

**MEASURING PERFORMANCE IN A KNOWLEDGE ECONOMY:  
LINKING THE SUBJECTIVE AND OBJECTIVE DIMENSION  
INTO ONE SYSTEM OF “VECTOR-BASED”  
PERFORMANCE MEASUREMENT <sup>1</sup>**

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**Abstract**

Customers or other stakeholders require from business or non-profit organizations today to act according to their subjective, qualitative values. Therefore organizations have to take increasingly qualitative, subjective ratings and values into account in managerial decision-making. Thus, they need performance measurement systems that are able to handle subjective, qualitative measures and to combine them with objective, financial information. The vector-based concept of performance measurement & visualization that is introduced in this paper and that the authors discuss in the context of public service management (to support the Swiss “New Public Management”) is offering a practical solution for this.

**Problem description and introduction**

Since supply was exceeding demand in the industrialized countries (beginning in the 1970s), organizations have started to compete more and more on quality, differentiation and customer satisfaction, rather than only on cost/financial efficiency. The ability to create a positive “effect” for customers from their subjective perspective (and increasingly for other stakeholder groups that have today power over the “license to operate” of an organization) became the critical success and survival factor for any organization – whether business or non-profit (Daum, 2002). When customers and other stakeholder have choice, they can choose between various offers, meaning that they are able to select that product or service that

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<sup>1</sup> Peter Bretscher has developed the foundations of the vector-based concept that is presented in this article (see Bretscher, P., 1996, 1998) in collaboration with organizations from different sectors in Switzerland. It also has been licensed to consulting organizations and the concept has been continuously enhanced and further developed. In this article the two authors are trying to describe the concept from a broader perspective with the intention to allow any organization to use it to improve its performance measurement system.

**Ref.: PMA 477 - PRACTICAL APPLICATION SUBMISSION**

is more in line with their personal, subjective qualitative values than other offerings. Therefore the main driver for competitive advantage today is what we call “external effectiveness”, that is effectiveness from a subjective stakeholder perspective. As a result, subjective, qualitative factors, the intangibles, became at least as important in evaluating the performance of an organization as the objective (financial) factors - and performance can no longer be defined and expressed just in financial terms.

Unfortunately most of our performance measurement systems are still dominated by “objective” financial measures and ignore the subjective effectiveness of an organization from the perspective of its customers or other important stakeholders. But only if we take both dimensions into consideration, we are able to assess the true performance of a company, a business unit, a product line or of a public service organization. An increasing awareness exists for this fact especially in the public services sector, where organizations have been managed for centuries only by budgets and funds. Today, when citizens are expecting more value for the taxes they have to pay, these organizations need something different than just the budget to manage their operations and to create value for their “customers”.

But not only public service organizations, any organization today need a performance measurement system that is able to express subjective valuations, experiences and ratings and to combine them with quantitative, financial information. This should be possible in a way so that the result is easy to understand and “handable” from a managerial perspective, meaning that such measurements can be applied across and within large organizations, linking different areas of measurement into one system of performance measurement. We believe that the vector-based concept of performance measurement and visualization, that we are going to describe in this paper, is offering a practical solution for this problem.

### **Introduction to the concept of subjective measurement**

Subjective measurement systems based on qualitative “measures” are nothing new. In fact they are at the root of many of our objective quantitative measurement systems to which we have become so used to that we sometimes forget that they didn’t exist two or three hundred years ago. One example is how we measure temperature. Before we had our current objective, quantitative temperature measurement systems, people have been used to define temperature by categories like “cold” and “warm” – “measures” that need subjective interpretation and that are highly context sensitive (“cold” in Norway probably means something different than “cold” in Italy). It was only in the 17<sup>th</sup>/18<sup>th</sup> century when Réaumur (1683-1757), Fahrenheit (1686-1786) and Celsius (1704-1744) introduced the first standard temperature scales that were oriented on natural/common temperature fix points, like the temperature of the human body or the temperature when water is transformed from a fluid state to vapor or ice, so that people have been able to measure and compare temperature through an objective measurement system that is based on context and interpretation independent measurement scales.

Subjective, qualitative measurement happens every time – also today -, when an individual stakeholder, such as a customer, values a company’s offering. Every customer is valuing the product or service offered according to subjective qualitative criteria. That valuation is driving the decision to buy or not to buy for a specific price. Consider Mrs. Miller, who is intending to buy a new dress. What might drive her decision to buy it from a designer boutique, where

**Ref.: PMA 477 - PRACTICAL APPLICATION SUBMISSION**

she has to pay double of the price than at an ordinary department store (even if the production costs are the same)? Decisive factors might include that the dress from the boutique corresponds more with the latest international fashion trends, that its color is her favorite color, that it carries the label a famous designer, that she is treated with more attention at the boutique than at the department store etc. – all intangible, qualitative values. But as every person has a different set of personal qualitative i.e. subjective valuation criteria, the willingness to pay a specific price-premium will probably differ from person to person. To make this relationship visible and manageable is the objective of the vector-based concept.

### **The concept of vector-based performance measurement & visualization**

The intention of the vector-based concept for performance measurement & visualization is to combine subjective, qualitative measurement of performance with objective, quantitative measurement of performance, so that total or compound performance (the compound of qualitative and quantitative performance) becomes visible (Bretscher, 1996, 1998).

The basic principle of the concept is simple (see diagram 1): One dimension (the x-axis) represents the objective (usually financial) dimension of performance. The second dimension (the y-axis) represents the subjective, qualitative dimension of performance. The third dimension (the length of the vector =  $v$ ) represents the absolute total performance, the compound result of qualitative and quantitative performance. It can be calculated as:  $v = \sqrt{x^2 + y^2}$ . The gradient of the vector can provide users with additional relative performance information. It can be calculated as  $\alpha = \arctan (y/x)$ . Here an example for a simple managerial application (see diagram 2):

- the **x-axis displays financial results achieved** (monetary units representing e.g. profit or return on investment). It gives an indication about how efficiently an organization is using its resources from an (objective) economic/financial perspective.
- the **y-axis displays value created from a customer perspective** (measured e.g. according to a relative customer satisfaction scale). It gives an indication about how effective an organization is in satisfying (subjective) customer demand.
- the **vector represents management's total performance**: The length of the vector represents total performance achieved (including qualitative, subjective customer value *and* financial results). The gradient angle of the vector can serve as an additional indicator of available or lacking performance potential ("sustainability/potential indicator"): the steeper the vector's gradient, the larger is the value-added created from a customer perspective compared with financial results achieved. This could be a sign that the company or the business unit has created significant customer value, but has not yet been able to leverage it from a financial perspective. The opposite case (the vector's gradient is low) would signal that, while the company or business unit is still producing good financial performance, it has destroyed customer value – a fact that might result in the future also in declining financial results.

Another variant of the vector-based concept for performance measurement & visualization is shown in diagram 3. Here the vector (i.e. its length and direction/gradient scale) is not defined by a value on the x-axis and one on the y-axis but by two values on the x-axis. The value for the y-axis is then determined through the vector. A possible application for this variant is the valuation of enterprises by different investors with different investment strategies: values on

**Ref.: PMA 477 - PRACTICAL APPLICATION SUBMISSION**

the x-axis represent book value and the price / market value different investors are willing to pay. The values on the y-axis show the different subjective use values the investment represents for these investors. This application example is drawing the attention to the difference between price (objective, monetary dimension) and value (subjective, qualitative dimension) and is very useful e.g. in customer segmentation and strategic planning.

Because the vector-based concept for performance measurement & visualization of total performance is based on a mathematical foundation (calculations with objective *and* subjective values are possible), it allows users to easily aggregate performance of various sub-entities into a “sum” of performance for the whole entity (**vector aggregation**). Analysis and assessment of quantitative and qualitative values is starting on the sub-entity level per sub-entity. The results, objective and subjective values for each sub-entity, are then added up to show the total performance of the whole entity (“the sum”). For example a company could rate its business units according to profit (x-axis) and use value created from a customer perspective (y-axis). The results of the single business units would then be added up to show the total performance of the whole company (see diagram 4)<sup>2</sup>. **Drill-down analysis** would start with a vector representing the performance of an entity – e.g. of a company, a bank, a business unit or a region. This total performance is then de-aggregated into the contributions of the various sub-entities (e.g. business units, branch offices, product groups or countries) creating a specific vector profile for each sub-entity (see diagram 4). Through the drill-down analysis the components of an entity’s total performance become visible on a sub-entity level and can thus become targets for managerial interventions.

**Benefits of the vector-based concept of performance measurement & visualization:**

- It enables managers to keep the overview over subjective and objective information: In the decision making process managers have to take into account objective, quantitative – usually financial information, such as price, cost, revenue or profit, but also subjective, qualitative criteria - i.e. information about the likely qualitative effect of their decisions for customers, investors or other company stakeholders. Without such an instrument people cannot keep all these different parameters in their mind and cannot make the necessary weightings and calculation necessary for rational decision making.
- It makes subjective information independent of time and location and therefore comparable and communicable in large organizations: The vector-based concept for performance measurement & visualization provides a value logic that allows managers to include subjective views, experiences and values in coded form in reporting and decision processes. Thus, even when the holders of these subjective views are not personally present/involved in the decision making process, subjective, but decision relevant information can, for instance, be passed on in written or electronic form to the next hierarchical level
- It helps managers to make optimal trade-off decisions: Due to its mathematical foundation calculations (aggregations and de-aggregations) are easily possible also for subjective information so that the whole picture across different sub-entities / sub-domains remain visible at any point in time. Priorization in managerial decision making (in trade-off decisions), e.g. for optimizing resource allocation across business units, can be done with the whole picture in mind so that not only total efficiency (resource

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<sup>2</sup> for simplification we are neglecting here the costs / use value of the center.

**Ref.: PMA 477 - PRACTICAL APPLICATION SUBMISSION**

perspective) but also total effectiveness (customer or market value generated by investment) will be increased.

- It is easy to understand from a managerial perspective: The vector-based concept for performance measurement and visualization provides managers with decision relevant information in very concentrated form and in an easy to understand and easy to digest way. The result: less interpretation uncertainty, better and more consistent decisions.
- Assumptions behind decisions and the history of the decision making process become transparent: It makes subjective criteria behind a decision transparent and allows also to track the development of the values of these assumptions over time in order to modify decisions and optimize the intended effect at a later point in time without the need to communicate again all the details to people that are involved in the decision process.

### **III. Practical application of the concept in a public service organization**

Governmental authorities are facing today a major challenge in administrating / managing their public service organizations. Citizens are expecting more value for the taxes they have to pay, but an instrument that makes these subjective “customer values” visible in managerial decision making is missing so far. Under the traditional public service management regime public service organizations have been managed for centuries just by budgets / funds, making it difficult to determine, how well or bad a public service organization is really performing. To overcome this problem and to establish Swiss public services as modern customer focused and efficient service organizations is the objective of the “New Public Management” (NPM) initiative in Switzerland. The Swiss NPM-concept is focusing on three key questions:

- How should our politics affect the citizens? (effects)
- What contribution / performance of the public service administration is required to achieve these effects? (activities and their performance)
- How much does it cost? (costs)

To show the relationship between effects, performance and costs and to use the resulting insights for optimizing public service management represents the core-principle of the Swiss NPM-concept. The basic assumption is that when effects, activities and their performance and costs are taken into account together and are managed as the parts of one system (the “NPM Magic Triangle” – see diagram 5), optimal results will become possible and effects and performance will move to the center of managerial attention – not just the costs (funds) that a public service organization is spending. This creates the foundation for a more “customer-centric”, i.e. citizen-centric public service management (Kanton Basel-Stadt, 2003).

The vector-based concept for performance measurement & visualization is providing the appropriate instruments to support NPM in Switzerland<sup>3</sup>. The basic principle for applying it in e.g. a Swiss Kantonalverwaltung is very simple: achieved effects and effect-goals (“Wirkung”) are presented on the y-axis, actual costs and cost-budgets (“Kosten”) are presented on the x-axis and actual performance and performance targets (“Leistung”) is

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<sup>3</sup> The application of the concept of vector-based performance management & visualization to support public service management is actually under investigation at several Kantonalverwaltungen in Switzerland.

**Ref.: PMA 477 - PRACTICAL APPLICATION SUBMISSION**

presented through the vector (see diagram 5). With that approach it is possible to measure and present the performance in all three performance dimensions. Using vector aggregation and drill down analysis enables a Kantonalverwaltung to keep always the overview over effects, performance and costs of its various product groups (services) and Departments (public service departments), in order to make better trade-off decisions between effects and costs and thus to optimize the portfolio of its services from a holistic perspective. The vector-based approach combines information from cost accounting with non-financial performance and effects into a multidimensional coherent performance measurement system that links all organizational levels into one system of measurement. This makes the complexity manageable and puts every product group and every public service department into the context of the whole system/organization (see diagram 6). Possible results include:

- Public service managers would not need anymore to dig through 300 budget pages (that is for instance the actual number of pages for the Kanton Basel-Stadt budget, including product / product group effect objectives and performance targets) to get an overview.
- Because the concept helps to set focus in the first place on value and performance (effects for citizens and performance of the public service) and then on financial budgets (on how to get and spend funds), it is aligning the whole organization with the intended effect of its activities for society and citizens.

Many organizations, especially companies in service industries, are facing today similar challenges in performance measurement and management like public services organizations. We are convinced that the vector-based concept of performance measurement & visualization is providing an instrument that can bring more clarity, transparency and speed into the decision making and reporting process by combining subjective, qualitative information, with objective, financial information. Due to the limitations for the length of this paper we are not able to cover here other use cases. But in our presentation at the PMA 2004 conference we will discuss as a second case the application of the concept in supporting the management of an R&D operation of a software company. We also will discuss the application of the concept in a bank and in enterprise valuation / strategic planning.

**Implementation of the concept in an organization**

We recommend following these implementation steps:

1. Awareness & Scope Workshop: The objective of this workshop is to broaden the understanding of the concept, create awareness for its opportunities and for its limitations, to determine the scope of a first prototype, and to make a final decision about the members of the project team and the government structure of the project.
2. Object definition: Define the objects of performance measurement (projects, departments, process steps ... → what do we want to measure?) and their relationship between each other and with the “whole picture” (company, business unit etc.).
3. Defining measures, metrics and visualization: Define measures and metrics for qualitative, quantitative and compound measurement (→ how do we want to measure in a multidimensional way? What are the relevant/critical dimensions?).
4. Parameterization: Define rules for quantifying qualitative values (→ how do we quantify subjective ratings in a way that we can perform later mathematical operations with them?)
5. Clustering: Define clusters for objects that have been selected in step 2 (→ how can we group the most detailed objects into clusters so that we can keep the overview?).

**Ref.: PMA 477 - PRACTICAL APPLICATION SUBMISSION**

6. Weighting: Define weights for each object (→ how important is each object within the framework of the whole entity from the perspective of the customer?).
7. Charts / visuals: Define the charts/visuals (→ which charts do we need to support planning processes, performance reviews, or specific decisions? How are they connected?).
8. Test and revision: Test the new measurement and the visualizations system (→ are the assumptions made in line with reality? Does the system work in practice?) and revise it where necessary (iterative process).

### **Conclusion and outlook**

The vector-based concept of performance measurement & visualization is offering a practical solution for the performance measurements challenge today's organizations, whether business or non-profit, are confronted with: to integrate subjective and objective performance measurement into one system of performance measurement. While detailed feedback from a larger number of practical applications of the concept is still missing, discussions with and investigations of various organizations of different sectors about the application of the concept in areas such as internal audit, R&D, strategic planning, performance management in public services, customer service management and many others have already demonstrated its practical relevance. We are convinced that organizations will need and will use in the future instruments that can handle intangible, qualitative, subjective values in a similar way than financial accounting and financial statements can handle today financial information. Therefore organizations will need in addition to the financial balance sheet an intangible balance sheet that accounts for intangible values (potential for the future) that has been created or destroyed during the reporting period. And they will need in addition to the financial income statement an intangible income statement that accounts for how efficiently (intangible costs) and effectively (intangible revenues) an organization is utilizing its intangible values / potential. The vector-based concept brings the necessary degree of rigidity and discipline into the rating, measurement and handling of qualitative performance measurement. We therefore regard it as a first important step in developing systems for the systematic recording, reporting and visualization of intangible, qualitative, subjective performance that set the qualitative and subjective (intangible) dimension into the context of the quantitative and objective (tangible) dimension. This is important because intangible, qualitative factors can create only value, when they are connected to the physical, tangible and financial world of our economies.

### **References**

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- Kanton Basel-Stadt (2003). "New Public Management im Kanton Basel-Stadt", Basel (Brochure of the Kantonalverwaltung Basel-Stadt), p. 6

**Diagrams**

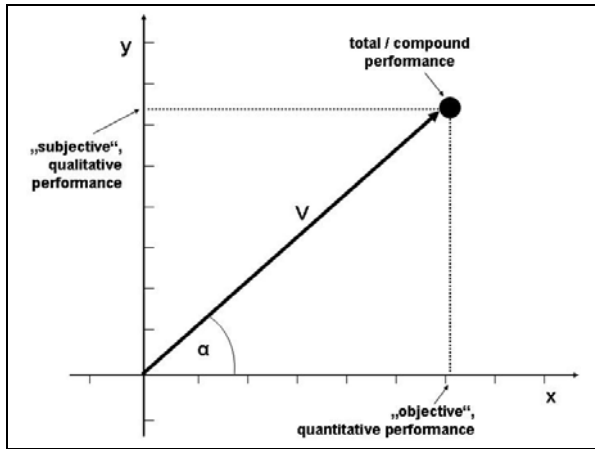


Diagram 1

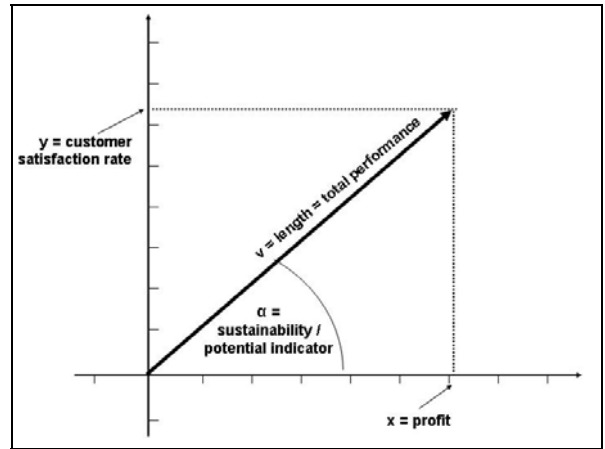


Diagram 2

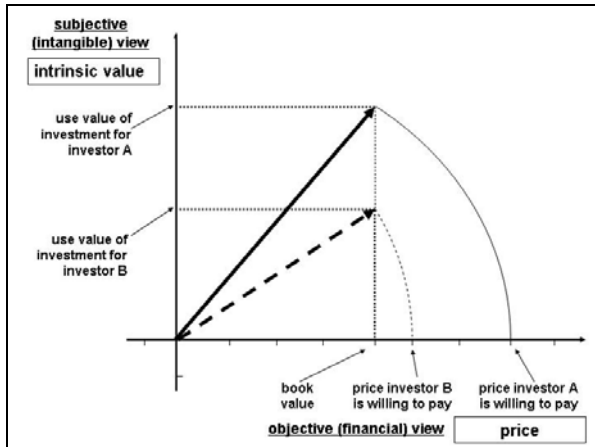


Diagram 3

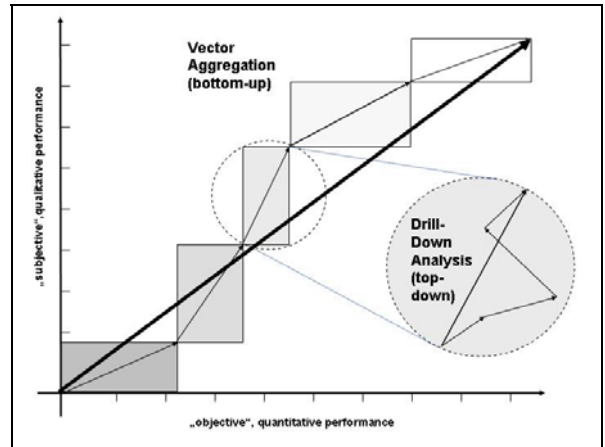


Diagram 4

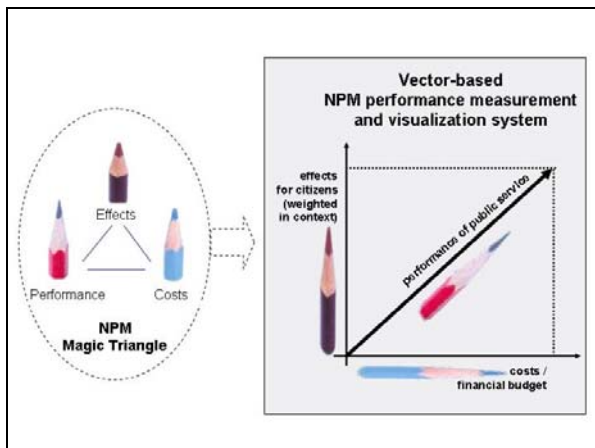


Diagram 5

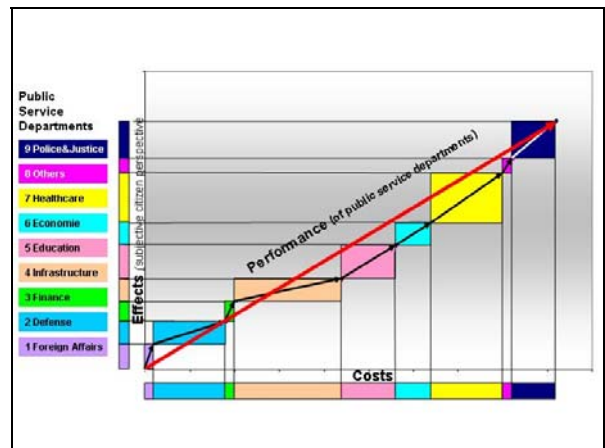


Diagram 6