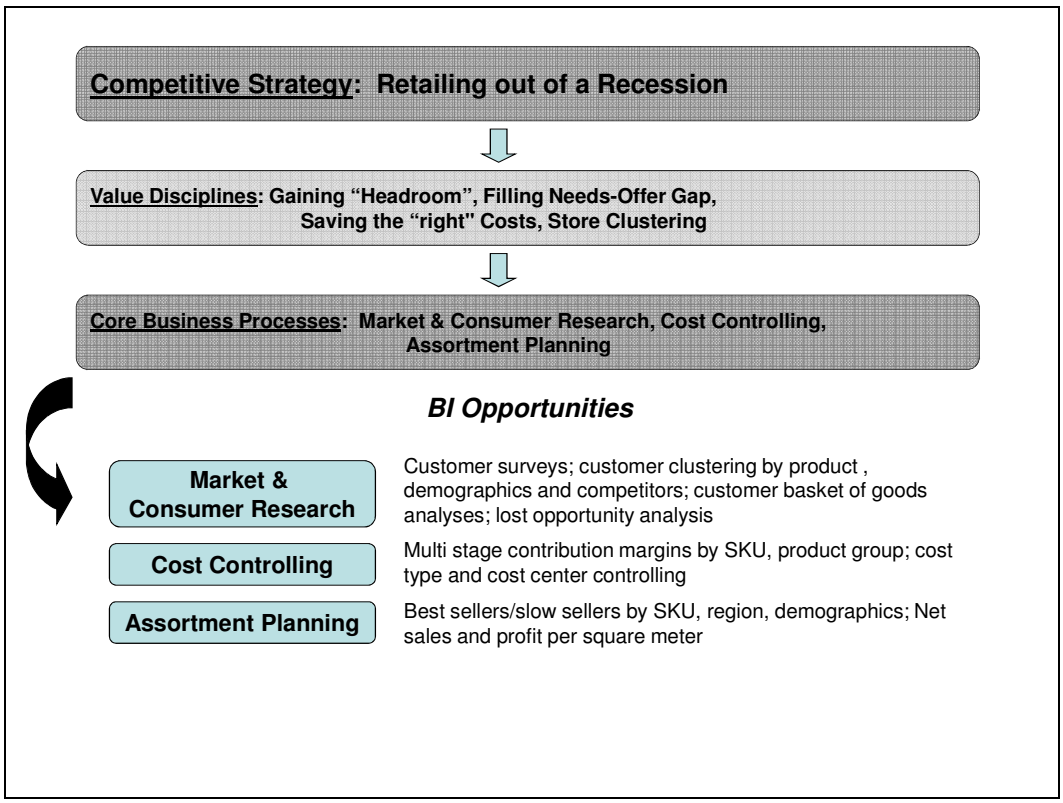
In order to realize variety and local adaption efficiently, stores can be grouped into clusters. Thereby a store can be divided into several segments fulfilling the needs of various consumer types. Categories of those types could be, for example, location, income level, ethnicity, competitors and family status. According to local amenities, retailers can determine and prioritize store clusters and align types to demand.

5. Rebuilt core processes

The fifth rule tells to “retool” business processes in order to realize rule 1-4. Core business processes that have to be overworked are market and consumer research, cost controlling as well as assortment planning. Additionally, strategic planning must be aligned to meet these measures, face the downturn and grow.

When it comes to how to strengthen business processes Favaro, Romberger and Meer (2009) basically argue to "jump outside the box" with extended and innovative analytical capabilities. The article's exemplified measures and necessities to support the core business processes could as well have been derived by using the BI opportunity framework. In that way they are draught in Figure 2.

Figure 2: BI Opportunities for Retailing out of a Recession



[Source: Based on the framework of Steve Williams and Nancy Williams, *The Profit Impact of Business Intelligence* (San Francisco: Elsevier 2007), 145]

4 How to Benchmark Retail Analysis Dashboards

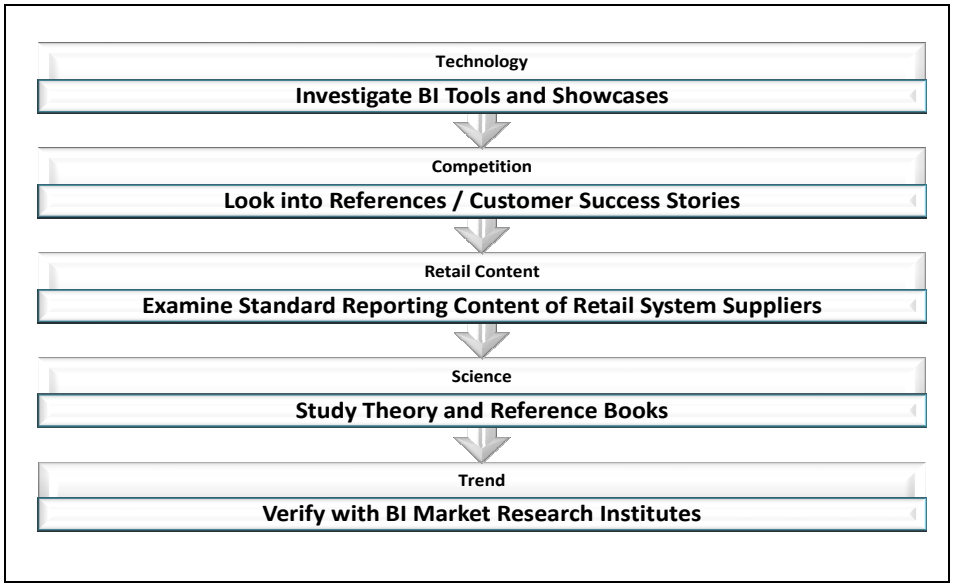
To better comprehend the general advantage and purpose of "benchmarking", the term needs to be described first. Benchmarking enfolds "[…] a continuous systematic process for evaluating the products, services and work processes of organizations that are recognized as representing best practices for the purpose of organizational improvement."[22] In the case of benchmarking retail BI or retail analysis dashboards, the initial objective is not to instantly become an analytical competitor (as explicated in 3.2) but to set up a competitive analytical basis whose value lies in assured best practices. In order to enable this, this chapter aims to establish a high level practice that, by following its steps, enables retail analysts to define and develop a state-of-the-art POS dashboard that takes into account current benchmarks. Basically, a short "how to guide" on learning about the status quo of retail analysis dashboards is introduced. Unlike mentioned in the definition above, not only "products, services and work processes of organizations" are considered, but also existing tracts of literature and journals on the BI topic as well as features and trends of software tools. Contrary, the last part of this chapter outlines critical parts of benchmarking in order to emphasize why following benchmarks or best practices alone cannot lead to most efficient, bespoken analysis solutions.

4.1 A Practice to Benchmark Retail Analysis Dashboards

In the following, a stepwise guide of processes is represented. After its execution and completion analysts or project team members should possess an idea about a current status quo of retail dashboards. Figure 3 shows a delineation of this stepwise practice which is explicated subsequently.

[22] Michael Spendolini, *The Benchmarking Book,* (New York: American Management Association, 1992), 9

Figure 3: Practice for Benchmarking Retail Analysis Dashboards



[Source: Own creation]

The benefit of working out and working through a benchmarking practice is its applicability independent from the advancements and changes of BI over time. By deploying it, standard dashboard features can be derived which can be regarded as current status quo.

The following benchmarking process is principally congruent to the research process it took to come up with chapter 5 on POS dashboard components and chapter 6 on Trends for POS Dashboards worked out later in this thesis.

Next, each step, as presented in Figure 3, is explained by means of its purpose, possible actions and a complementary example. Nevertheless, in order to focus on the essential, the presentation of the whole practice to benchmark retail analysis dashboards remains high-level. Additional to-do's can be added or changed according to circumstances.

Investigate BI Tools and Showcases

The purpose of investigating BI vendors and their tools is to get a general understanding how analysis requirements can be realized. A first impression of what completed analysis dashboards could look like is delivered as well as a concrete idea of functionalities, graphical user interface, ease of use and interactivity. Also, with a little asking further, the complexity of the technical infrastructure and the scope of project management can be estimated.

BI vendors or tools can be found via BI conferences, trade shows, demos on professional websites or rankings published by BI committees. To narrow the investigation of tools, only a limited amount of contemplable vendors should be focused. Demos and showcases can be examined on suitability for POS reporting and then software presentations can be arranged.

As starting point, rankings and BI studies which evaluate the most successful tools using certain criteria of, for example, institutes such as Gartner or BARC can be consulted.

Look into References / Customer Success Stories

Looking into customer references enables to find out on how and with which result close related customers or rather competitors came up with satisfactory analysis applications or dashboards. Usually, references describe a company's problem about information deficiencies and how a specific BI implementation helped to overcome and improve it. Therefore, success stories of other retailers may reveal methodologies, attentions or innovations which are useful to derive best practice approaches.

Helpful to-do's in regard to finding reference stories is searching for case studies of BI vendors, whitepapers of journals, networking or attending BI vendors "regular's tables" having existing clients holding before/after presentations. Examples of journals offering whitepapers, news of BI customers or events are businessintelligence.com or information management review.

Examine Standard Reporting Content of Retail System Suppliers

Retail ERP systems usually contain standard reporting features. In most cases some lists can be printed out after a user transfers parameters through input forms. Nevertheless, the retail analysis contents that are delivered base on substantiated research, experience and enhancements. Systems and documentation of retail ERP systems can be inspected with regard to KPIs, dimensions, analytical schemes, data granularity, handling of data volume and flexibility. By sifting a couple of retail system on these reporting criteria a understanding of a standard content for retail analysis is delivered which serves as common status quo.

The course of action, besides regarding own in house systems, is to select trade specific system vendors and study relevant passages of documentation, demos or specialized books on the software. Examples for suitable retail system vendors that include reporting or standard reporting contents are Sap Retail, Radiant Systems, FuturERS or Microsoft Dynamics Retail Management System.

Study Theory and Reference Books

The intent of looking up theory of BI, technical infrastructures for BI, retail controlling or project management around BI is to use theory as goal and ambition. Literary compositions mostly base on experience and research and deliver structured, sophisticated methods and findings. Thus, as theory is something mature and perfected, it represents something to strive for. Between theoretical conclusions and the as-is state, there are always gaps to fill for the benefit of innovation, efficiency and longevity.

Literary researches for KPIs, retail innovations, retail strategies or dashboard case studies are insightful and complemental.

Theoretical knowledge and methods can be acquired via reference books, literature, publications on the fields of retailing, BI, dashboards, controlling or via professional journals specialized on retail sectors, technology and the like.

Verify with BI Market Research Institutes

The purpose of consulting BI market research institutes is to hold up dashboards or the current dashboard development status against trends, progress and BI predictions. Research institutes such as Gartner, BARC or Forrester regularly publish predictions about what will become important in the BI field including reasons for the predicted development. Scanning and matching trends on individual, operational needs helps to verify and sustain analysis dashboards for the medium term.

4.2 Critical Aspects of Benchmarking Dashboards

Even though his book “Best Practices in Planning and Performance Management” sounds like a collection of proven methods and technologies

for managing analytics, Axson (2007) criticizes the value of benchmarking in terms of performance management and BI. "[…] There is no 'one size' fits all in terms of best practices […]"[23] for performance dashboards. One of the reasons leading to this argument is "what works well at one company […] is no guarantee that the same practice will work or even be appropriate for another organization"[24].With this announcement, Axson tries to impart two messages before too high expectations are set on the best practices carried out in his book.

The first message goes along with what has been carried out in chapter 3.3: Companies must align BI to their strategy, to their culture and to their objectives. Besides getting impressed of all the well presented best practices of market opponents, specialists or research institutes, companies must not forget to ponder whether these fit their needs or not. It is very likely, that most best practice approaches are successful results of businesses that launched innovative BI projects which were fully adapted to their needs. In the end, efficient methods of the project progression were generalized and published. Conclusively, it is recommendable to seek for underlying circumstances and check against them.

Second, in addition to the outcome benchmarking reflects, it must be aligned more towards how and for what reason competitors, researchers, professionals or developers came up with theses and results. Behind every outcome are a handful of mistakes and iterations of improvements. There is a great chance that if benchmarks or results do not match to an individual organization, the processes and findings behind the benchmarking process can be helpful, time-saving and expense-saving.

---

[23] David Axson and Keith R. Herrmann, *Performance Management and Reporting Best Practices: From Data to Decision, (*Hoboken: Wiley & Sons, 2003), 37

[24] David Axson and Keith R. Herrmann, *Performance Management and Reporting Best Practices: From Data to Decision, (*Hoboken: Wiley & Sons, 2003), 38

5 Components of a POS Dashboard for optimized Retail Analysis

On the basis of the benchmarking process introduced in 4.1, this chapter assembles a status quo of a contemporary retail POS dashboard. The subsequent dashboard features are not adapted to any individual strategy or requirement; they are “valid” for retail in general. Realizing those contents will not primarily turn a company into a high flyer in BI. Yet, when using the following dashboard status quo in a way that integrates retailers’ individual interests, an accelerant runway can be built.

The first part of this chapter explains general dashboard fundamentals including particular attributes they must fulfill. After that, components become concrete and, for the most part, relate to retailing and POS activities. In the second section, POS relevant key figures and KPIs are introduced and defined, followed by a section which discusses suitable analytical schemes and techniques. Perspectives to wisely subdivide POS dashboards and to prevent losing track conclude this chapter.

5.1 Fundamentals of Dashboards

Irrespective of the kind of information that is displayed and analyzed, a dashboard consists of several basic elements. Those elements are configured, shaped, layouted or scheduled differently depending on what makes sense for the demonstrated data. Generally, fundamental elements of dashboards hold the purpose to show the data in a best-to-interpret style, to intuitively navigate the user through the application and to assure up-to-dateness.

5.1.1 Dimensions

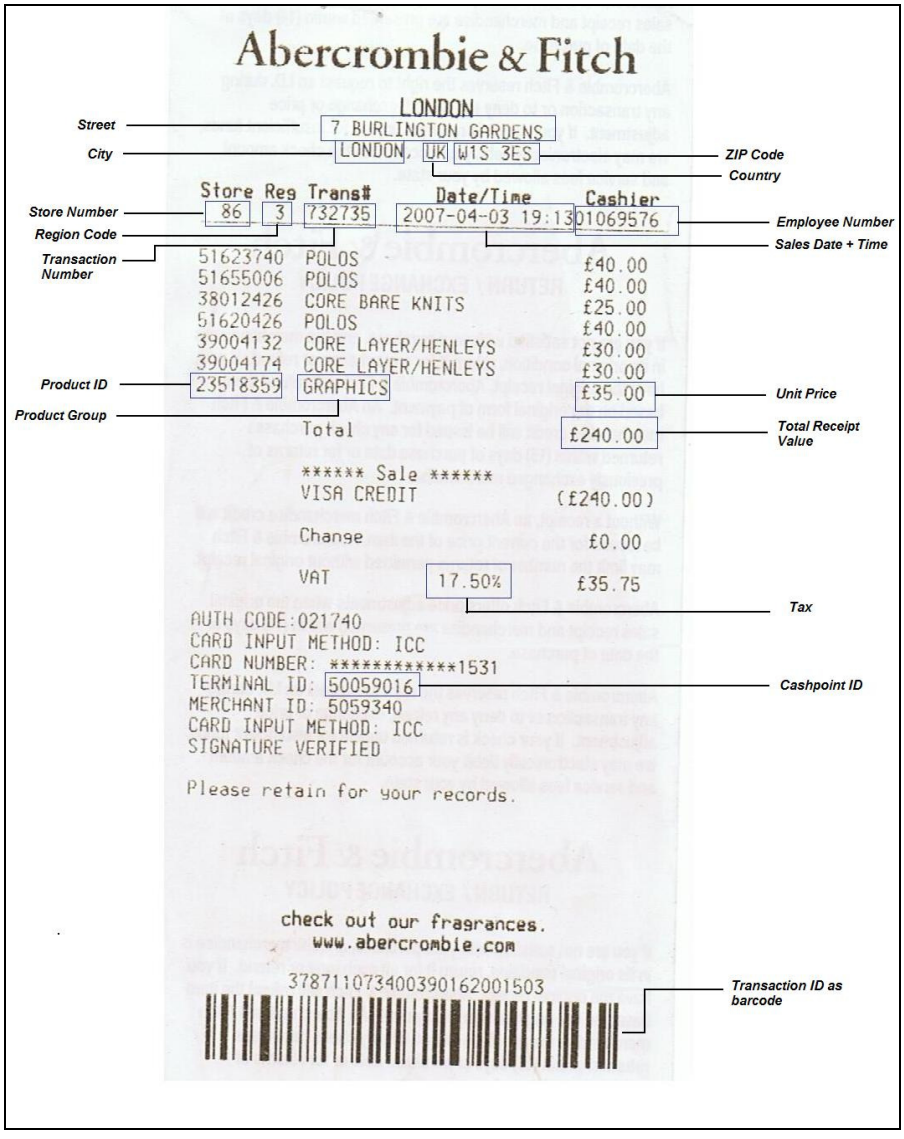
In order to facilitate meaningful interpretation, data or information must belong in a certain context. To structure context in BI models, data relate to various dimensions or characteristics. Examples of dimensions are year, month, country, state, material group, store number, product ID, customer and whatever a reporting issue requires. Furthermore, dimensions or

characteristics determine the granularity of a dashboard application: Having a key figure (e.g. net sales) related to a product ID offers a more detailed insight than having it related to product group level only. When it comes to conventional data modeling dimensions are similar to data fields.

Dimensions include values or contents. The dimension country, for instance, can be “Spain” or “Germany” and material group can hold values such as “Tools”, “Ceramics” or any other material group the company sells or manufactures.

The receipt of an apparel retailer below (Figure 4) exemplifies typical POS dimensions or rather reference IDs to more descriptive dimensions as well as figures that are collected at the cash point.

Figure 4: Point of Sale Dimensions on a Receipt



[Source: Based on Jan Becker and Alex Winkelmann, *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen* (Berlin: Springer, 2006), 99]

Dimensions enable the user to interactively set filters or selections on desired values and thus, specify the analyzed dataset to constrain the reporting.

Dimensions are often modeled and displayed by objects designed for value filtering and selection setting. So-called listboxes, checkboxes or dropdown-boxes are examples of these objects. Also, dimensions serve to span tables, charts or axes of bar or line diagrams.

5.1.2 Key Figures

"Figures" or "key figures", "metrics" or "KPIs" in a dashboard embody the most relevant aspect for an analyst, a controller or any other business user. Those are the numbers and facts of a database that evaluate, count, measure or calculate business processes. Examples of figures are net sales, purchase price, retail price, age, inventory, planned sales, weight, and calculated figures or KPIs, such as turnover, sales units, profit margin, age average or inventory turnover as a more complex calculation. Combined with dimensions, key figures provide management relevant information, such as the "net sales derivation in March 2009 compared to March 2008 in Austria for the product group ice cream".

In general, figures in dashboards ought to comply with the following qualities:

Alignment

To select key figures or KPIs reasonably, it is essential to make sure that they are aligned with the retailer's strategic objectives. Measuring and being directed by wrong or less prioritized business process indicators certainly leads to business performance below or off target.

Actionability

"There is no purpose in measuring activity if users do not change the outcome."[25] In fact, each key figure must be an approved node within an organization - activating geared operations to progress the business. The often unlearnt truth is that a KPI by itself will not alter behavior or improve performance.

25 Wayne Eckerson, *Performance Dashboards*, (Hoboken: Wiley & Sons, 2006), 200

Standardization

Another difficulty, especially in multinational companies, is to get analysts or dashboard users agreed on a common, company-wide definition and understanding of each KPI. Nonetheless, a standardized basis is important in cases when analysis dashboards are segmented and utilized by several user groups in order to uphold comparability and avoid inconsistency.

Accuracy

Key figures should measure the targeted circumstance as correct as possible. Analysts must question whether the progress of a KPI really traces back to improved performance of the company or if external factors, e.g. inflation, holiday seasons have influence on it. In addition, the accuracy of key figures depends on the condition of the data that shape them. Data values can be missing or faulty. In some cases it might even be worthwhile to replace a KPI instead of launching a data cleansing assignment.

Simplicity

In order to trigger affective actions, key figures should be uncomplicated and context explanatory. Users therefore have to know their meanings, definitions or whether a high score is positive or negative. In addition, users should not be overstrained by a multitude of figures appearing on their dashboard. Oftentimes "less is more", a supported fact by TDWI Institute whose research identified as optimal amount an average of 20 KPIs per company or a maximum of 7 KPIs per user-in-charge.[26]

5.1.3 Basic Analysis Techniques

In theory, the term "analysis techniques" implies to possess advanced knowledge on structured, statistical methodologies. Its meaning could entail capabilities, such as quantitative research, which can only be acquired by extensive studies or experience. However, that is not what analysis dashboards are intended for. Instead, they must offer intuitive analysis or rather navigation techniques guiding the user to detect implemented methodologies and KPIs. There are "mouse-click" techniques such as

[26] Wayne Eckerson, *Performance Dashboards*, (Hoboken: Wiley & Sons, 2006), 211

filtering or selection setting to specify information and sorting to rank values or dimensions. Another basic analysis technique is the “drill down”: In order to systematically provide further details, a drill down analysis begins at a high aggregated level and refines with more specified data at a lower level. In this conjunction, a navigation path is designed hierarchically like, for example, drilling down (or up) sales units of a region (Asia) to a country (Japan) and then to a city (Tokio).

Another option is to set up a navigation “path” categorically. This means to group several dimensions and switch among them while seeing the same key figure or their spreading in different perspectives.

Analyzing and navigating in dashboards can go along with the user to forget the current status. Filtering, drilling and switching between views, or sometimes even through dashboards (as through so called “report-report-interfaces”[27]) can lead to “getting lost”. To prevent this, dashboards should offer a navigation status map or an element displaying the current status.

5.1.4 Data Refresh

One indispensable element of dashboard applications is a "mechanism" that automatically updates the data. The update regularity usually depends on the needs of analysts or executives and the frequency of decisions being made. However, to stay close to operations, POS dashboards should usually be refreshed once a day. Companies often use the “night shift” to run dashboard reloads including all preceding updates of source system interfaces and data warehouse layers. A global retailer, however, with worldwide stores, has to find compromises in this case, for example holding POS data of non completed sales days of several regions.

To ensure actuality with little effort, dashboard applications can be integrated as "reload type" into a process chain or they can be scheduled into a task manager. That way, dashboards "update themselves" either at a fixed time or after a preceding, triggering task.

[27] Retrieved on 10 July 2009 from http://help.sap.com/saphelp_nw04/helpdata/EN/99/08629bd3e41d418530c6849df303c9/content.htm

5.1.5 Interface Design

The first impression to the user is delivered by the design of the dashboard screen. Therefore, "[…] design can directly influence the way that users ultimately interpret data."[28] Even though data availability and accuracy has top priority, it is recommended to put effort in the dashboard's visual design. To raise its acceptance and usability, certain visual guidelines should be observed.

Limited Amount of Information on Screen

Putting all required data on a single display while not exhausting the user who normally only holds on to a limited amount of information at a given short time is one primary challenge when designing a dashboard. Massive data amounts often make this difficult, resulting in scroll bars, huge table schemes or unwieldy graphics. To prevent this and fit data to single, linked screens, key figures have to be prioritized and limited, information is best grouped to several semantic clusters and the detail level must be organized and allocated.

Another common, more "radical" opinion veers toward a data presentation delivering optimum information while using the least amount of space[29]. In this case, styles such as gauges, traffic lights or thermometers are frowned as they provide one KPI without clear context or comparison while taking space. If such styles are still employed, only top prioritized KPIs should be displayed.

Figure 5 demonstrates a gauge's space consumption when displaying the key figure "average sales per day". In contrast, it could be a small number marked red next to, for example, the same date's "average sales per day" of several previous years or months.

---

[28] Robert Kearse, "6 BI Pitfalls and How to Avoid Them", *Information Management Special Review,* 14 July 2009, (Brookston: Information Management and SourceMedia, Inc). Retrieved on 15 July 2009 from http://www.information-management.com/specialreports/2009_151

[29] Stephen Few, *Information Dashboard Design,* (Cambridge: O'Reilly, 2006), 55

Figure 5: Gauge Chart

[Source: Retrieved on 16 July 2009 from http://www.infocaptor.com/user_help/dashboard_meter_chart.htm]

Recognizable Labels and Wording

When labeling figures, filter objects, tables, charts etc., it should be done consistently. This means that each defined KPI only has one name, at best throughout all dashboards company-wide. Also characteristics such as “article” should not appear as “product” or “item” within dimensions, column headers, legends or axis labels. Instead, the syntax for a defined data field is to be uniform.

Abbreviating labels, for example by using initials only, might help to save space in tiny headers. However, the use of shortcuts should depend on the frequency analysts work with the dashboard. The more often it is used, the better the meaning of KPI abbreviations is kept in mind. Abbreviations are subject of consistency, too. In addition, it is helpful to explain them in a central glossary which is linked to or embedded in the dashboard.

To support recognition, font styles or colors can be used. Highly prioritized KPIs can be marked appropriately or numeric variances below or above target could generally be colored red or green. However, coloring should be applied thoughtfully and, once again, the use of coloring or font styles has to be consistent.

Visualization Underlying the Data Representation

BI vendors constantly introduce new styles when launching new releases and provide many chart types to display data. Examples are heat diagrams, maps or animated trend or pie charts. Thereby the choice of an illustration that delivers the appropriate message at first glance becomes quite tricky.

It is, for example, recommendable to present time developments in line diagrams because tendencies become visual. “Top n” overviews are best

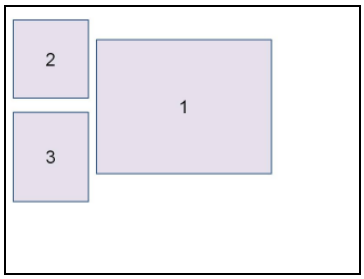
demonstrated via bar charts when intending to outline the decline rate between the tops. Contrary, it is not efficient to display plan-actual comparisons and their variations via bars since it takes quite some time to grasp the exact derivation. In this case, tables are more efficient.

Locating and Positioning of Objects

The way in which analytical elements are positioned on a dashboard screen affects an analyst's impression of what is more and what is less important.

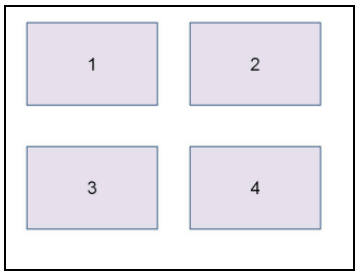
Elements at the central screen (Figure 6) or, in accordance with the reading habit of western cultures, objects in the upper left screen corner draw the most attention, followed by the upper right, bottom left and bottom right corners (see Figure 7).

Figure 6: Object Positioning - Center



[Source: Based on Stephen Few, *Information Dashboard Design,* (Cambridge: O'Reilly, 2006), 55]

Figure 7: Object Positioning - Reading Habit



[Source: Based on Stephen Few, *Information Dashboard Design,* (Cambridge: O'Reilly, 2006), 55]

Additionally, object size as well as shade or color contrasts influence the order in which elements are perceived by the user.

When applying these principles, it is possible to emphasize diagrams, to set apart core KPIs, to embed sequential views and to visualize or cluster related analytics.

5.2 Key Figures for POS Analysis

As learnt in chapter 5.1.2, key figures or KPIs are the elements that define an analysis dashboard. After all, how could analysis be performed without processing measurements to significant key figures?

POS analysis involves a range of figures starting from simple "sales" via "price markdowns" up to more complex formulas, such as "inventory turnover rate". In the next sections prevalent key figures that should be enclosed in

POS dashboards are presented. Each section describes the key figure, defines the key figure and lists related “sub figures”, if existent.

5.2.1 Net Sales

Net sales are the turnover. They are the sum of all sales prices of the sold items. Net sales must be available in a standard currency as well as a local currency. Further key figures related to net sales are:

- Average receipt value: *Net sales / Amount of receipts*
- Average price: *Net sales / Sales units*
- Returned sales: *Sum of all prices of the returned items*

[Source: Jan Becker and Alex Winkelmann, *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen* (Berlin: Springer, 2006), 258, 123, 124]

5.2.2 Sales Units

Sales units are the accumulated amount of all sold items.

Further key figures related to sales units are:

- Average sales units per receipt: *Sales units / Amount of receipts*
- Returned units: *Cumulated amount of all returned items*

[Source: Jan Becker and Alex Winkelmann, *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen* (Berlin: Springer, 2006), 258, 123, 124]

5.2.3 Profit Margin

The profit margin is the amount earned after all costs are covered. When it comes to retailing, the profit margin usually relates to the product and is calculated as follows:

Unit sales price – Unit purchase price

Looking at the profit margin, further versions of the key figure are helpful:

- Markup margin in %: (*Unit sales price – Unit purchase price) / Unit purchase price*

- Gross profit: *Net sales valued at sales price – Net sales valued at purchase price*

[Sources:
Jan Becker and Alex Winkelmann, *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen* (Berlin: Springer, 2006), 258, 268
Jan Becker and others, *Retail Information Systems based on SAP products* (Heidelberg: Springer, 2001), 122-125]

5.2.4 Price Markdown Ratio

Price markdowns are discounts due to special promotions, product maturity, defects etc. They decrease the profit margin, but are often necessary to stimulate sales or oblige customers. The price markdown ratio gives an average idea about the markdown intensity and can be related to product groups, stores or seasons. It is computed as:

Accumulated price markdowns / Total net sales

[Source: Jan Becker and Alex Winkelmann, *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen* (Berlin: Springer, 2006), 268]

5.2.5 Sales per Square Meter

The figure sales per square meter (it could also be any other area measure like square yard) reveals the area productivity. It enables a comparison of stores on a common basis as well as to detect an indicator for optimal area utilization. The formula is:

Net sales / Square meters of sales area

[Source: Jan Becker and others, *Retail Information Systems based on SAP products* (Heidelberg: Springer, 2001), 122-125]

5.2.6 Stock Units

Stock units refer to the accumulated amount of goods in stock. The figure reveals the quantities of items that are available (or reserved) at a certain timestamp. From a financial perspective stock units represent tied-up capital

when evaluated with an adequate price (e.g., purchase price or manufacturing costs) and interest.

- Reserved stocks (e.g., for customers or in transfer): *Accumulated amount of stock units marked as reserved*
- Available stocks: *Accumulated amount of stock units marked as available*
- Stock value: *Stock units * Purchase price*
- Tied-up capital: ((*Beginning inventory * purchase price) – (closing inventory * purchase price)) / 2 * (1+(interest rate * time of storage / 360))*
- Out of stock units: *Accumulated amount of stock units* $=^{!} 0$

[Source: Retrieved on 16 August 2009 from http://www.luk-korbmacher.de/Schule/Mathe/defslag.htm#GebundenesKapital]

5.2.7 Inventory Turnover Rate

Inventory turnover is a key figure measuring the average number of stock sold during a time period. It indicates how "well" a company can expect to turn their inventory into liquid assets. It is calculated as follows:

Costs of goods sold / Average inventory

In this conjunction both constituents must relate to the same period. C*osts of goods sold* are similar to *net sales valued at purchase price* and *average inventory* is calculated (*beginning inventory + ending inventory) /2*.

[Source: Retrieved on 16 August 2009 from http://www.luk-korbmacher.de/Schule/Mathe/defslag.htm#GebundenesKapital]

5.2.8 Sell-Through Rate

The sell-through rate tells the proportion of a retailer's sales and purchase activities during a considered time period. Its value reflects the demand strength and is helpful at short term assortment decisions regarding, for instance, re-ordering, visual merchandizing or price markdowns. The formula of sell-through rate is calculated as follows:

Sales units / (Incoming goods + beginning inventory)

[Source: BBE Retail Experts**,** *Sortimentsanalyse*, (Köln: BBE Verwaltungs GmbH, 2002-2008). Retrieved on 22 August 2009 from http://www.bbe-handelswissen.de/data/themen/Marktpositionierung/Sortiment/Sortimentssteuerung/Sortimentsanalyse.php]

5.2.9 Product Mix Indicators

There are three figures to "count" the merchandise mix. The focuses are set on variety, category and basic products. Decisions concerning future extension or reduction of assortment are influenced and supported by looking at the spreading of past sales over product lines, product variants or products and by restructuring the following framework:

- Product mix breath: *Number of offered product lines* (product groups)
- Product mix length: *Total number of products in all lines*
- Product mix depth: *Number of variants per product*

[Source: Jan Becker and others, *Retail Information Systems based on SAP products* (Heidelberg: Springer, 2001), 249]

5.2.10 Customer Return Rate

A customer return rate along with many other customer performance indicators implies to have customer data stored in the retailing system. This is usually achieved by having customers signed up to a newsletter subscription or a store card.

The average customer return rate tells how often customers carry out another purchase after the first time. A low return rate signifies customer fluctuation or retention. This may be taken as an indicator of low customer satisfaction.

A formula for the average customer return rate is.

Accumulated amount of purchases per customer – 1 / Total registered customers

Similar customer related figures are:

- Customer collection rate*: Total registered customers / Number of transactions*
- "New customers"-ratio: *Number of registered customers of a new period / Total registered customers*
- Penetration rate*: Number of returning customers / Number of potential customers*

  Potential customers are estimated by defining the target customer groups and using market demographics to derive a number.

[Source: Jan Becker and Alex Winkelmann, *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen* (Berlin: Springer, 2006), 288, 317]

5.2.11 Conversion Rate

The conversion rate is a popular KPI providing an idea about utilization of opportunities. A so called traffic counter counts the store visitors (opportunities). The number of transactions at the cash desk is set in relation to the traffic counting:

Number of transactions / Number of store visitors

The *number of transactions* equals the *amount of receipts.*

When relating the KPI to certain time spans such as daily hours or holiday seasons, peaks and weak periods of conversion can be detected.

[Source: Jan Becker and Alex Winkelmann, *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen* (Berlin: Springer, 2006), 288]

5.2.12 Deviation of Delivery Time for Incoming Goods

This KPI on delivery time deviation serves to assess suppliers in terms of punctuality. Having ordered goods available for sale on time can often be critical for a store's success. Suppliers holding a higher delivery time aviation on average are more endangered when it comes to further supply chain cooperation than those holding a low average. The appropriate formula is calculated as follows:

Accumulated amount of delivery date deviations / Number of deliveries

[Source: Tim Minahan, "Top 10 Supply KPIs: Aberdeen's View", *SupplyExcellence.com, 13 December 2006*, (Ariba, Inc, 2006–2009).Retrieved on 1 September 2009 from http://www.supplyexcellence.com/blog/2006/12/13/top-10-supply-kpis-aberdeens-view/]

5.2.13 Deviation of Delivery Quantity for Incoming Goods

The average deviation of delivery quantities reveals the supplier's habit regarding completeness of delivery. Having enough or not enough goods available for sale can be major for retailers. Again, this KPI can be included in a scorecard to assess suppliers and optimize supplier management. It is calculated the following way:

Accumulated amount of deviations of delivery quantities / Number of deliveries

[Source: Tim Minahan, "Top 10 Supply KPIs: Aberdeen's View", *SupplyExcellence.com, 13 December 2006*, (Ariba, Inc, 2006–2009).Retrieved on 1 September 2009 from http://www.supplyexcellence.com/blog/2006/12/13/top-10-supply-kpis-aberdeens-view/]

5.2.14 Forecasts

Forecast figures are results of the budgeting process and represent the company's financial targets. In most cases the basic key figures *sales units* and *net sales* are planned on high level, for example, on monthly level or on product group level. Dashboards enable the comparison of planned figures and actual figures and provide two main operations:

- Plan-actual derivation: *Planned value – Actual value*
- Target achievement ratio: *(Planned value – Actual value) / Planned value * 100*

[Source: Own Creation]

5.3 Analytical Schemes and Segmentation Techniques

In order to set key figures into context, to visualize them, to group them, to compare them, to view them from different angles - all, lastly, to conduct

better analyses - several appropriate schemes can be used. Analytical schemes illustrate one or more key figures in association to one or more dimensions. Often, analytical schemes represent segmentation techniques characterized by segmenting dimensions in reference to similar KPI values.

5.3.1 Hypothesis Driven Schemes and Techniques

Standard schemes to analyze data are driven by existing assumptions. This becomes obvious when tables, charts and overviews are created and figures and dimension for columns or axis are selected intentionally. In these cases, the correlations which are being analyzed are known in advance and confirmation or counter-findings of an assumption or hypothesis are sought.

Next, the most common and useful of both, analysis schemes and segmentation techniques that examine given ideas are introduced and exemplified by means of Figure 8 to Figure 16.

Listings / Reports

Basic tables show one or more key figures for each characteristic value. They can be sorted, values can be accumulated to totals or edge values can be visualized. Listings have the advantage that they are complete and detailed. An example of a listing is pictured in Figure 8.

Figure 8: Example of a Listing

Customer	SalesReceiptNo	Net Sales	Net Sales per Receipt	Item Value	Transactions	Sales Units
Total		**5.530**	**346**	**102**	**16**	**51**
Customer A	**Total**	**266**	**266**	**133**	**1**	**2**
Customer A	369	266	266	133	1	2
Customer B	**Total**	**999**	**999**	**88**	**1**	**11**
Customer B	400	999	999	88	1	11
Customer C	**Total**	**68**	**68**	**68**	**1**	**1**
Customer C	1253	68	68	68	1	1
Customer D	**Total**	**1.142**	**571**	**88**	**2**	**10**
Customer D	972	90	90	15	1	3
Customer D	973	1.052	1.052	150	1	7
Customer E	**Total**	**464**	**464**	**155**	**1**	**3**
Customer E	1091	464	464	155	1	3
Customer F	**Total**	**17**	**17**	**17**	**1**	**1**
Customer F	5059	17	17	17	1	1
Customer G	**Total**	**299**	**299**	**150**	**1**	**2**
Customer G	6124	299	299	150	1	2
Customer H	**Total**	**38**	**38**	**38**	**1**	**1**
Customer H	1252	38	38	38	1	1
Customer I	**Total**	**344**	**344**	**115**	**1**	**3**
Customer I	2455	344	344	115	1	3
Customer J	**Total**	**38**	**38**	**38**	**1**	**1**
Customer J	5051	38	38	38	1	1
Customer K	**Total**	**494**	**247**	**99**	**2**	**5**
Customer K	368	71	71	71	1	1
Customer K	379	422	422	106	1	4
Customer L	**Total**	**830**	**830**	**138**	**1**	**6**
Customer L	8193	830	830	138	1	6
Customer M	**Total**	**214**	**214**	**214**	**1**	**1**
Customer M	5055	214	214	214	1	1
Customer N	**Total**	**317**	**317**	**79**	**1**	**4**
Customer N	4561	317	317	79	1	4

[Source: Own creation]

Plan / Actual comparisons

Actual and planned metrics are compared to reveal differences and the current status of target achievement. Planned dimensions could, for example, be segmented by “below target”, “above target” or “met target” status. A table to identify plan-actual states per months is displayed in Figure 9.

Figure 9: Plan Actual Comparison of Sales Units

Plan-Actual Comparison / Units

Month	Sales Units Planned	Sales Units Actual	%	
	176.316	236.556	34,2%	
Jan	25.350	34.282	35,2%	
Feb	19.929	29.058	45,8%	
Mar	26.208	34.855	33,0%	
Apr	24.253	28.368	17,0%	
May	24.737	37.395	51,2%	
Jun	26.130	32.630	24,9%	
Jul	29.709	39.970	34,5%	

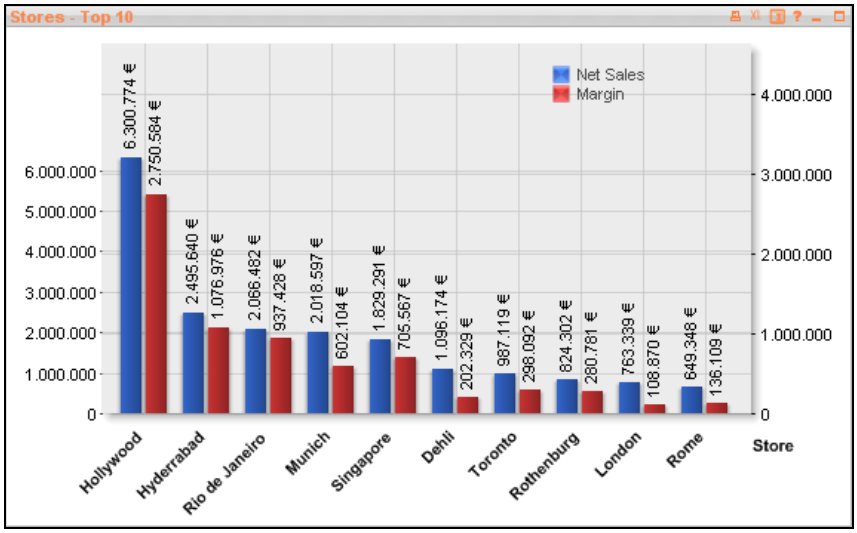
[Source: Own creation]

Top n / Last n

Dimensions are ranked based on KPI values. For instance, a top seller list shows the 10 seasonal articles which are sold at highest quantity or generate

the highest net sales. Figure 10 demonstrates a possibility to visualize top n rankings.

Figure 10: Top 10 Stores by Net Sales

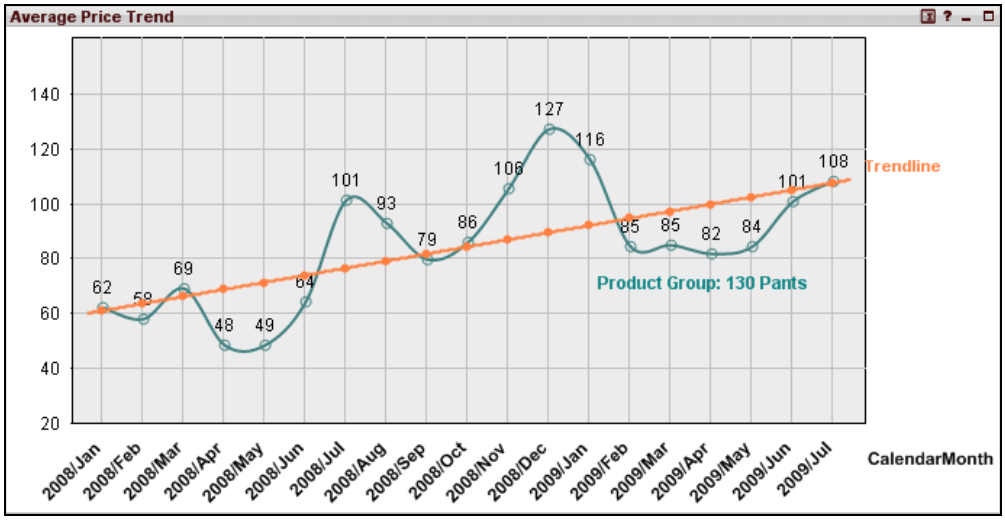


[Source: Own creation]

Trend Analysis

Key figures are linked to a time dimension, for example, day, week or month in a continuous manner. Developments and trends can be derived or forecasted, as exemplified in Figure 11.

Figure 11: Average Pants Price over Time with Trend



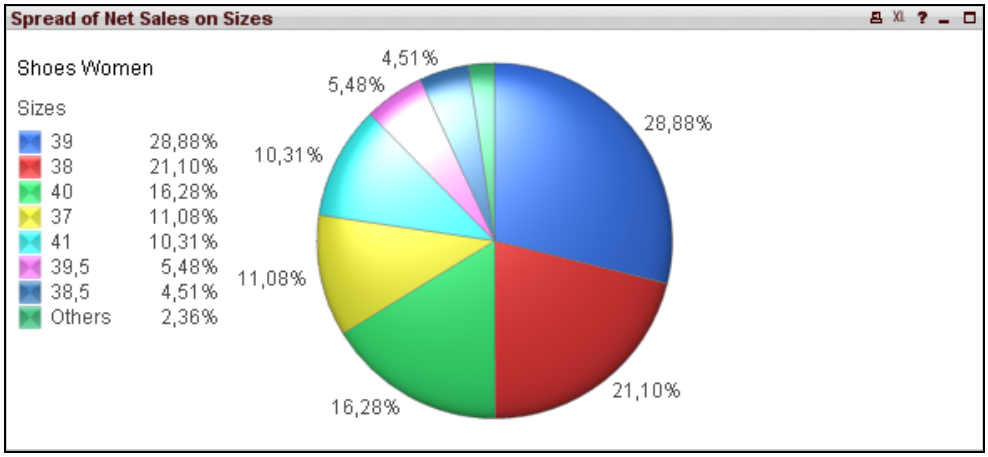
[Source: Own creation]

Spreading

The share of each value of a dimension is displayed proportional to the total value of a selected KPI. The spread can be used to detect, for example, how strongly each item variant contributes to total turnover or to derive distribution keys for planning activities.

Figure 12 illustrates an example of how net sales of shoe sizes are distributed in a certain country.

Figure 12: Spread of Sales on Shoe Sizes

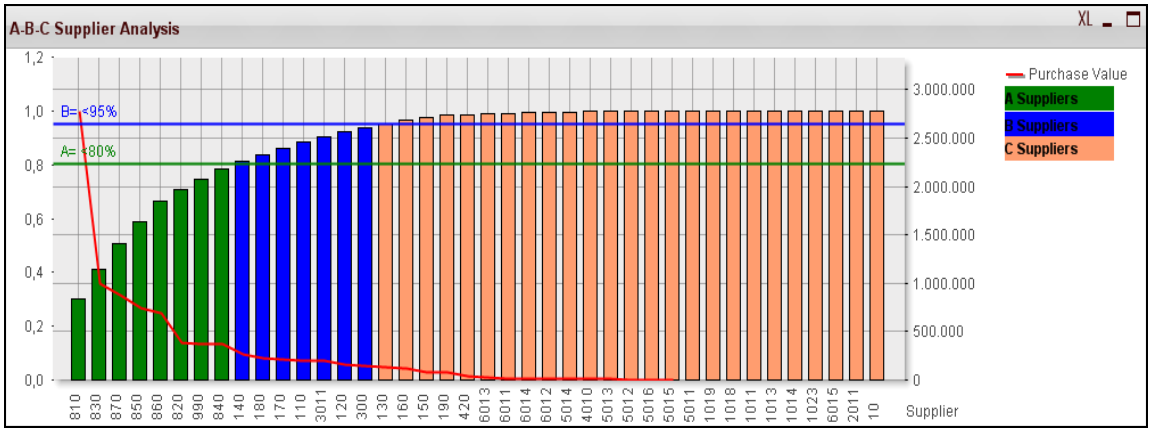


[Source: Own creation]

ABC Analysis

Dimensions are grouped with regard to performance of designated key figures. It is used to separate essential business partners from the inessential by, for example, classifying suppliers into A, B, C based on purchase value. Normally, A-categorized suppliers are those who compose up to a percentage of 80% of the total purchase value, B-categorized suppliers compose up to 15% and C-categorized suppliers up to 5%. Figure 13 displays an ABC segmentation.

Figure 13: ABC Analysis on Supplier Importance



[Source: Own Creation]

80/20

A typical distribution pattern says that 80% of output is caused by 20% input. POS data might possess this pattern in terms of products, stores or countries, for instance, 20% of products cause 80% of net sales. To verify this pattern and find out on the leading 20% of products, stores, countries, etc., 80/20-tables as illustrated in Figure 14 are useful.

Figure 14: 20% of Products Generate 80% of Sales

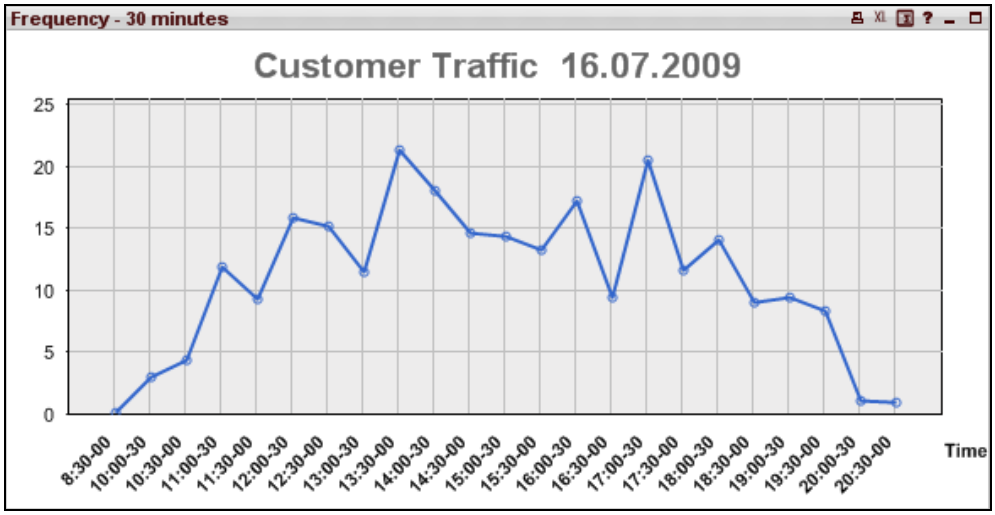
Product	Net Sales	Net Sales % cum	Products % cum
	121.339	100,0%	100,00%
Storage Furniture	58.454	48,2%	2,63%
Small Storage	9.349	55,9%	5,26%
Kitchen	8.879	63,2%	7,89%
Beds & mattresses	8.246	70,0%	10,53%
Clothes storage	6.754	75,6%	13,16%
Office Solutions	4.925	79,6%	15,79%
TV Solutions	4.261	83,1%	18,42%
Sofas	3.754	86,2%	21,05%
Bathroom furniture	3.488	89,1%	23,68%
Garden	2.913	91,5%	26,32%
Chairs	2.809	93,8%	28,95%
Tables	2.401	95,8%	31,58%
Desks	1.173	96,8%	34,21%
Cooking ware	865	97,5%	36,84%
Food and Dinerware	711	98,1%	39,47%
Textiles	523	98,5%	42,11%
Pet	412	98,8%	44,74%
Lighting	368	99,1%	47,37%
Tools	366	99,4%	50,00%
Tableware	261	99,6%	52,63%
Decoration & mirrors	222	99,8%	55,26%
Flowers	211	100,0%	57,89%

[Source: Own creation]

Frequency Analysis

Events are analyzed on how often they occur in a certain time unit. Examples are to find peak hours of transactions or visitor attendance, as illustrated in Figure 15.

Figure 15: Customer Frequency



[Source: Own creation]

Cross Selling

"Customers Who Bought This Item Also Bought […]"[30]is a well known example of cross selling. Based on sales quantities and transactions, selected products can be analyzed on similarities and common shopping behavior. Figure 16 depicts an example.

[30] Retrieved on 27 August 2009 from www.amazon.com

Figure 16: Example of Cross Sold Products to a Selected Product

Customers who bought 55M014SS62220130 also bought:

Cross Sold Product No	Customer	Sales Units	Net Sales	Net Sales per receipt	Item value
		1.107	153.180	19.147	136
81H812WS69395160	Customer E	1	12	12	12
81SD28SS00920500	Customer E	1	214	214	214
80SD28SS00920190	Customer E	1	214	214	214
81H923PS73068210	Customer E	1	214	214	214
81T351SS73158000	Customer E	1	220	220	220
81T351SS73158430	Customer E	1	220	220	220
54K900SS63900120	Customer H	1	140	140	140
55F005SS62215140	Customer H	1	240	240	240
85TD17SS00350000	Customer L	1	250	250	250
99T101SS00021580	Customer M	1	-12	-12	-12
81A327SS01043011	Customer M	1	12	12	12

[Source: Own creation]

5.3.2 Non Hypothesis Driven Methods

Non hypothesis driven analysis occurs when searching for unknown correlations. Algorithms are used to search several dimensions or key figures for peculiar interrelationships. Clusters, sequences, prognoses or what-if scenarios are derived.[31]

When, in terms of BI, referring to “non hypothesis driven” analysis, it concerns the field of “Data Mining”. Data mining forms a whole science of its own and it is not further addressed in this thesis. Subsequently, only the most popular analysis used in retail is introduced: The basket of goods analysis. Among other analysis, it can be performed by so called “Data Miners”.

Basket of Goods Analysis

Basket of goods analysis implements the idea that consumers who buy a certain group of products tend to buy or refuse another group of products. Therefore, it provides hints as to what a customer might have purchased if the idea had appeared to him. Because shopping is often impulsive, basket of goods analysis can help retailers on optimizing the shop floor and shelve

[31]Retrieved on 30 August 2009 from http://www.data-mining.de/miningmining.htm

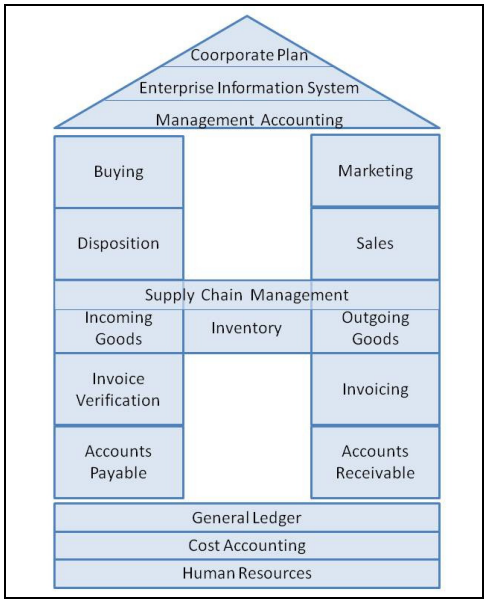
arrangement, visual merchandising and promotion activities in order to "catch" additional consumer purchases.

The algorithms for performing basket of goods analysis are plain, compared to further mining methods. Constraints may arise due to large amounts of item and customer data, their cross combination and classification.

5.4 Perspectives of POS Dashboard

When constructing a practical retail dashboard and when having collected all necessary dimensions and key figures, it is wise to structure and subclassify the dashboard. How to categorize a retail dashboard into multiple views and find the right clusters of information predominantly gears towards the retailer's individual dashboard purposes and requirements. Yet, as a general guideline, dashboards can be partitioned by using core business functions. According to Becker and Winkelmann (2006), core business functions of retailing are illustrated in the "H-Model", pictured in Figure 17 below:

Figure 17: H-Model of Retail Business Functions



[Source: Jan Becker and Alex Winkelmann, *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen*, (Berlin: Springer, 2006), 108]

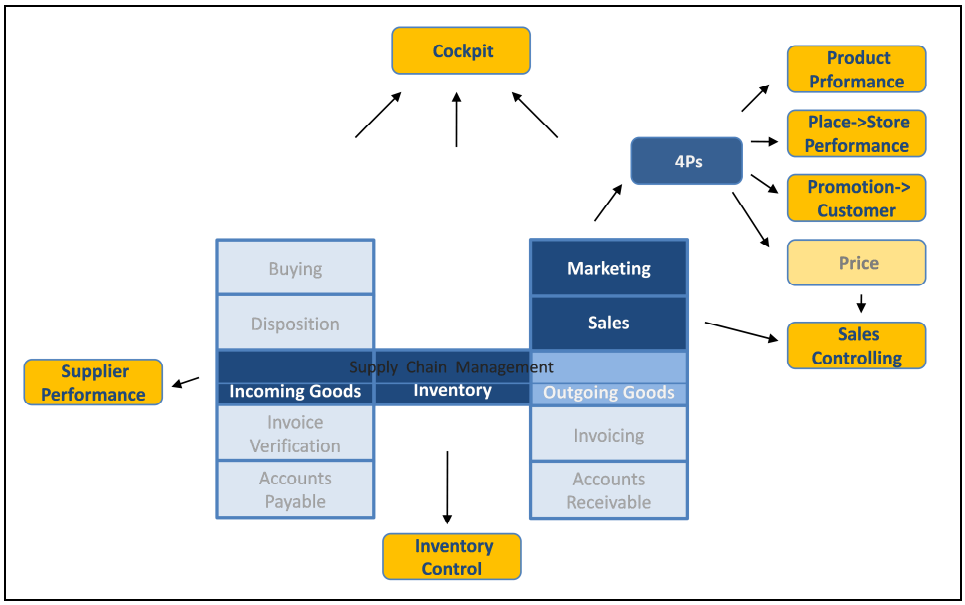
When checking the H-Model carefully, several business processes are not unlike those of businesses of other industries. From a data point of view "inter-industrial" functions require special processing such as mass data handling, batch processing, real time operating and advanced calculation

routines. Thus, the standard functions as supply chain management, replenishment (disposition), financial accounting (general ledger and cost accounting) or forecasting (corporate plan), for the most part, are performed and reported via specialized systems or modules of ERP systems.

Even though these functions often require similar integrated data interfaces and - in an optimal case - use a common DWH as basis, they are not the main elements of a retail dashboard. Instead, a retailer's core analysis dashboard has to reflect the industry's primary benefit which is its closeness to the market and its opportunity to align towards it. Setting the focus on POS information, in the broader sense, regarding the store not only the cash point, means to focus on sales, customers, regions, products, inventory and merchandise availability. The following Figure 18 illustrates the bridge between the H-Model and suitable dashboard perspectives: Marketing, sales, incoming goods and inventory are core "storefront" processes. Outgoing goods could be relevant for e-commerce retailers, catalogue or TV sellers. However, as "non physical" retailers they are not further considered.

After further detailing, rephrasing or "brainstorming" these core processes, the following dashboard perspectives (marked orange) can be deduced. They represent key POS areas to monitor:

Figure 18: POS Dashboard Perspektives



[Source: Own creation]

The subsequent paragraphs describe the idea behind the above elaborated dashboard perspectives, suggest how to group information and suggest useful dimensions and relevant key figures.

Cockpit

The “cockpit” perspective is supposed to give an entry view when the POS dashboard is opened. Typically, top prioritized KPIs are presented via charts on a high level. Those could be the plan actual sales status, net sales compared to last year’s net sales (YearToDate/YTD), a store ranking, total margin or an article ranking. The dimensional granularity of the cockpit perspective is low and inflexible. This means that KPIs are illustrated on fixed dimensions, mostly referring to the latest date but not referring to a special region, product group or to a store. Yet, every KPI should be linked to a more detailed demonstration on the suitable dashboard perspective.

What a cockpit view could look like is demonstrated in Figure 19 below.

Figure 19: Example of Cockpit View

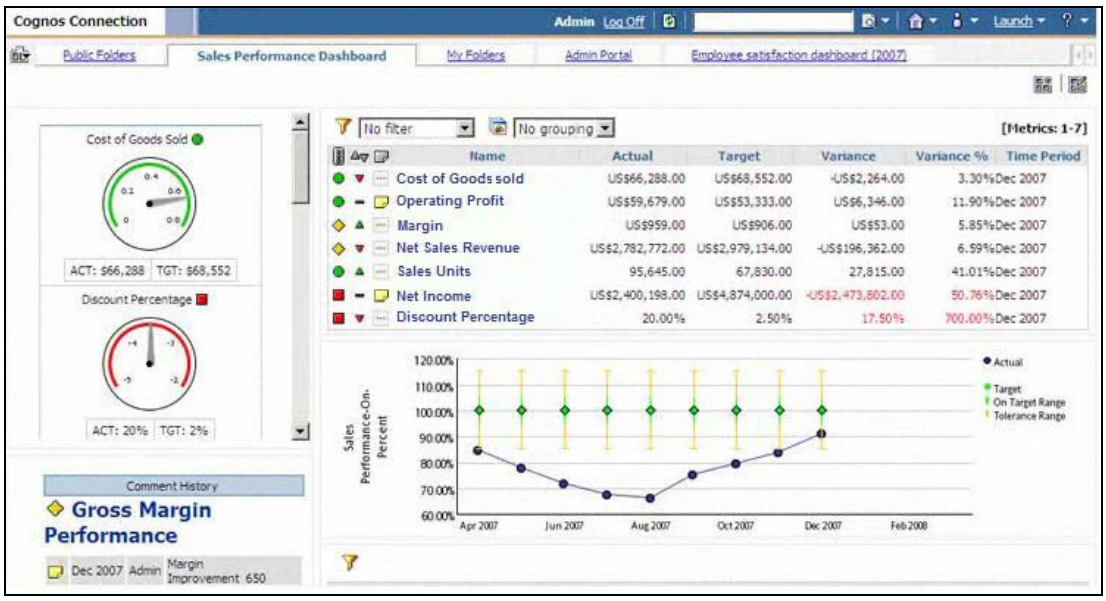
[Source: Retrieved on 27 August 2009 from http://demo.qlikview.com/]

Sales Controlling

“Sales controlling” delivers insight into general accounting measures not explicitly relating to specific characteristics, see Figure 20. The focus is set

on cash point transactions, prices, margins, inventory valuation, net sales development and target achievement. High level dimensions such as year, month, day, weekday, country, region, product group should be available to set filters. Proper measures are net sales, average net sales (valued at sales and purchase price), sales units, profit margin, price markdown ratio, return ratio, average receipt value, average amount of items per receipt and plan / actual or this year / last year comparisons of sales units or net sales.

Figure 20: Example of a Sales Controlling View



[Source: Retrieved on 27 August 2009 from http://download.boulder.ibm.com/ibmdl/pub/software/data/swlibrary/cognos/demos/od_cognos8/ibm_cognos_bi.html]

Store and Region Performance

"Store and region performance" aims to provide a deeper understanding of store productivity and location related performances to evaluate performance gaps between regions or stores and to recognize growth or "shrink" potential. The dimensional focus is set on territorial hierarchies, which means that data can be drilled down to region, country, county, city, street level as well as from store type to store number.

Important figures that should be deployed are net sales, sales units, profit margin, price markdown, sales per square meter, conversion rate, transaction frequency analysis (by hours) or dispersions of particular characteristics per region.

A store ranking by diverse figures can be contained as well as ABC analysis and a graphical development of sales regions, countries and stores.

Product Performance

“Product performance” aims to audit the sale of goods in order to optimize placement in the right stores at the right time and, in parallel, control the flow of inventory. Data granularity is high: the complete product hierarchy should be filterable as well as year, month, day, time, store number or price class. Important key figures are net sales, sales units, profit margin, average price, price markdowns, sell through rate, return ratio, product mix depth and product mix breadth. Analysis setups are product ranking with diverse figures, best sellers slow sellers-ratio, 80/20-analysis, product lifecycle estimation, cross selling lists and the dispersion of return causes.

Customers

The “customer” perspective intends to create customer knowledge starting from crucial demographics up to profiles that reveal specific buying behavior. Using this information enables to better target, observe, evaluate and improve sales and marketing efforts. This perspective offers a great deal of dimensions allowing to view customer behavior from multiple perspectives. Year, month, day, time, customer ID as well as other customer master data, details of the product hierarchy, price class, store number and territorial data are supposed to be available. Central metrics, besides the usual net sales, sales units and return rate are “new customers”-ratio, penetration rate, customer collection rate or average sales per customer segment. A proper analysis scheme in this perspective would be cross selling or results of basket of goods analysis, in the style of several lists displaying product correlations and sales frequencies grouped by certain customer demographics.

Inventory Control

The goal behind inventory control is to prevent setting up too much stock while simultaneously preventing to run out of stock. Usually, stocks are kept in each store and in central warehouses. Additionally, some goods are in transit between parties. Dimensions relating to inventory are often constrained in time details. Therefore, when it comes to inventory key figures,

mostly only the actual date is available with a monthly or weekly level of detail in retrospective. Further useful dimensions are store number and product hierarchy or product master data. Key inventory indicators are total current stocks, current available stocks, current reserved stocks, current stock value, inventory turnover rate and out of stock units. Proper graphical illustrations would be the stock development over time or the dispersion of goods in stock.

Supplier Performance

For the most part, supplier and purchase controlling is assigned to a central purchasing department using separate, specialized supply chain dashboards. In case of POS monitoring, the perspective “supplier performance” intends to complement inventory control. Open quantities to be delivered and incoming goods are critical to estimate inventory. Furthermore, analyzing vendor performance on store or region level helps to optimize store aligned purchasing and assures steady inventories. Key figures to evaluate suppliers are average deviation of delivery quantity and delivery time, average purchase price and quantity of product returns. Detail levels for this perspective should be year, month, day, supplier name, product hierarchy, store number and territorial data.

Of course, literature holds a lot more management ratios that would fit into POS dashboards. Yet, when considering one main challenge of business intelligence, which is the integration of data from dissimilar POS systems, a stable and performing “common denominator” in the form of a dashboard is more likely to be accomplished and accepted with only a medium amount of figures (7 to 22 KPIs) and dimensions. Furthermore, process organization behind overloaded dashboard systems is complex. It means to communicate to and enforce miscellaneous system administrators of mostly “independent” retail subsidiaries to set up a regular extract of common data structures and to verify it. Troubleshooting and occurring reschedules of reload batches due to system failures compromise the dashboard completeness.

Under the circumstances of “the more data the higher the error rate and process failures”, a sufficient amount of ensured data and accurate KPIs must be preferred to a vast amount of uncertain data.

6 Trends for POS Dashboards

Increasing employee mobility, growing competition, time pressure, the need for consumer orientation, the pressure of being one step ahead, all combined with the permanent demand for knowledge, ideally in a personalized style regardless of location or device, creates the need for a world of information without boundaries. BI does and will continue "[…] to make businesses smarter, especially during these difficult economic times."[32] To assure the fulfillment of "boundless information", BI vendors and "BICCs" need to comply with certain trends, introduced as follows.

6.1 Integration of Market and Buying Power Data

Retailers are able to analyze more insightful data by extending location based analytics. Most of what retailers analyze holds a location dimension, meaning a country, region, city, address and, thus, coordinates it refers to. Using their own data, retailers are already able to measure where they run the most successful stores, where their best customers live, which specific product sells best in what regions. In order to optimize BI in the context of location, retailers have the opportunity to broaden this context and integrate data on competition, demographics or purchasing power belonging to the selected location. Central market research institutes such as GFK-Geomarketing[33] or IRI[34] offer substantiated "location complementary" market information. This preformatted data can either be acquired and integrated by the retailer into its own BI system or it can be completed by the retail client's internal data into an external "software as a service" ("SaaS") data warehouse, run and provided as analytical service by the market researcher. Retail specific market data collections offer the following features: City and region-related buying potential, customer demographics such as age groups or income levels, demand calculations for certain products and address

[32] Don Campbell, "10 Red Hot BI Trends", *Information Management Special Review,* 23 June 2009 (Brookston: Information Management and SourceMedia, Inc). Retrieved on 19 May 2009 from http://www.information-management.com/specialreports/2009_148/

[33] Retrieved on 20 May 2009 from http://www.gfk-geomarketing.com

[34] Retrieved on 20 May 2009 from http://us.infores.com/

based POS sale information of retailers and competitive POSs including their turnover. All information relate to geo coordinates which permit the exact positioning of own, competitive and complementary POSs. Furthermore, the research data can be acquired by product line, for instance, “Camping and Sports Equipment” or “Coffee”.

The merge of external market data with own POS data holds obvious analytical advantages for retailers. Companies can compare own KPIs to industry wide benchmarks, they can better grasp actual market potential and align towards closing this gap, they can see the changes in consumer behavior and derive own forecasts, they can optimize their store locating, they can use the geo coordinates to optimize supplying routes and much more. The trend of including industry specific market research information is also highlighted by Gartner Institute in one of its 2009-predicts: “Industry specific information aggregators delivering analytic applications […] will significantly increase the level of information transparency in those industries.”[35]

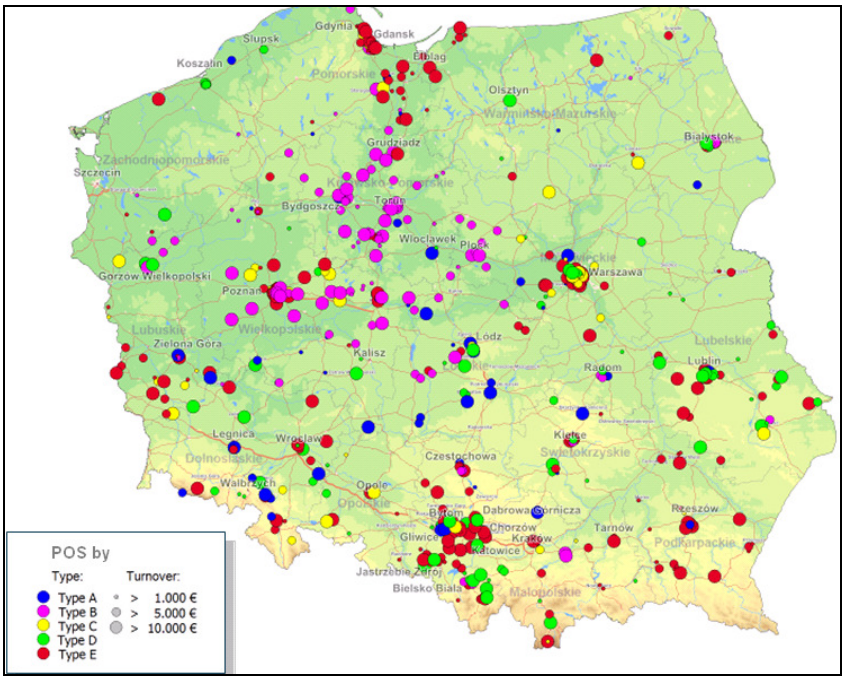
In the regard of embedding industry focused information, another trend of “next generation” data visualization can be applied more easily. Due to geo coordinates, metrics can be visualized on country map diagrams which facilitate analyses by marking hotspots or weak regions, even on the street level. By improving intuitive analysis and offering a “discoverability style […], retailers will find some degree of value in implementing better visualization tools […].”[36]

Figure 21 and Figure 22 show examples of what geo diagrams for POS or purchasing power could look like. Both diagrams could also be overlaid.

Figure 21: Geo Diagram – POS Positions and Turnover Strength

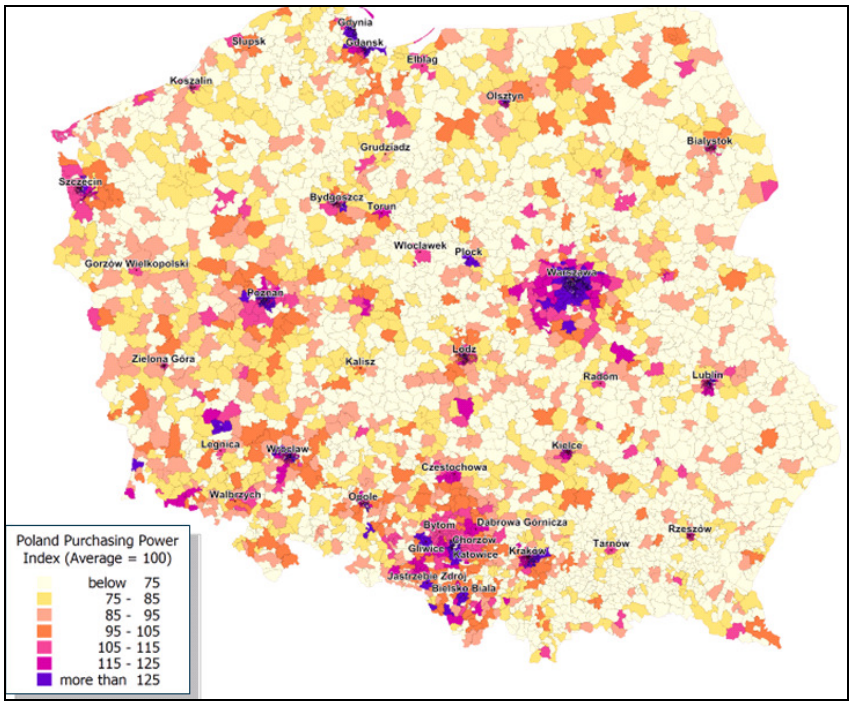
[35] Kurt Schlegel and others, *Predicts 2009: Business Intelligence and Performance Management Will Deliver Greater Business Value, 18 December 2008,* (Gartner, Inc, 2009), 5

[36] Hung LeHong, *New Retail Business Intelligence Technologies That Retailers Should Consider, 23 September 2008*, (Gartner, Inc, 2009), 4



[Source: Retrieved on 20 May 2009 from http://www.gfk-geomarketing.de/software/regiograph/rundgang.html]

Figure 22: Geo Diagramm – Purchasing Power



[Source: Retrieved on 20 May 2009 from http://www.gfk-geomarketing.de/software/regiograph/rundgang.html]

6.2 Real Time Business Intelligence

Real time Business Intelligence allows companies to monitor “up-to-the-minute” data and react immediately. Retailers often lack real time visibility of

critical operations and, thus, make hurried decisions based on “historical” and days-old information. Retail processes in which up-to-date analytics can make a significant difference are inventory controlling, auditing and management of store traffic including queue lengths or sales monitoring solutions for products with a short lifecycle.[37] Virgin Megastore, for instance, a music and movie reseller uses highly topical sales figures to align inventory and assortment because “a new album typically does half its sales within two weeks of release.”[38] Fashion business, as another example, is a season based business in which the success of a collection starts all over several times a year and sales time is very limited. Getting data in real time is crucial! Gerry Weber Holding, the fashion brand sold in the German department stores Galeria Kaufhof, currently sets the optimal precondition for fast sales monitoring. The companies are testing opportunities of RFID technology by tagging their clothes and setting up reading devices in few selected stores, stocks and distribution centers. Besides creating a more efficient handling of incoming goods, inventory, cashing, theft or customer service, RFID entails numerous potentials for analytics. The Gerry Weber shop floor of Galeria Kaufhof in Essen, Germany, has been equipped with so called “intelligent racks”, ”intelligent shelves” and “intelligent fitting rooms”.[39] Each of these “storage devices” is fitted with RFID scanners and automatically records and assigns clothes that are displaced or placed in. Thus, moving articles from a rack to a fitting room creates data transactions. By analyzing the amount of such movements of clothes at the beginning of a sales season, steering insights about an article’s popularity can be revealed. A piece of clothes, for example, that has often been carried from a shelve to the fitting room but never to the cash desk might bare some fit or comfort problem. Another example is an article that holds no movement and might, therefore, be considered as ugly by the customers.

Real time analytics of RFID transactions can make a considerable contribution when launching a new collection. They reveal how to arrange the

---

[37] Hung LeHong, *New Retail Business Intelligence Technologies That Retailers Should Consider*, *23 September 2008,* (Gartner, Inc, 2009), 3

[38] Kim Nash, *How Real-Time Business Intelligence Pumps up the Volume for Sales, 11 February 2009*, (CXO Media Inc). Retrieved on 1 June 2009 from http://www.cio.com/article/480472/

[39] Metro Group Future Store Initiative, *Mittendrin Galeria Kaufhof*, 27 Mai 2009. Retrieved on 1 June 2009 from http://www.future-store.org/fsi-internet/html/de/5439/index.html

shop floor and stocks, where to do discounts or what article to advertise in order to achieve optimized sales and inventory turnover for the remaining season.

Although it might now sound feasible and pioneering, not every single business processes ought to be measured in real-time, rather individual driven operations aimed to solve very specific problems are particularly eligible. Usually, BI requires an extended data-harmonization, cleaning and transformation process that passes through several DWH layers to deliver stable and system integrating data insights. Often data sources from different time zones are included, so that the reload process runs at one fixed time per day and takes up to several hours. Furthermore, real time BI faces some technical conditions as it requires a “real time compatible” BI tool holding direct data accessibility and efficient reloading techniques as well as hardware with huge memory to process data masses.

6.3 Mobile Analysis Front Ends

It often occurs that executives are away on business and need some decision supporting figures, for example recent sales, best and slow selling products or budget comparisons. Usually they call the office, let their assistants recall the data and announce over the phone. This proceeding is both, prone to errors or misunderstandings and time-consuming.

Mobile BI applications or dashboards that are retrievable via smart phones or handhelds help out in such situations. That way, managers are not dependent on their desk or their mobile connected laptop. Having a compilation of KPIs constantly at hand enables convenient, information based management, decision making or critical responding in all kinds of situation, for instance in trains, during coffee breaks or stuck in a traffic jam.

Today, people are familiar in using mobile devices in everyday life which makes a mobile BI adoption less complex and less costly for a company. After all, utilization resistance and training remain minimal. Also, technology has progressed: BI software now runs stable and shows elaborated applications on small touch screen devices or other smartphones.

Nevertheless, companies have to consider certain issues in order to minimize risks and to assure trouble free operation. Security aspects are significant. Companies have to pay attention to what is passing their firewall and how to protect data. Furthermore, to assure efficient and affirmative mobile BI deployment, companies should take care of instituting uniform mobile devices that, additionally, are easy to operate.

To get an idea of what mobile BI looks like, Figure 23 and Figure 24 below demonstrate a dashboard application with a selective dimension (month) and a chart (bar chart showing actual sales in current year vs. last year and current budget line).

Figure 23: Selective Dimensions on Mobile Phone

[Source: Retrieved on 3 June 2009 from http://www.qlikview.com/contents.aspx?id=9774]

Figure 24: Bar Chart on Mobile Phone

[Source: Retrieved on 3 June 2009 from http://www.qlikview.com/contents.aspx?id=9774]

7 Conclusion: Retail Business Intelligence and Market Research Integration as Development Need

When reviewing the necessities to develop retail dashboards that have been described in this thesis, such as benchmarking options, dashboard components and BI trends, realizing a successful dashboard project appears manageable. BI tools, experts available on the market and the ever advancing technical infrastructures to underlay analytics also accommodate the realization of dashboards. Projects may vary in time, scope, complexity, variety of data and source systems, detail levels, data actuality or the amount of KPIs. Yet, with a sophisticated, multi phased project plan, with an overall willing attitude towards BI, with adequate management commitment and with the right resources, achieving a strategy oriented and status quo-compliant POS analysis dashboard is no rocket science. Those retailers performing “dashboard rocket science” mostly set themselves apart by pioneering in mass or real time data handling, in technical infrastructures or by displaying dashboards on mobile front ends or web browsers.

Based on own experience and based on investigations as well as benchmarking retail BI, what is neglected in this field is the encouragement of retailers along with the offering of best practice guidelines to integrate own market research and marketing activities into their dashboards and underlying data models. As mentioned in chapters 3.3 and 5.4, that what distinguishes retailers from other industries and allows them for possibilities, is the closeness to the customer, which enables to “gain headroom”, to collect customer behavior and, thus, to enlarge opportunities. As described under BI trends in 6.1, integrating data of central market research institutes is one innovative step towards market data integration. Yet, the deficient part of data from research institutes might be the industry wide generality of data and the lack of specific business-tailored consumer researches.

When it comes to insufficient information sources, retailers must not consider analytics as limited. Instead, it is a frequent barrier required to be overcome by retailers in order to go beyond company internal information.

If ideas are indefinite or have not been researched before, retailers are called upon finding a way to investigate them. When it comes to striving for analytical competition, retailers have to be innovative and must dare to integrate new methods and boost BI data that is relevant for them, while, of course, respecting legal boundaries such as data privacy.

For example, retailers are very likely interested in customers who leave the store without a purchase. These customers are most unknown and, thus, could reveal missing needs-offer-gaps which complete POS information. Such data could be gathered by letting store personnel systematically audit, estimate and collect information on "non buyers". An example for apparel retailers would be to have staff reporting on the customers sex, estimated age group, estimated weight/size, estimated type (for instance "accompanying husbands") and, in case of a sales conversations, retain answers to questions such as "did the customer find what he need?" and in particular "is there something the customer wants that the company doesn't carry?"[40].

In most cases it is helpful to confer research projects with a market research consultancy that is specialized in the determination of relevant populations, formulating surveys or schemes and assessing their appropriate scale and scope. Yet, even though market researchers are experts when it comes to breaking the ground of non-transparent consumer behavior, they are no experts in respect of integrative information or BI management.

To make sure innovative analytic attempts or collaborations of BI and market research do not end in a power point presentation, some aspects to pay attention to are listed closing this thesis. The following principles are based on judgment and own experience concerning "potential data integration projects".

Structure and Long Term Practicability

When designing schemes or surveys for market data collection, key information and data has to be compatible to the existing structure of the data

[40] Ken Favaro, Tim Romberger and David Meer, "Five rules for Retailing in a Recession", *Harvard Business Review, Voume87, Nr. 4* (April 2009), 71

warehouse. That means that storage technology, data format and terminologies must match. For example, date format or size estimation should be stored according to a companywide standard (S, M, L, XL). Additionally, BI integration usually implies more than one-time use of information. Sales or cost comparisons between days, months, years or trend analyses are demanded. Thus, it is required that, for example, the trend of demographical developments of desired consumers is traceable.

In reality, when designing a survey, “sustainability” is not the primary focus and often neglected due to all other factors to be considered (e.g., questions, question order, test persons, etc.). Nevertheless, it is essential to repeat market research in order to get an idea of how consumer preferences change. It pays out to orient market research towards resisting several “turns” and to forestall adaptations or a complete redesign.

Integration of BI Team

In most cases, market research projects are conducted isolated within marketing or sales divisions as their realization is ranged under marketing activities. That way, data integration in the company’s data warehouse is neglected.

If the aim is to associate market research data with own POS data, projects cannot be finished efficiently without integrating members of the BICC into the project team. BICC members are able to counsel and support decisions on how to integrate market data, which analysis dashboard is appropriate and what analytical associations or KPIs make sense and are realizable. Examples could be to relate results of consumer research to top and flop sales days or to display a “non buyer’s rate”. In addition, BI specialists have to determine the data structure and format to enable integrated market research.

Employee Awareness and Commitment

Letting employees execute research activities is a “by the way task”. Rightly, sales driving activities must be prioritized. Yet, if all employees are fully utilized by selling, an additional employee should be scheduled to focus on the research.

Performing surveys or audits requires training of the selected personnel and their dedication to the task. They must understand why the research is essential for the overall company and be encouraged by the fact that it is their judgment, know-how, discretion and their customer experience that is needed to successfully gather data. To assure a precise and extensive information collection, when for example auditing consumer behavior, the personnel must obtain the support from their company they need. They could, for instance, be equipped with mobile handhelds that hold a simple input form allowing them to just check some boxes and type in some key words. That way, data can be saved quickly, preformatted and by the way.

Experience and research in both, BI and retail showed that companies are in the need of knowledge and seek for clues lifting them one step ahead of the competition. When it comes to internal processes, BI is regarded as the obvious solution because it handles system diversity and delivers meaningful collections of data. When it comes to external subjects like market development, customer potential, brand reputation, market surveys or research is well conducted with professional help. However, the process of data gathering remains manual and unique, thus, it can easily sink into oblivion.

When considering that most BI projects, to a greater or lesser extent, lead to BICCs in any case, what would be the downside of including their experience into external research projects in order to ensure sustainable and integrated knowledge?

This last chapter of the thesis intended to suggest the idea of including market research activities - or any kind of research - into the company's BI and to state organizational premises for this inclusion. Applying them can certainly lead to turn more innovative "[…] data into information and information into knowledge […]"[41] which paves the way towards analytical competition while actually being independent from technological progress.

[41] Wayne W. Eckerson, *Performance Dashboards* (Hoboken: Wiley & Sons, 2006), 49

Bibliography

Books:

- Axson, David and Keith R. Herrmann. *Performance Management and Reporting Best Practices: From Data to Decisions.* Hoboken: Wiley & Sons, 2003.
- Becker, Jan and Alex Winkelmann. *Handelscontrolling - optimale Informationsversorgung mit Kennzahlen.* Berlin: Springer, 2006.
- Becker, Jan and others. *Retail Information Systems based on SAP products.* Heidelberg: Springer, 2001.
- Davenport, Thomas D. and Jeanne G. Harris. *Competing on Analytics.* Boston: Harvard Business School Publishing, 2007.
- Diverse. *Harvard Business Review on Retailing and Merchandising.* Boston: Harvard Business School Press, 2009.
- Eckerson, Wayne W. *Performance Dashboards*. Hoboken: Wiley & Sons, 2006.
- Finnigan, Jerome P. *The manager's guide to benchmarking.* San Francisco: Jossey-Bass, 1996.
- Parameter, David. *Key Performance Indicators - developing, implementing, and using winning KPIs.* Hoboken: Wiley, 2007.
- Reynolds, Jonathan and Christine Cuthbertson. *Retail strategy. The view from the bridge*. Oxford: Elsevier Butterworth-Heinemann, 2004.
- Spendolini, Michael. *The Benchmarking Book.* New York: American Management Association, 1992.
- Williams, Steve and Nancy Williams. *The Profit Impact of Business Intelligence.* San Francisco: Elsevier, 2007.
- Zentes, Joachim, Dirk Morschett and Hannah Schramm-Klein. *Strategic Retail Management.* Wiesbaden: Gabler, 2007.

Articles:

- Davenport, Thomas H. “Competing on Analytics”. *Harvard Business Review - Special Issue on Decision Making*, *January 2006*. Boston: 2006 Harvard Business Publishing.
- Favaro, Ken, Tim Romberger and David Meer. “Five rules for Retailing in a Recession“. *Harvard Business Review, Volume 87, Nr. 4, April 2009*. Boston: 2009 Harvard Business Publishing.
- LeHong, Hung, Mim Burt, Van L. Baker, Gale Daikoku and John Davidson. *Key Issues and Research Agenda for Retail, 1H09, 29 January 2009.* Gartner, Inc, 2009.
- LeHong, Hung. *New Retail Business Intelligence Technologies That Retailers Should Consider, 23 September 2008.* Gartner, Inc, 2009.
- Schlegel, Kurt, Mark Beyer, Bill Hostmann, Rita Sallam, Bill Gassman , Nigel Rayner, Neil McMurchey, Neil Chandler, Matthew W. Cain. *Predicts 2009: Business Intelligence and Performance Management Will Deliver Greater Business Value, 18 December 2008.* Gartner, Inc, 2009.
- Willenbrock, Harald. “Das Geheimnis der Guten Wahl”. *Geo, 08/2008*. Hamburg: Verlag G+J.

Websources:

- BBE Retail Experts**.** *Sortimentsanalyse*. Köln: BBE Verwaltungs GmbH, 2002-2008**.** Retrieved on 22 August 2009 from http://www.bbe-handelswissen.de/data/themen/Marktpositionierung/Sortiment/Sortimentssteuerung/Sortimentsanalyse.php
- Campbell, Don. "10 Red Hot BI Trends", *Information Management Special Review, 23 June 2009.* Brookston: Information Management and SourceMedia, Inc, 2009. Retrieved on 19 May 2009 from http://www.information-management.com/specialreports/2009_148/
- Graham, Peter. "Organizational Considerations for Information Empowerment", *Information Management Magazine*. Brookston: Information Management and SourceMedia, Inc, 2008. Retrieved on 28 April 2009 from http://www.information-management.com/issues/2007_48/10001347-1.html
- IM Editorial staff, "SAS Study reveals BI Competency Centers are Key to Effective Information Management", *Information Management Online*. Brookston: Information Management and SourceMedia, Inc, 2007. Retrieved on 28 April 2009 from http://www.information-management.com/news/1082213-1.html
- Jefferies, Duncan. *BI strategy in retail, 8 July 2008.* Retrieved on 22 February 2009 from http://www.onwindows.com/Articles/BI-strategy-in-retail/2810/Default.aspx
- Kearse Robert. "6 BI Pitfalls and How to Avoid Them"*, Information Management Special Review, 14 July 2009*. Brookston: Information Management and SourceMedia, Inc. Retrieved on 15 July 2009 from http://www.information-management.com/specialreports/2009_151
- Korbmacher, Karlheinz and Lydia Korbmacher*. Sätze zur Lagerkennziffer*. Retrieved on 18 August 2009 from http://www.luk-korbmacher.de/Schule/Mathe/lemmalag.htm#Lagerzinsen
- Metro Group Future Store Initiative. *Mittendrin Galeria Kaufhof*, *27 Mai 2009.* Retrieved on 1 June 2009 from http://www.future-store.org/fsi-internet/html/de/5439/index.html
- Minahan, Tim. "Top 10 Supply KPIs: Aberdeen's View". *SupplyExcellence.com, 13 December 2006*. Ariba, Inc: 2006–2009.

Retrieved on 1 September 2009 from http://www.supplyexcellence.com/blog/2006/12/13/top-10-supply-kpis-aberdeens-view/]

- Nash, Kim. *How Real-Time Business Intelligence Pumps up the Volume for Sales, 11 February 2009*. CXO Media Inc. Retrieved on 1 June 2009 from http://www.cio.com/article/480472/
- Skeele, Dale. "Beyond BI to Real-Time Operational Intelligence", *Information Management Special Reports, 20 January 2009*. Brookston: Information Management and SourceMedia, Inc, 2009. Retrieved on 6 June 2009 from http://www.information-management.com/specialreports/2008_120/10002409-1.html
- Smalltree, Hannah. "Mobile business intelligence – Will it take off (for real, this time)?" *SearchDataManagement.com, 18 Januar 2007.* Retrieved on 6 June 2009 from http://searchdatamanagement.techtarget.com/news/article/0,289142,sid91_gci1239777,00.html
- *Starbucks' growth strategy: locations, locations, locations.* Washington Post, September 3, 2002. Retrieved on 30 April 2009 from http://www.sptimes.com/2002/09/03/Business/Starbucks__growth_str.shtml

General Websources:

- http://www.barc.de. Retrieved on 15 August 2009
- www.qlikview.com. Retrieved on 10 April 2009
- http://www.gfk-geomarketing.com. Retrieved on 20 May 2009
- http://us.infores.com. Retrieved on 20 May 2009
- http://help.sap.com/. Retrieved on 10 July 2009
- www.amazon.com. Retrieved on 21 August 2009
- http://en.wikipedia.org. Retrieved on 21 August 2009.
- http://www.data-mining.de. Retrieved on 30 August 2009