MEASURING PERFORMANCE IN A KNOWLEDGE ECONOMY: LINKING THE SUBJECTIVE AND OBJECTIVE DIMENSION INTO ONE SYSTEM OF "VECTOR-BASED" PERFORMANCE MEASUREMENT[1]

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Abstract

Customers or other important stakeholders require from business or non-profit organizations today to act according to their stakeholders' subjective, qualitative values and criteria. Therefore, organizations have to take increasingly qualitative, subjective ratings and values into account in managerial decision-making. They need performance measurement systems that are able to handle subjective, qualitative measures and to combine them with quantitative, i.e. financial information. The vector-based concept of performance measurement & visualization that is introduced in this paper, is offering a practical solution that can be applied e.g. in public service organizations, or to support R&D management of a software company.

Introduction and problem description

As long as demand exceeded supply, management's attention was focused on efficient production processes and efficient resource utilization: the focus was on internal efficiency. This is reflected in traditional financial control-based[2] performance measurement concepts where emphasis is put on costs and return on capital – that is on efficiency measured in "objective" financial terms.

However, this proven and practical model for evaluating and managing the performance of organizations is falling short today. Since supply was exceeding demand in the industrialized

[1] 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. It also has been licensed to consulting organizations and the concept is continuously enhanced and further developed.

[2] A good description of the basics of the financial control concept and the development of the financial control based management system at General Motors in the 1920s can be found in (Sloan, 1963), chapter 8.

countries (beginning in the 1970s), companies 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).

Efficiency is still important today, but it doesn’t anymore create competitive advantage. The main driver for competitive advantage today is what we call “external effectiveness”, that is effectiveness from a subjective stakeholder perspective. This becomes obvious especially in the service sector and here especially in public services, where organizations have been used for centuries to manager only by budgets and funds. But today, when citizens are expecting more value for the taxes they have to pay, these organizations need something different than just the budget to optimize their operations in order to create value for their “customers”.

Performance of an organization can no longer be defined and expressed just in financials terms (profit / return on investment for commercial organizations or meeting the budget for a public service organization). As long as performance measurement systems are still based mainly on financial information[3], they are too exclusively focused on financial efficiency and ignore the external effectiveness of an organization.

Instead we need performance measurement systems that are able to express subjective valuations, experiences and ratings in a way, that an organization is able to combine it with quantitative, financial information. In addition, the result has to be easy to understand and “handable” from a managerial perspective, meaning that measurement is scalable (i.e. independent from time and location), that it can be aggregated and de-aggregated so that it can be used across the entire organization, linking different areas of measurement into one system of performance measurement.

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.

Requirements for an alternative concept of performance 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 200 or 300 hundred years ago.

One example is how we measure temperature. Before we had our current objective, quantitative temperature measurement systems, people have been used for millenniums to “measure” and define temperature by categories like “cold” and “warm” – measures that need subjective interpretation and that are highly context sensitive (“cold” in Norway probably

[3] According to the experiences of the authors still 70-90 percent of the information found in performance management systems and management reports of companies and e.g. public service organizations are financial information

means something different than “cold” in Italy). It was only in the 17th/18th 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. And only in the 19th century Kelvin (1824-1907) developed the Kelvin-scale – a measurement concept of which no scientist today (e.g. in physics) can imagine to live without it.

Subjective, qualitative measurement systems are typically used – also today - when qualitative criteria are the focus in the measurement / valuation process that require interpretation through third-party experts or external company stakeholder. An example for a qualitative measurement system is the rating of a company’s credit worthiness by Standard & Poors (S&P) with ratings ranging from “AAA” to “D”. While S&P has probably internal rules and standard procedures how they rate a company, the rating results are nevertheless “subjective”: they are based on a S&P-specific valuation/measurement system and personal qualitative expert-judgments by the analysts in charge are required. Because no objective measurement scale for credit worthiness of a company exists (at least yet), the S&P rating cannot be compared directly with the ranking of e.g. another rating agency or with the rating of e.g. the housebank of a company. Nevertheless is the S&P rating widely accepted and provides useful information about a company for capital market participants or suppliers.

Subjective, qualitative measurement happens also, when an individual stakeholder, such as a customer or an investor, values what a company is offering to him or her. Every customer is valuing the product or service offered according to subjective qualitative criteria. That valuation is driving his or her decision to buy or not to buy it 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 she has to pay double of the price than at an ordinary department store – even if the production costs of the dress of the boutique are the same as of the dress from the department store? 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 name of a famous designer, that she is treated differently at the boutique than at the department store etc. – all intangible, qualitative values. But the willingness to pay a specific price-premium will probably differ from person to person, as every person has a different set of personal qualitative i.e. subjective valuation criteria. That is also true for investors who consider to invest in a company: different investors have different strategies and objectives that create a different context for that investment and thus different criteria and different subjective values.

I. The concept of vector-based performance measurement & visualization

As outlined before, when supply exceeds demand, subjective, qualitative factors, the intangibles, become at least as critical as the quantitative, objective (financial) factors in managerial decision making today, because customers and other stakeholder have choice: they can choose between various offers and that means they are able to invest in a company or buy something that is more in line with their personal, subjective qualitative value scale than other offerings. That doesn't mean that the quantitative, objective measurement that the financials provide (e.g. costs, price – all measured in monetary units that allow objective comparison independent from context and subjective interpretation) become irrelevant. It is still an important measurement of performance. But it covers only one dimension: the dimension of economic/financial efficiency. Missing is the dimension of external non-financial effectiveness from a subjective stakeholder perspective.

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 even of a public service organization. We consider the vector-based approach to performance measurement & visualization as a good method to do that in a systematic way and allow aggregations and de-aggregations (that is mathematical operations) on the compound result, which we define as the total or compound performance.

The basics of the concept

The intention of the vector-based concept for performance measurement is to combine subjective, qualitative measurement of performance with objective, qualitative measurement of performance in a way, so that total or compound performance (the compound of qualitative and quantitative performance) can be easily calculated and visualized. The solution is the concept of vector-based measurement and visualization of performance (Bretscher, 1996, 1998).

The basic principle of the concept is simple (see diagram 1):

- one dimension (the x-axis) represents the objective, quantitative 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 α= arctan (y/x)

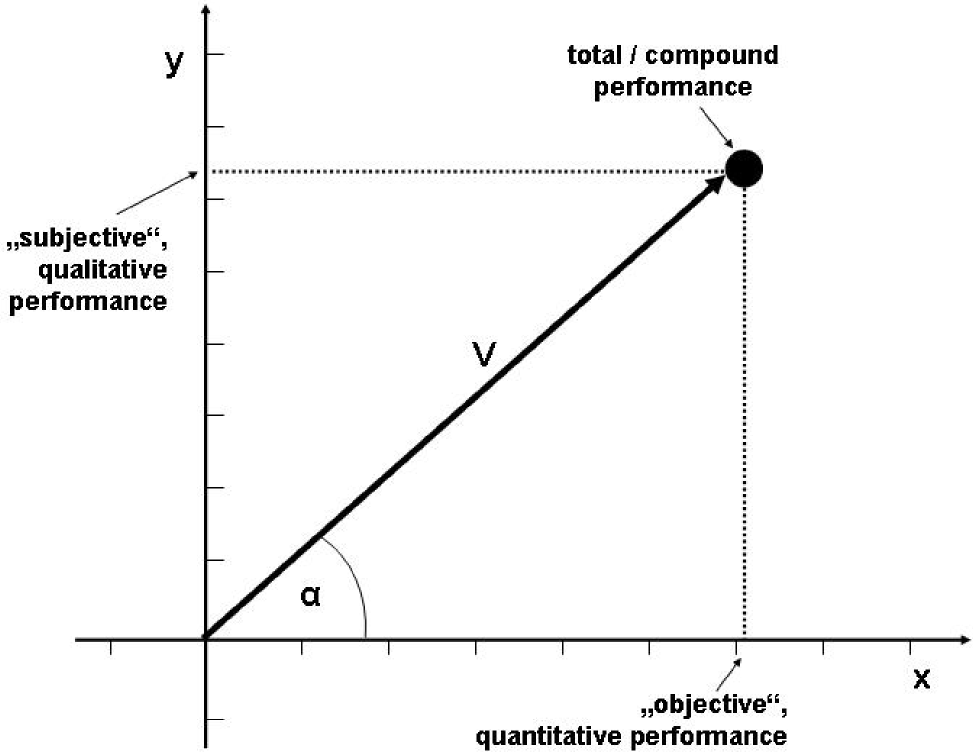

Diagram 1

Example of a simple managerial application for measuring and visualizing performance of a company, business unit or product group (see diagram 2):

- the **x-axis displays financial results achieved** (explicit values measured in 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 economic/financial perspective.

- the **y-axis displays value created from a customer perspective** (implicit values measured e.g. according to a relative customer satisfaction scale or based on regular surveys and industry benchmarks). It gives an indication about how effective an organization is in satisfying customer demand.

- the **vector represents management's total performance** (measured according to a relative scale that includes length and gradient angle). The length of the vector gives an indication of total performance achieved (including qualitative, subjective customer value *and* financial results). The gradient angle of the vector can give a relative indication about created or destroyed potential for financial performance for the future ("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 created not very much true customer value or has somehow destroyed customer value (which could mean that its offerings are overpriced) – a fact that might result in the future also in declining financial results.

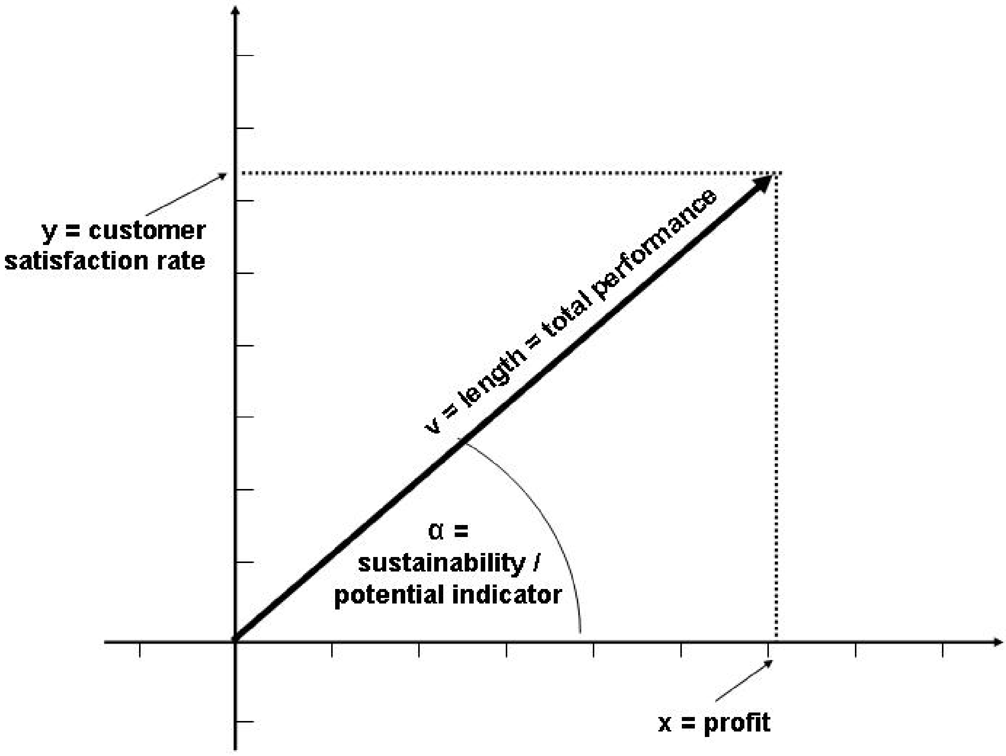

Diagram 2

Whereas the approach depicted in diagram 1 and 2 requires a direct rating of the subjective, qualitative dimension by separate means (such as by a customer survey or by a systematic product use value analysis), the approach depicted in diagram 3 allows to determine values for the y-axis indirectly.

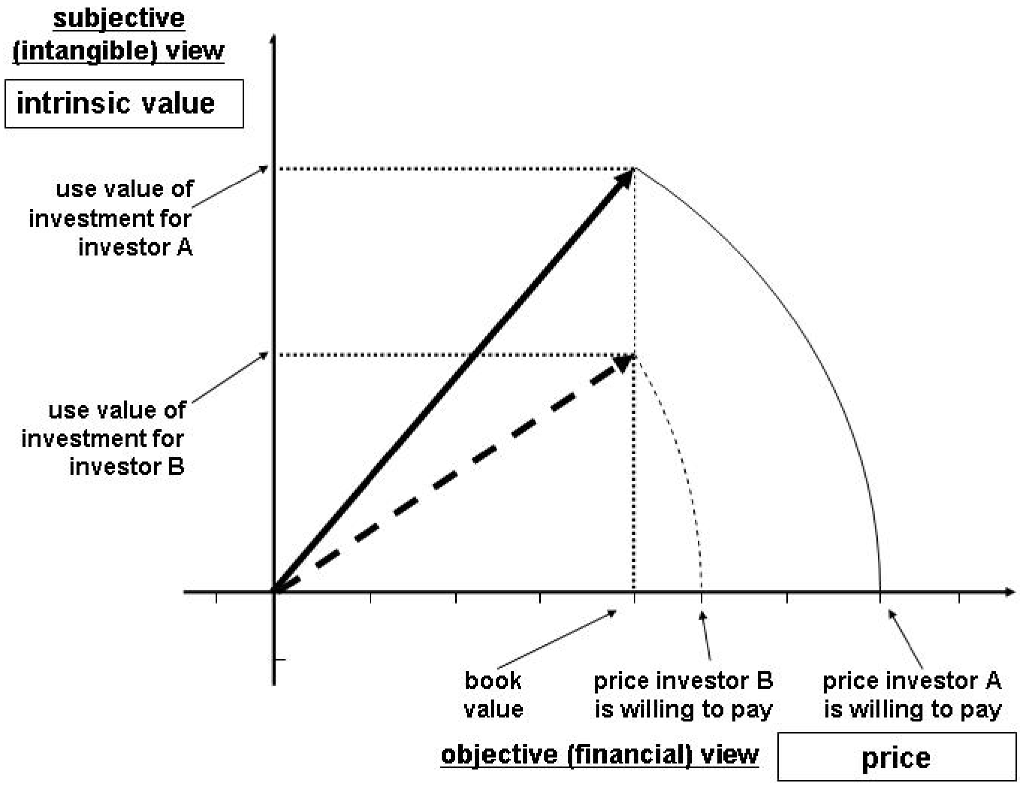

Diagram 3

In this case 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 derived from the vector – introducing as a side-effect an absolute scale for the y-axis. A possible application for this variant is the valuation of enterprises by different investors with different investment strategies: values on the x-axis represent book value and the price / market value a specific investor is willing to pay. The entries on the y-axis that are derived from the two values on the x-axis show then the different subjective use values the investment represents for different investors.

This application example is drawing the attention to the difference between price and value. If this difference is not recognized, a tendency exists to confuse cause and effect. But in reality price is always – sometimes with a time lag – dependent on the subjective value a potential buyer is attributing to a product or good (see also the application example for enterprise valuation on page 17).

Vector aggregation and drill down analysis

The vector-based concept for performance measurement and representation of total performance allows users also to easily aggregate performance of various sub-entities (such as groups of customers of a company, of market segments, business units, corporate functions or of others) into a "sum" of performance for the whole entity (such as a company). Analysis and assessment of quantitative and qualitative values is starting on the sub-category level per sub-category. The concept of vector-based performance measurement & visualization allows users to aggregate objective and subjective values of these sub-entities into total performance of the whole entity. We are calling this the bottom-up approach. One example is the separate valuation of the different business units of a company according to profit (x-axis) and customer use value (y-axis) the have generated. The results of the single business units would then add up to the total performance of the company (see diagram 4)[4].

The top-down approach starts first with a vector representation of the performance an entire 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 a top-down drill-down analysis of the performance of an entity, the components of its total performance become visible on a sub-entity level and can be targeted with managerial interventions.

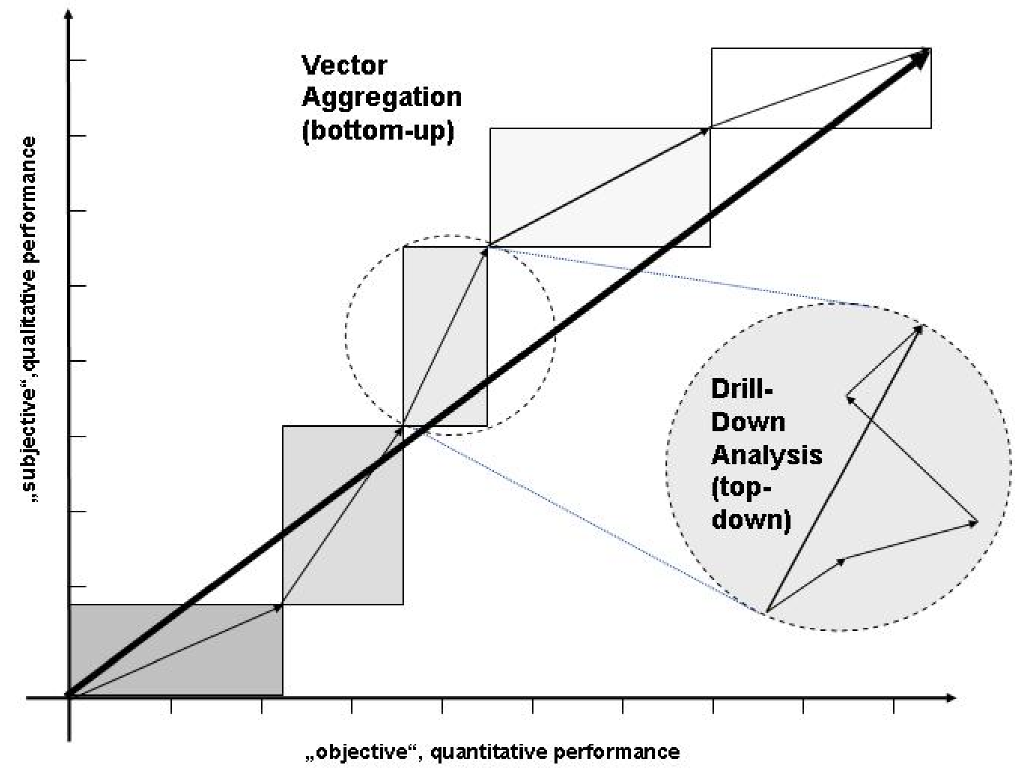

Diagram 4

[4] for simplification we are neglecting here the costs / use value of the center.

II. Benefits of the concept:

Helps managers to keep the overview over all relevant aspects (subjective and objective) in the decisions making process:
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. They need to structure these different types of information and make valuations and weightings in order to take a rational decision that takes all relevant aspects into account. Because people cannot keep all these different parameters in their mind, they need instruments that support them in structuring decision relevant information and to keep the overview. In traditional managerial decision making often the only instrument available are financial / accounting instruments that structure and visualize financial information – representing just the cost, price, profit or revenue dimension of a decision. The concept for vector-based performance measurement & visualization represents an instrument that allows companies or non-profit organizations to do that also with subjective, qualitative information (e.g. focusing on effectiveness from a stakeholder perspective) and to combine it with objective, quantitative measurement (focusing e.g. on economic/financial efficiency) for performance reporting and decision support.

Makes subjective and objective views comparable and communicable – independent of time and location (= increased transparency across the entire organization)
The vector-based concept for performance measurement and visualization provides a value logic that allows managers to include subjective views, experiences and values and to link them with objective measures in decision making processes - even when the holders of these subjective views, experiences and values are not personally present/involved in the decision making process (which is a normal situation in larger organizations, where decisions and decision relevant information have to be passed on in written or electronic form to the next hierarchical level).

Due to its mathematical foundation, aggregations and de-aggregations are easily possible (linking the strategic overview with the operational view):
Compared with other techniques that are used to present qualitative, subjective values for decision making (such as the BCG portfolio graph for instance) the vector-based concept provides the benefit that calculations (aggregations and de-aggregations) are easily possible so that the whole picture across different sub-entities / sub-domains remain visible at any point in time. It can show the objective and subjective aspects of results for single sub-entities (such as projects or business units) and for the whole entity (such as a company). Priorization in managerial decision making, e.g. for optimizing resource allocation across R&D projects or business units, can be done with the whole picture in mind so that not only total efficiency (resource perspective) but also total effectiveness (customer or market value generated by investment) will be increased.

Represents an efficient and effective management information management concept / it is easy to understand from a managerial perspective:
The knowledge economy of today is confronting managers with difficult trade-off decisions under increasing time pressure. The vector-based concept for performance measurement and visualization provides them with a decision support and management information

management concept that presents management / decision relevant information in very concentrated form and in an easy to understand and easy to digest way – far beyond the possibilities of the classical concepts: requiring fewer paper, fewer pages, and works with more graphics/charts that help to establish a common understanding in a management team of a situation and its various subjective and objective aspects. The result: less interpretation uncertainty, better and more consistent decisions.

Assumptions behind decisions and the history of the decision making process become transparent:
Subjective ratings, valuations and experiences are always involved in managerial decision-making. Because the vector-based approach is offering a systematic way for the rating and measurement of qualitative, subjective criteria, 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 cases of the concept

Application in public services: How the vector-based concept for performance measurement can support the "New Public Management" in Switzerland

Governmental authorities are facing a major challenge in administrating or managing their public service operations. Different from the commercial sector, public service organizations usually do not generate revenues through their operations. Their customers, the citizens, do not pay directly for public services, such as education, infrastructure maintenance, police&justice, defense etc.. Revenues of public service organizations arise instead from fund allocation: the government or governmental agencies allocate funds (i.e. a part of their tax income) according to their current policies to the various public service departments. Because revenues from customer (that can serve as a proxy for success) are missing, it is very difficult if not impossible under the traditional public service management regime to determine, how efficient and effective a public service operation is and how well or bad it is performing.

To overcome this problem and to establish public service as a modern customer focused and efficient service organization is the objective of the "New Public Management" (NPM) initiative in Switzerland. The Swiss NPM-concept is trying to set focus on the effects of governmental activities on society, for example in healthcare or education, by centering public service management on these 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)

Thus, the main intention of the Swiss NPM-concept is to show the relationship between effects, performance and costs and to use the resulting insights for optimizing public service management. NPM will adapt public service management in Switzerland to today’s demands of citizens while balancing this with today’s financial possibilities. It is expected that NPM will lead to more efficient use of available funds and resources and that they are invested /deployed there, where they are needed to create specific desired effects for society. With that approach, effects and performance will move to the center of attention – not just the costs (funds) that a public service organization is spending.

The basic assumption is, that when effects, activities and their performance and costs are taken into account together, optimal results will become possible. If one of these three parameters is changed, the change will affect the entire system of the NPM’s “magic triangle” (see diagram 6). If the budget, a specific fund, will be reduced, then certain activities cannot be performed any more: performance will decline. If the government or the Kanton-Verwaltung is changing the effect-goals, then activities and performance levels of public services need to be changed as well.

Because NPM takes into consideration not just costs and funds, but also effects and performance, not only financial targets (budgets or funds available to be spend) can be defined, but also qualitative targets (effects to achieve, performance targets). This creates the foundation for a more “customer-centric”, i.e. citizen-centric public service management and for the possibility to delegate tasks and responsibility to the level, where the corresponding competence is available. This principle of devolution is an important building block of the Swiss NPM concept. The expectation is, that the integration of tasks, competencies and responsibilities on each level is leading to more clarity, productivity (efficiency *and* effectiveness) and flexibility. Therefore the Swiss Regierungsrat has defined as a major objective of the NPM initiative: “Flexibility in resource allocation and responsibility will be delegated as far as possible down to the expert basis” (Kanton Basel-Stadt, 2003).

To control and manage a large public service organization under these conditions (three dimensions instead of one financial dimension, and that across many organizational levels) requires something else than the traditional budget-based or fund-based management instruments public service organizations have been used to for centuries. We believe that the vector-based concept for performance measurement and representation is providing appropriate instruments for executing the new policies in Switzerland, as they have been outlined in the NPM concept.

For instance, according to the NPM concept the activities of a Kantons-Verwaltung are structured into 140 “product groups” and for each product group effect goals, performance targets, and financial budget have to be defined and need to be controlled. 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.

The basic principle for applying the concept for vector-based performance measurement and visualization to e.g. a Swiss Kantonalverwaltung is very simple: achieved effects and effect-goals (“Wirkung”) are presented on the y-axis, cost-budgets and actual costs (“Kosten”) are presented on the x-axis and performance targets and actual performance (“Leistung”) is presented through the vector (see diagram 5). With that approach it is possible to measure and present the performance of one product group in all three performance dimensions.

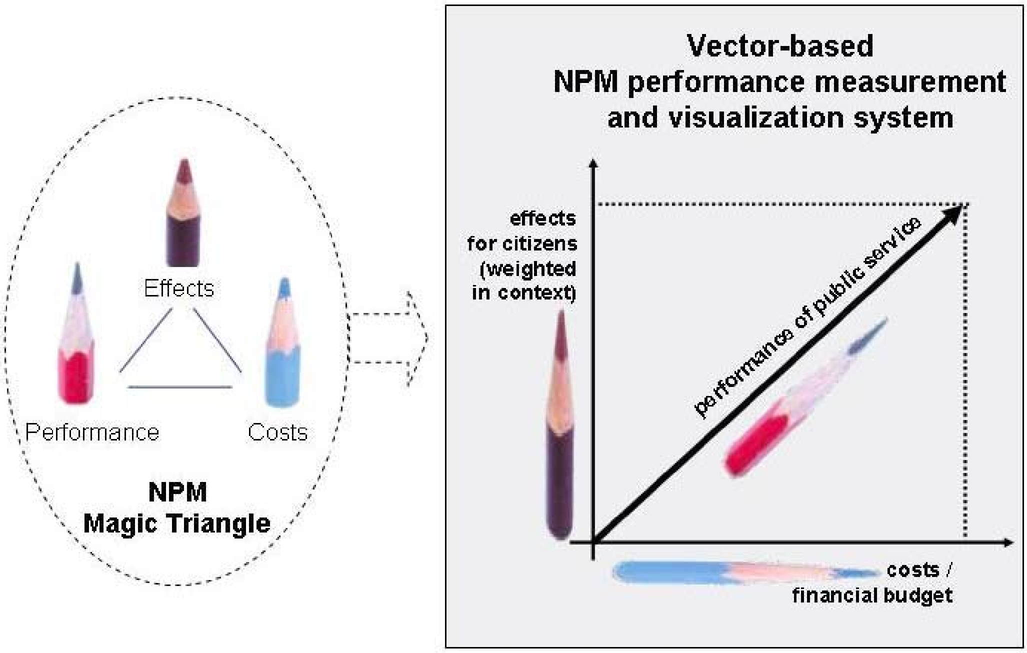

Diagram 5

It is also possible to break total performance of the product group down into performance contributions of sub-entities, e.g. organizational units, or to add performance of all product groups up to the overall performance of a department or an entire Kanton. This enables a Kantonalverwaltung to keep always the overview over effects, performance and costs of the various product groups and departments and to make better trade-off decisions between effects and costs and thus to optimize the portfolio of its services from a holistic perspective (see diagram 6).

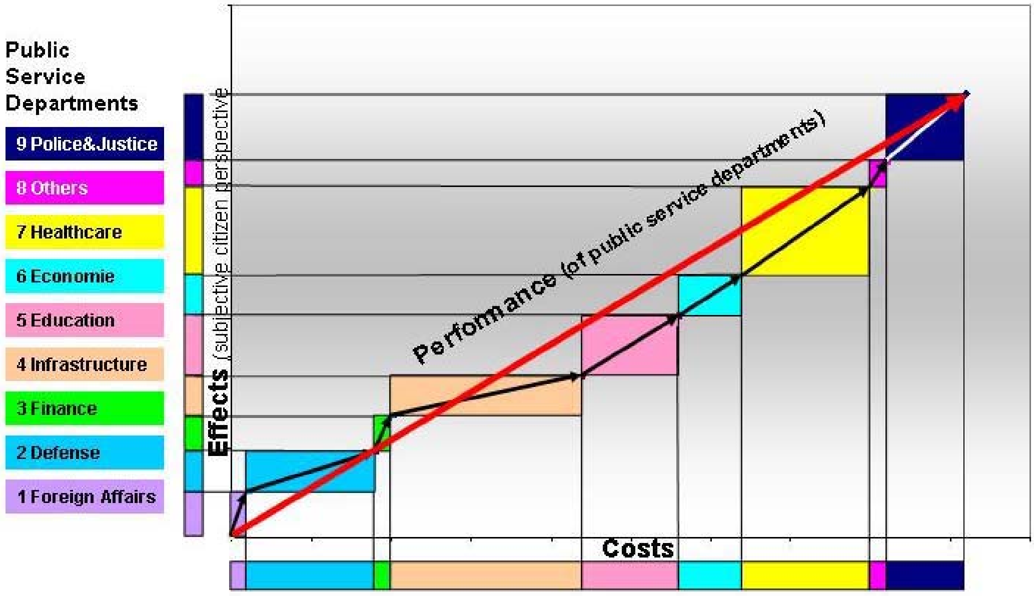

Diagram 6

Benefits for the Kanton-Verwaltung include:

- Public service managers do not need 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). A few graphs/charts are enough to get an overview.

- The focus is set 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). This is aligning the whole organization with the intended effect of its activities for society and is enabling management to make better trade-off decisions between tight budgets (efficient use of resources) and benefits (effects) from a citizen perspective.

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.

Application in the software industry: How the vector-based concept for performance measurement & visualization can support the management of an R&D operation:

While R&D investments and activities are major value generators in companies today[5], they are also one of the most risky ones. The time span from investment decision to return is quite long (in the pharma industry for instance up to 15 years, in the software industry 5-8 years). During this long period the investment is subject to many risks: that the market is changing in the meantime, so that new products, once they come finally to market, are not in demand anymore (market risk), that the engineers are not meeting customer requirements or that they produce a defective product (engineering risks), that the technology, on which the product is based, is outdated at a certain point in time (technology risk) etc.. Therefore it is considered as best practice in the software industry, as in other R&D intensive industries, to manage R&D projects as investment projects on a rolling basis through a continuous investment management approach that allows corrections during the development process

At clearly and predefined check-points, it is again and again decided, if a development project will be continued, modified (changing e.g. specifications of the final product, underlying technology or the general scope) or abandoned, rather than to make only one (investment) decision at the start of the project. Typically this rolling investment management procedure is applied to several project in common, that is to a portfolio of products that are targeted for instance to one market segment or for all R&D projects of a company.

The major challenge in the decision making process of the product technology board of a software company (sometimes also called R&D portfolio board) is to keep the overview over all portfolios / development projects and to make good trade-off decisions between costs and effects for customers (customer value, i.e. created revenue potential). But they also have to judge the performance of a development manager or development teams (for instance to make a decision, which is based on clear criteria, about which team or which manager is best suited to lead a new important development project). And that is not an easy task.

Should the performance be measured based on the number of coding lines produced in a certain period of time? While this indicator provides an insight, how efficient a development team is in utilizing its resources to produce output, it certainly is telling nothing about the effectiveness of its output, that is, if the final software product will meet customer demand and will be attractive enough for potential new customers. It is obvious that additional, qualitative information, e.g. subjective rating by a set of pilot customers, is required. Only when both dimensions are taken into account, a sound judgment can be made about the performance of a software development team. The problem so far in many software companies is, that no concept exists, that allows to measure and visualize in detail these qualitative aspects, connect them with the quantitative, financial information and to link it into the performance measurement system of the entire organization. Also here we consider the concept of vector-based performance measurement & visualization as a solution:

[5] Lev and Aboody (Lev and Aboody, 2000) report for example that a study in the chemical industry has revealed, that while traditional capital investments (in tangible assets) return after tax just the cost of capital of 7 percent, in contrast to that investment in R&D return 17 percent – representing thus a if not the major source of the added value created by chemical companies. For value creation through R&D and other intangibles see also (Lev, 2001).

The vector-based concept allows a software development department to measure efficiency (x-axis: e.g. number of coding lines per headcount) *and* effectiveness (y-axis: e.g. relative rating of customer satisfaction or, if the intended result of the project is a “semi-finished” product that will be used by other development projects, rating of the usefulness of the tool buy other software development teams) in a way that allows an easy to understand visualization of the compound result (the vector).

Because the vector-based concept of performance measurement is introducing (often for the first time) a standardized way of rating of qualitative effectiveness based on a standard rating scale, performance of development projects, portfolios, single teams, departments or entire business units can be easily aggregated and disaggregated. This enables a software company to manage and optimize its entire development organization based on clear criteria oriented on customers, markets, costs and individual performance of development teams or even single developers.

The software industry is under considerable pressure to become commoditized. A counter-strategy that e.g. suppliers of business software are applying is, to transform their business model from the one of a software supplier (shipment of code) to the one of a service provider: the objective is to support customers end-to-end in the process of optimizing their business processes through information systems. Critical in the customer engagement process for management is to keep the overview over all activities in the customer oriented value chain – not only from a cost and (short term) revenue perspective, but also from a qualitative perspective that is shedding lights on the most critical potential the company needs to create customer value and competitive advantage. The vector-based approach, especially the vector aggregation technique described above, is providing these software companies also with a powerful strategic tool to keep the overview over their entire customer oriented value chain across all functions and process steps, both form a financial and intangible/qualitative perspective. This helps management to determine, where investments to enhance capabilities (i.e. value potential for the future) are required / or where investments will create maximum value (see diagram 7).

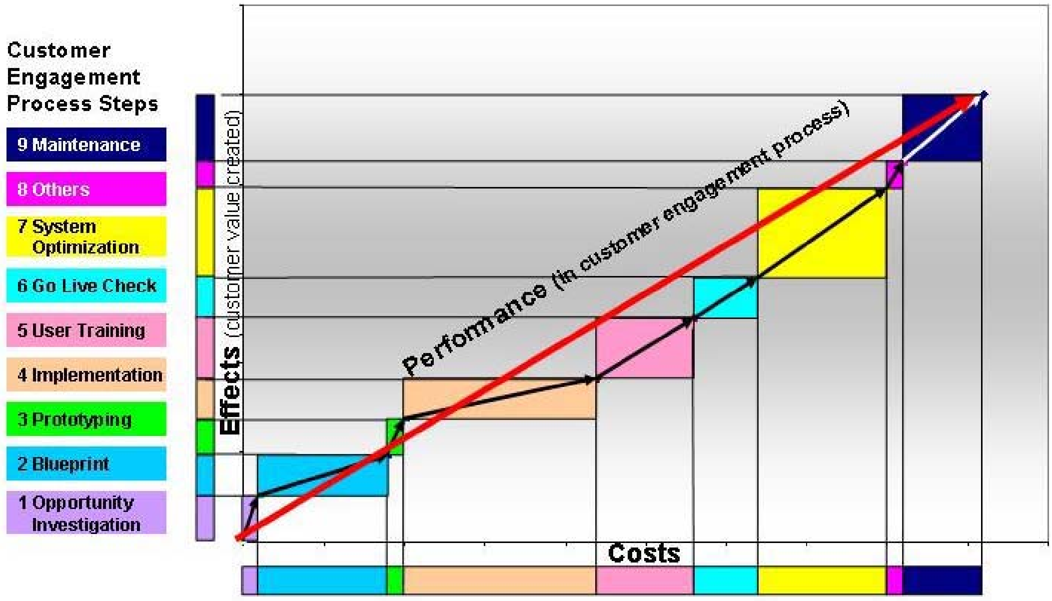

Diagram 7

Other possible applications

Also organizations in other sectors, especially companies in service industries, are facing similar challenges in performance measurement and management like public services organizations or software companies. We are convinced that the vector-based concept of performance measurement and visualization is providing all these companies and organizations with an instrument that can bring more clarity, transparency and speed into the decision making and reporting process by combining subjective, qualitative information, with objective, quantitative information. One of the industries that is actually going through a major transformation that is facing its players with the challenge to focus much more on effectiveness from a customer perspective is the banking industry.

Application in a bank:
In a bank the concept can be used to optimize trade-offs between financial efficiency and customer satisfaction throughout the entire organization - something that is regarded in the banking sector as one of the major challenges and success factors at the same time. The vector-based concept would introduce in e.g. a retail bank an additional performance management dimension, additional to the usual financial performance metrics. Branch performance, for instance, can be visualized easily with the vector-based concept as the compound result (represented through the vector) of effectiveness, which is measured through customer satisfaction (value on the y-axis, e.g. based on a yearly general survey or by quarterly surveys of randomly selected customers) and efficiency, which is measured for instance through the cost/income ratio (value on the x-axis, based on accounting data). Through vector aggregation and/or de-aggregation contribution of branches, areas, regions to

the total compound (qualitative and quantitative) performance of the entire bank organization can be visualized. It could be also used to break down total performance into the contributions of product groups or functional departments.

Many other possible applications of the vector-based concept for performance measurement and visualization exist, where the concept provides powerful tools for optimizing trade-offs between qualitative subjective parameters and quantitative, objective (financial) parameters and for improving the productivity of an organization, whether commercial or non-profit.

One of these other applications that we have already briefly mentioned is the

Application of the concept for valuing an enterprise:
Continuing with the example for applying the vector-based concept to the area of enterprise valuation from page 7, an additional perspective the vector-based approach could provide is the perspective on intangible asset levels a possible acquirer of an enterprise would require in order to create a "leverage effect" and to create a positive return. To explain that let us take the example of an acquisition of Cisco and the leverage effect Cisco had been able to realize by leveraging two important intangible assets: its customer base and the capability of the company to integrate the products and employees of an acquired company very fast and successfully into its own value creation system:

Cisco, the network equipment vendor, acquired Crescendo, a small company specialized in so-called network switches, in 1995 (Bunnell, 2000). Cisco paid 97 million dollars for Crescendo, an enterprise that had an annual turnover of only 10 million dollars. Wall Street analysts found this to be hopelessly overpriced. However, Cisco went on to gain a 500 million dollar turnover a year later with the Crescendo products. In the light of this new figure (500 million instead of 10 million) Cisco's acquisition of Crescendo was cheap. The analysts had overlooked the fact that the combination of Crescendo technology and Cisco sales potential (the Cisco customer base) meant that Cisco was able to immediately gain a much higher sales volume than Crescendo would ever have had in the foreseeable future. The subjective perception of Wall Street analysts differed extremely from the subjective perception of the Cisco management. Both saw Cisco very differently: in sharp contrast to the financial analysts, who saw Cisco only from the perspective of a financial investor, who can only apply portfolio techniques and financial market information to "leverage" an investment, the Cisco management saw the investment opportunity Crescendo represented from the perspective of an entrepreneur, who is able to leverage the investment with a strategic enterprise asset a financial investor cannot dispose of: Cisco's customer base and the ability of the organization to integrate a new companies products and employees very fast and successfully.

From such a perspective the ratings on the y-axis in diagram 3 wouldn't just represent the subjective value different investors with different strategies would attribute to an investment opportunity like the acquisition of a company like Crescendo. It would also define the level of intangible assets an investor has to dispose of, if this investor wants to be able to "leverage" an investment for a given price. The concept of vector-based performance measurement & visualization helps to make this different value concepts visible and is setting focus on the difference between price and value that has been described already on page 7.

IV. Implementation steps

For organizations that want to apply the concept, we recommend the following implementation steps:

1. Awareness & Scope Workshop: workshop with the key-persons (sponsor, owner, experts) of the area that has been selected to serve as a "prototype" to test the concept (these persons usually will become members of the project team or steering committee later). 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 the prototype, and to make a final decision about the members of the project team and the government structure of the project (project plan and miles stones, formation of steering committee, etc.). The members of the project team, who might collaborate for certain tasks with other people in the organization, perform the following steps:

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 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?), define the framework for 2D or 3D visualization.

4. Parameterization: Define rules for quantifying qualitative metrics (➔ how do we quantify subjective ratings in a way, that we can perform later mathematical operations with these measures?) e.g. by introducing a qualitative scale such as 1-5 for qualitative ratings in a survey.

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?) An example would be to group the 140 product groups of a Kantonalverwaltung into number of clusters that can be handled from a managerial perspective / can be used for aggregation and de-aggregation.

6. Weighting: define weights for each object / cluster to be analyzed from the perspective of the whole picture of the organizational entity involved (➔ how important is each object within the framework of the whole entity from the perspective of the customer or another major stakeholder) For instance, in a public service organization like a Kantonalverwaltung in Switzerland one would weight the importance of the services of the different Departments from the perspective of the citizens or from the perspective of the governing party – see diagram 6.

7. Defining the charts / visuals: define the charts/visuals for each application area on the various levels of the organization / in the areas involved (➔ which charts do we need to support planning processes, performance reviews, or specific decisions? How are they connected with each other / what is their logical link?).

8. Test and revision: Test the new measurement and the visualizations system (➔ are the assumptions we made in line with reality? Does the system work in practice?) and revise it where necessary (iterative process).

Conclusion and outlook

In the demand dominated global knowledge economy of today, customers or other important stakeholders of business or non-profit organizations require from these organizations to act according to their stakeholders subjective, qualitative values and criteria. Therefore, in managing their operations, organizations have to take increasingly qualitative, subjective ratings, experiences and values of customers, external stakeholders, but also of their managers and experts into account, in order to create value added, i.e. to create positive effects for customers and stakeholders with minimal resource consumption.

Performance of an organization can therefore no longer be defined and expressed just in financials terms (profit / return on investment for commercial organizations, or meeting the budget for a public service organization). As long as performance measurement systems are still based mainly on financial information, their bandwidth is too small so that they ignore vital performance information for successful enterprise management today: information about the external effectiveness of an organization.

We therefore need performance measurement systems that are able to express subjective valuations, experiences and ratings in a way, that an organization is able to combine it with traditional quantitative, i.e. financial information. In addition, the result has to be easy to understand and “handable” from a managerial perspective, meaning that it is scalable (i.e. independent from time and location), that it can be aggregated and de-aggregated, and that it can be used across the entire organization, linking different areas of measurement into one system of performance measurement.

The vector-based concept of performance measurement & visualization is offering a practical solution for this problem. Discussions with and investigations of various organizations of different sectors – business and non-profit – 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 expect from in-depth tests and experiences from the broader applications in different organizations in the near future further insights into its practicality and where improvements / enhancements are required.

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. 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 concept of vector-based of performance measurement & visualization brings a degree of rigidity and discipline into the rating, measurement and handling of qualitative performance measurement in organizations that usually does not exist so far. We therefore regard the concept of vector-based performance measurement & visualization as a first important step in developing systems for the systematic recording, reporting and visualization of intangible, qualitative, subjective values that set the qualitative and subjective (intangible) dimension into the context of the quantitative and objective (tangible) dimension. This is important because intangible, qualitative aspects can create only value, when they are connected to the physical, tangible and financial world of our economies.

References

Aboody, D. / Lev. B. (2001). "R&D Productivity in the Chemical Industry", (this paper is available on Baruch Lev's website: http://www.baruch-lev.com/)

Bretscher, P. (1996,1998). "Re-Inventing Business Administration, der Grundlagenartikel" (this paper is available at http://www.bengin.com/)

Bunnell, D. (2000). "Making the Cisco Connection", John Wiley & Sons, New York, p. 35 ff.

Daum, J.H. (2002). "Intangible Assets and Value Creation", John Wiley, Chichester

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

Lev. B. (2001). Intangibles: "Management, Measurement, and Reporting", Brookings Institution Press, Washington D.C.

Sloan, A.P. (1963). "My Years With General Motors", Currency Doubleday, New York, p.116-148

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