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# Balanced Score Card Implementation for IP Rights Management in a Public Research Institution – Example of PTB

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## Structured Abstract

**Purpose** – There is a growing awareness of Intellectual Property (IP) rights in European public research institutes. Since 2008 a non-binding recommendation of the European Commission has been in effect, proposing a consistent policy for IP in research and development (R&D). While there is a broad consensus on the overall goal - achieving a higher competitiveness of European industry in the international market place - there are, however, conflicting expectations on the micro-management: are technology transfer agencies to be considered as profit-centers, cost-centers, mediators or all of the above?

**Design/methodology/approach** – The Physikalisch-Technische Bundesanstalt (PTB) is the national metrology institute of Germany with 1900 employees and an annual budget of 145 million EUR. It has established a micro-management policy for IP rights, which is successfully fostering the development of modern instrumentation for metrology and may serve as an example for other public institutions as well. While we are obliged by law to operate as a regular market participant when licensing patents, there are additional conditions, some of them with the status of a law or a binding government decision as well. For example, demand for neutrality with respect to market participants has to be carefully considered when licenses are exclusive. If patents occur in the context of standards, royalty-free licensing is mandatory and in some cases the public is better served by a publication. As a net result, this impedes a purely economic view on patent licensing.

**Originality/value –** To manage this conflict of goals we developed and implemented a Balanced Score Card (BSC) system for our IP management in order to optimize licensing income generation, cut costs, keep the inventor's motivation high and simultaneously realize macro-economic technology transfer tasks. The BSC was originally introduced for the private sector by Norton and Kaplan in 1992, in response to a failure of purely monitoring financial indicators. The Balanced Score Card considers economic and non-economic factors, often denoted as "soft", e.g. scientists´ motivation for inventions in our case. It is balanced with respect to result-oriented indicators, like licensing income, and with respect to process-oriented indicators, like the acceptance rate of inventions for patenting. And it tries to deduce from a trend of an indicator in the past a prediction of future development, associated with recommendations for actions to influence the ongoing process.

**Practical implications** – The BSC approach, implemented at PTB, provides guidelines to reconcile seemingly conflicting requirements for a public entity while at the same time generating economic benefits in terms of additional income from licensing. In our opinion this approach keeps costs at a reasonable level, fosters inventors´ motivation and furnishes data for decisions for the technology transfer office as well as for the leadership of the institution.



**Keywords –** IP, Intellectual Property, Asset Management, Balanced Score Card, Technology Transfer, Patents, Licensing

**Paper type** – Practical Paper

## 1 Introduction

There has been a growing awareness of IP (Intellectual Property) policy in public research institutions over the last decade. One result was the publication of an IP Charter by the European Commission in 2008 as a non-binding guideline for universities and research and development (R&D) public laboratories (EC, 2008). In the appendix of this IP Charter a "best practice" guideline is given, which states in its initial part, that a long term and coherent policy should be set up by the institutions, including clear rules and incentives for scientific staff. It also states, that IP shall be bunched into relevant portfolios and valorization is to be actively pursued. While this proactive policy generates additional income, the final objective of this approach should be maximizing the overall socio-economic benefit. The "mission statement on technology transfer" established in 2005 by the Physikalisch-Technische Bundesanstalt (PTB) used similar wording, thereby balancing economic aspects of IP management and operation as a public entity.

PTB is the national metrology institute of Germany. It has a staff of 1900 employees and an annual budget of €145 million. PTB works under the auspices of the Federal Ministry of Economics and Technology (BMWi). Among its legal obligations are the realization, maintenance and dissemination of the International System of Units (“Système International d'Unités”, with the international abbreviation SI). Radio broadcast of the time signal of our atomic clock is the best known example of SI unit dissemination. A novel realization of the SI unit kilogram is currently being undertaken in a European context under the headline “Avogadro project”, which will make the mass unit traceable to fundamental constants of atomic and solid state physics.

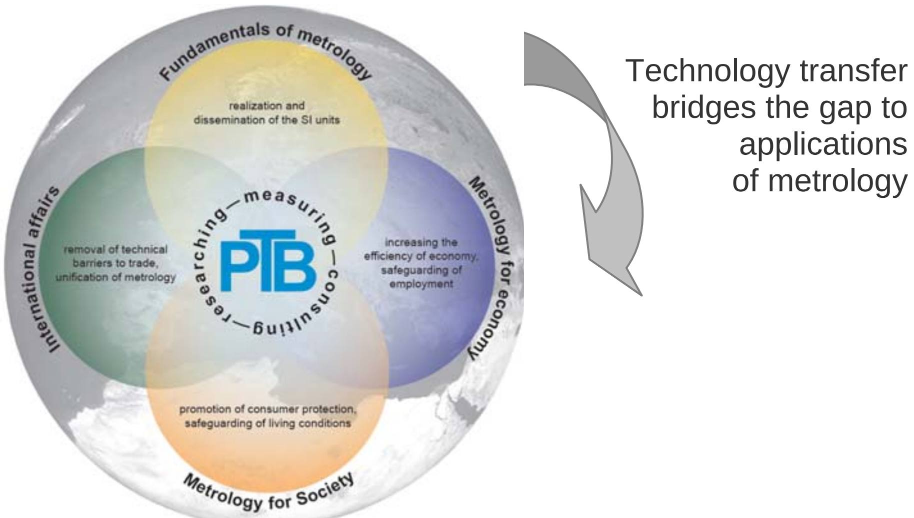



Fig. 1: **Fields of business of PTB**. Technology transfer bridges the gap between fundamental research and metrology for the economy.

PTB identifies four aspects of activity, which are integrated into the work flow of all the different departments and schematically shown in Fig. 1:

- Fundamentals of metrology - 60% of resources go into R&D
- Metrology for economy - e.g. legal metrology
- Metrology for society, e.g. customer protection
- International affairs, e.g. support for metrology infrastructure in cooperating countries

In total, about 60% of the budget goes into R&D.

Technology transfer bridges the gap between fundamental R&D and the metrological needs of industry and may be considered as part of the dissemination of novel measurement techniques for the SI units. At PTB it is implemented through the collaboration of the individual operating scientific units, as they are the ones closest to industrial needs, and through the central units, ensuring that economic and legal common standards are fulfilled.

The technology transfer office additionally bundles inventions into technological pools, and offers them to the pertinent markets, e.g. through trade shows. An overview of the portfolio is given in Fig. 2.

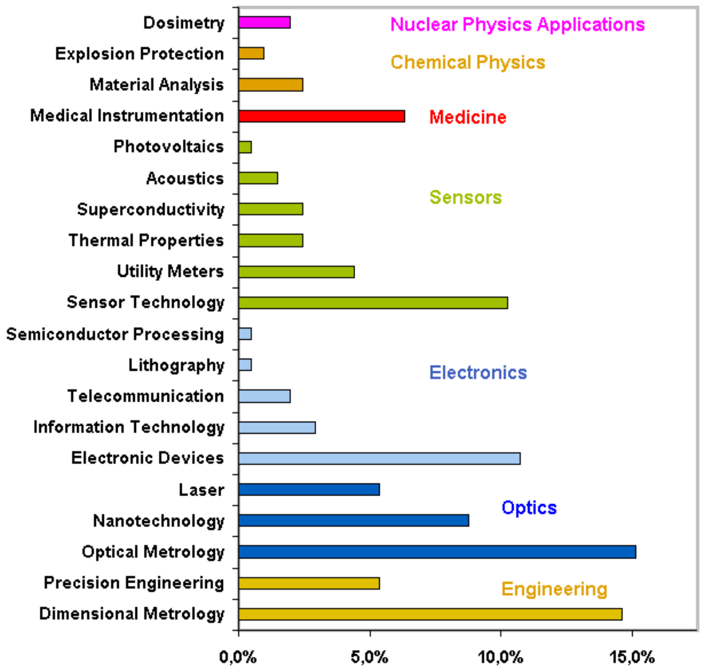



Fig. 2: **Patent portfolio of PTB**. Individual patented R&D work is pooled into technologies across the institution as a whole by the technology transfer office. Coloured categories show the most important industrial branches or areas of application.

Patents and industrial standards are complementary partners. While patents usually open up new markets through investment protection, industrial standards on the other hand lead to widespread applications of these novel technologies. If both are intertwined, patent swapping and FRAND (Fair Reasonable And Non-Discriminatory) licensing conditions become standard procedures in the semiconductor or telecommunication industry. However, as an institution with a public mandate, PTB will either acquire no patent at all or license a patent under the NERF-condition (Non Exclusive Royalty Free).

## 2 Marketing conditions in the public sector

There are some distinct differences between purely commercial licensing and the operation of a technology transfer office of a public research institution. The natural goal of a private company is to maximize profit, whereas a publicly funded institution operates under the incentive of maximizing macro-economic benefit. As a consequence, IP asset licensing and sales are an additional form of income, which have to be balanced with the overall political goals of the institution.

To name a few examples, the demand for neutrality in the market place has to be carefully considered, when licenses are exclusive. Here, maximizing royalty income is just one criterion, the market access of all relevant market participants easily taking a higher rank. Licensing to a PTB-generated start-up company is another subject, as these companies usually go through a deficit period in the first years of their business plan; therefore, licensing conditions have to take the business outlook of the start-up into account. Finally, in some cases the public is even better served through a publication.

Even the term "customer" appears short sighted in this respect. PTB actually works with companies as clients, with which long-lasting R&D relationships are to be developed. As the patent itself - from a technological viewpoint- is mainly just a piece of paper, technology transfer usually occurs through common projects, in which PTB enters with industrial partners in a competitive bidding process for third party public funding at a German or European level. In this way the gap between research and the application of technologies is bridged by pre-competitive, applied research up to a functional model. Prototype production and implementation of serial production is, henceforth, the task of the industrial partner.

In summary, a purely economic perception of patent licensing is inadequate, due to legal and other restrictions. Furthermore, it will also not show optimal results in terms of overall public welfare.

## 3 Balanced Score Card (BSC) as a management tool

In complex business environments target conflicts regularly occur between an overall positive strategy and the micro-management thereof. This contradictory situation was illuminated in section 2. Additionally, in any operating unit, quality of output, time of processing and available resources are competing with each other.

Especially in the 1990s a growing need to confront this situation was observed in managerial theory. Purely financial figures of a company just show whether operation is either running smoothly or deteriorating, but give no clue as to which actions have to be taken. Performance indicators show the past, but neither start a learning process nor generate ideas for future action. The literature of this period is crowded with keywords such as "Boston-Strategy-Matrix", "Benchmarking", "Business Reengineering", "Deming-Cycle" or "EFQM", to name but a few (Ten Have, 2003).

The Balanced Score Card (BSC) method stands out, as it tries to observe the overall strategy of an institution from different perspectives, thereby reconciling apparently conflicting goals. The BSC was originally introduced by Norton and Kaplan (Kaplan, 1996), in response to a failure of traditional accounting methods of purely monitoring financial indicators. In a recent paper, it is estimated that 50% of the top 1000 companies world-wide have adopted the BSC as a managerial tool (Yeung, 2006). It was later adapted and used in modern public service institutions and non-profit organisations to achieve the best results under legal or other constraints, such as reduced personnel resources (Niven, 2008). As an example, the police department of the City of Bremen has developed a BSC to optimize their public services (Bernhard, 2004).

The Balanced Scorecard considers economic and non-economic factors, often denoted as “soft”, e.g. scientists´ motivation for inventions in our case. It is balanced with respect to performance-oriented indicators, like licensing income, and with respect to process and action-oriented indicators, like the acceptance rate of inventions for patenting. And it also tries to predict future development from a trend in an indicator in the past, associated with recommendations for actions to influence the ongoing process.

Developing a BSC for a particular legal body, like a company or a scientific research institute, starts with a definition of an overall strategy denoted as the "mission". In the case of PTB the starting point is the “mission statement on technology transfer” (PTB, 2005) already mentioned above. Like the IP charter of the EC, it names - on an equal footing- an overall set of activities to be considered, such as increasing the number of industrial cooperations, supporting start-up companies, patenting for the protection of IP rights for German and European industry and licensing of IP rights to companies.

## 4 Implementation of IP management through the BSC method

Derived from the overall strategy, the different perspectives of the BSC on the business process have to be deduced. The aspect of a “perspective” is one of the key issues of the BSC. In the original work, these were “internal business processes”, “learning and growth”, "customer" and “finances”, which are shown in Fig. 3, adapted from the original work (Kaplan, 1996). In later adaptations, "learning and growth" was sometimes reduced to the term "organization" (Ten Have, 2003).

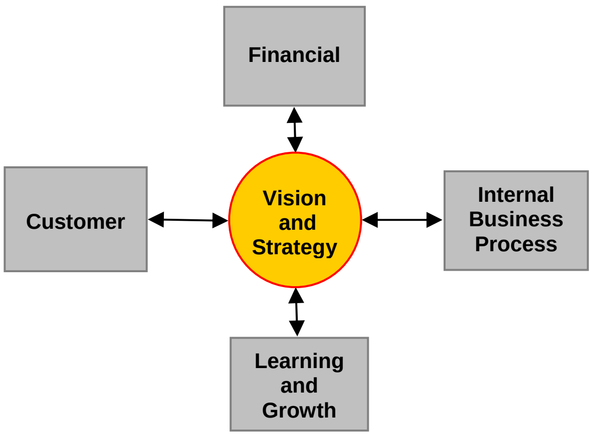



Fig. 3: **Original Balanced Score Card**: Perspectives on the business process.

Even in the original work, the question of whether four perspectives suffice, was discussed. With the growing adaptation to public services and non-profit organizations, the "customer perspective" was either substituted with "public tasks" or "public tasks" was added as an independent fifth perspective (Niven, 2008).

PTB's adaptation towards its IP management follows this overall approach and is shown in Fig. 4. First it should be noticed that this IP BSC refers to PTB activity in the IP sector in total, not the internal operation of the technology transfer office. Rather, it is the technology transfer office that balances the different business processes in the IP sector and allocates its own resources for an optimal overall operation.

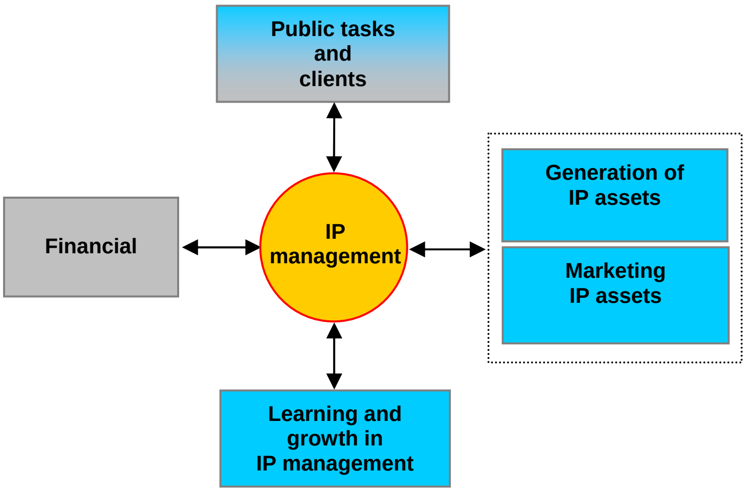



Fig. 4: **Balanced Score Card for IP management at PTB**

There are noticeable differences compared to the original work, depicted in Fig. 3. The perspective "customer" was replaced by "public task and clients" and put at the top of the diagram. The "financial" perspective, while still being central for the operation, has lost its absolute superiority compared to Fig. 3, the BSC perspectives of a private company. The process level had to be split, as raising and nurturing inventions is considerably different from marketing them and finding business partners.

The colours indicate the dominant functionality of the underlying indicators. In blue, primarily action oriented indicators are presented, while gray indicates underlying performance oriented-indicators.

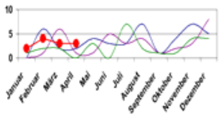
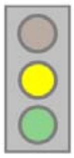
The following sub-sections describe the major indicators.

### *4.1 Generation of IP assets*

With this BSC-management, the difference to a traditional administrative approach is formidable. For a purely administrative perspective at the "generation" of IP, all that has to be taken care of is a proper processing of incoming inventions and subsequent patenting of a fraction thereof.

In contrast, in active IP management, questions like these have to be answered: Which departments hold clues to marketable technologies? Who are the actors and what is their professional and personal priority? How can inventors be supported and what should incentives look?

In this subsection the development of a scorecard for the perspectives of Fig. 4 is described in an exemplary way. Firstly, a strategic goal for the perspective has to be phrased. In this case it is: "Creating inventions in similar quantities to comparable R&D institutions, a noticeable fraction thereof should be applicable for licensing and/or patenting." Then key indicators have to be named and benchmark levels developed to the extent of their availability and comparativeness. In substitution of external benchmarks, relative internal levels may be set, like raising the number of inventions by a certain fraction per year. Formalized in a scorecard, Tab. 1 shows the respective result for the perspective "Generation of IP-assets".

| Scorecard **Generation of IP-assets** | | | | | |
|---|---|---|---|---|---|
| **Goal:** Substantial number of inventions; relevant portion must be eligible for licensing | | | | | |
| **Indicator** | **Bench-mark** | **Character of indicator** | **2009 data** | **Recording period** | **Symbolized perfor-mance** |
| Number of inventions per year | **25 to 30** | result-oriented indicator | **27** | per year |  |
| Number of inventions per month | Follow time line of data of previous 3 years | action-based indicator |   see cockpit, fig. 6 | on line |  |
| Acceptance rate $\alpha$ of inventions | **40 to 60%** | action-based indicator | **60%** | on line |  |

Tab. 1: **Scorecard for generation of IP asset**

To keep the goals of this scorecard on track, different interventions are now possible. For example, if the monthly monitored invention number drops considerably, so that the yearly benchmark is endangered, direct talks with known inventors, heads of departments or targeted e-mails are possible forms of action. Other forms of action are possible, if the acceptance rate of inventions turns out to be too high or too low. From a purely economic view, the rate should be considerably under 50%; thus reducing marketing efforts to the most asset-bearing inventions. But the inventor's motivation has to be taken into account; the current level of up to 60% is a compromise between inventor motivation and pure economic valorization of the inventions. Details on the management of this parameter are given in section 6.

### *4.2 Marketing IP assets*

The political goal for this perspective is phrased like this: "Finding the most suitable pathway to novel company clients and turning them into long lasting key accounts for cooperation". A similar approach to that in paragraph 4.1 towards the main marketing activities leads to these indicators: number of technologies and patents in active marketing, number of trade shows actively addressed, generated number of prospects, financial forecast for the next 12 months, number of key accounts. The marketing term "prospect" refers to a company manager, who has already expressed an initial interest in one of our technologies; the "forecast" indicator refers to a probability weighted expected cash flow through the known prospects in the coming 12 months, here not elaborated further for the brevity of the paper. These terms are used as in standard marketing.

As there are always limited resources available, activities in the process-oriented perspectives 4.1 and 4.2 will compete for the same personnel. This holds for the technology transfer staff as well as for the inventor. The inventor is the key "lead" towards the company prospect and the client. If the inventor focuses on more and more inventions and does not put them to work, an overall imbalance may occur. A similar case holds for the technology transfer staff, which needs 80% of its time to deal with the outside world. Therefore, a considerable overshoot in the number of inventions (paragraph 4.1) has to be avoided to focus on professional patent licensing.

### *4.3 Learning and growth*

The perspective of "learning and growth" enables management to implement visions and start completely new processes. This is vital in today´s business world and implicit in IP asset management which has novelties at its very center. PTB procedures consist of yearly planning sessions, where target agreements are established with the Presidential Board of the institution. In the case of IP asset management, the joint planning process leads to at least one new operational activity for the technology transfer office each year. Examples of these are the establishment of a website, a patent database, new trade show events or internal workshops for inventors.

### *4.4 Financial perspective*

This section contains the yearly development of costs and income and the strategic objective is phrased like this: "Achieving considerable surplus through tight cost control and contract compliance of licensees". Whereas costs can still be adjusted in the current year by adjusting the invention acceptance rate or reducing the number of international patents, the income basically stems from technological developments from years in the past and can not be influenced on a short term basis. In addition, as royalties are revenue-based cash flow, it sensitively depends on the economic cycle of the economy as a whole. Therefore, this is mainly a performance indicator.

### *4.5 Public tasks and clients*

In this perspective the strategic objectives of IP asset management should be monitored. Public research institutions are in need of IP: to hold it as proof of the economic significance in their field of work, as IP protection in industrial contract work, as a consequence of the political demand for technology transfer and as an additional form of income. Therefore, the key indicators in this subsection are the number of patents and patent applications and the number of licensing contracts. Indirect indicators for IP-assets are the number of industrial contracts and third party income generated through these contracts as well.

## 5 Characteristics of indicators and their lean generation

For an indicator-based system to become informative, very fundamental prerequisites of the indicators must be fulfilled. They must be

- objective in their very nature,
- not or not easily open to manipulation,
- few in their number,
- easily registered.

These conditions can be fulfilled simultaneously, if the indicators arise from the normal business process, in which inventions, contacts etc. are to be registered in the appropriate database. Through relative simple IT-based filtering techniques, the value of the pertinent indicators can then be deduced as a projection from this abstract IP data space. Thus, this data warehouse accumulates information through daily and normal registration at no extra staff time. By using this existing, valuable resource, the filtered output from the data warehouse can be viewed dynamically “while it happens” for reliable management decisions.

On the other hand, if the staff is asked to record extra data just for controlling purposes in supplementary activities, this will result in very subjective sets of data that are difficult to interpret. Examples of this may be the amount of time spend on individual customers being completely open for negligence or manipulation (Reinecke, 2006), or the number of commercial quotations that are sent out by the sales department, leading typically to hyper-activity with little net benefit.

PTB´s BSC indicator system holds all the positive connotations of the above criteria and will be explained in detail in the example of the subsequent section.

## 6 Patent quality management

While certainly not being a blueprint and also not the magic bullet, solving all managerial problems, the BSC still has the advantage of turning the attention of management to those aspects which show a conflict of objectives or are contradictory in themselves.

How these conflicting subsets of goals can be integrated with a BSC approach may be shown with the example of the acceptance rate $\alpha$ of inventions for patenting through the technology transfer office, namely

(1) $\alpha = N_{pat}(y_{reg}) / N_{inv}(y_{reg})$ .

Here $N_{pat}(y_{reg})$ is the number of patents for a particular year $y_{reg}$ , and $N_{inv}(y_{reg})$ is the number of registered inventions for the same year. From the "public task" perspective $\alpha$ should be high, to ensure broad IP protection and also as an incentive for inventors to keep on inventing. However, this will influence the "financial" perspective, increasing costs and reducing the expected surplus, as determined by a patent portfolio forecast, another key indicator. A high number of patents to be licensed will also influence the "marketing perspective", as resources are allocated to a large number of patents with a low probability of ever getting licensed at all. Finally, from the "IP generation" perspective only the most marketable inventions should be included in the pool.

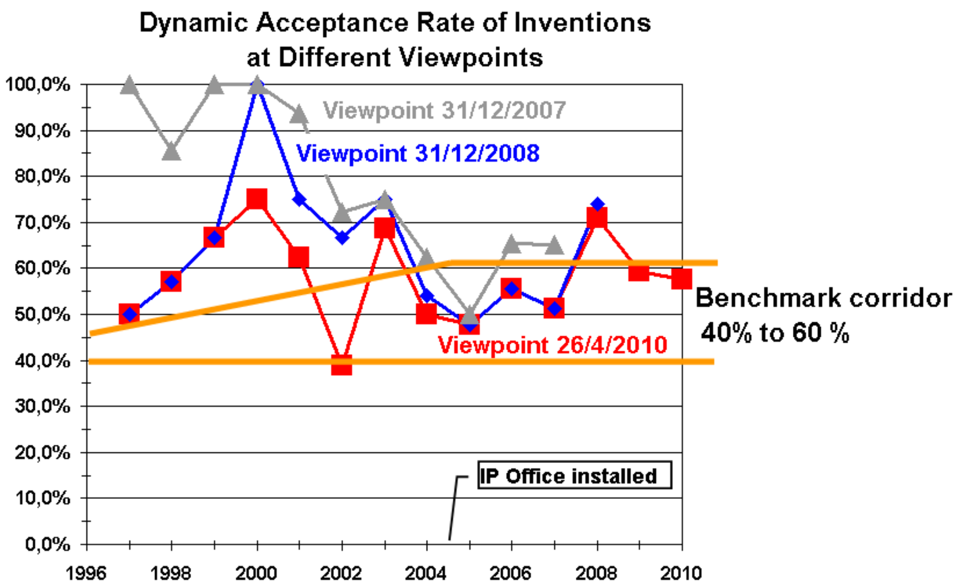



**Fig. 5: Dynamic view of the acceptance rate of the patent portfolio**, as registered for the pertinent year.

Therefore, benchmarks for $\alpha$ will be different for the "public task" and "generation" perspectives. This conflict is resolved by defining a corridor for $\alpha$ as guidance. This corridor is set at PTB between 40% and 60% and is shown in Fig. 5, and listed in Tab.1 for the "generation" perspective. Here, the upper limit (60%) stems from the experience in quality assessment of the inventions under examination through the IP office staff. Criteria for quality assessment are scientific merit, patenting probability and economical value. The lower limit is related to the licensing rate and will be introduced after the full introduction of Fig. 5.

Fig. 5 represents the portfolio view on PTB´s active patents. The gray curve represents the situation of 2007, shortly after setting up the technology transfer office. Each data point represents typically between 20 to 35 inventions as a statistical basis.

The acceptance rate for the most current year is given by eq.1. What is fundamental for understanding Fig. 5 is the obtained portfolio view by sorting each invention into its yearly register and adding a temporal observation point $t_{obs}$. Eq.1 then transforms into the two-dimensional form of eq.2

(2) $\alpha_{dyn} = N_{pat}(y_{reg}, t_{obs}) / N_{inv}(y_{reg})$ ,

in which we call $\alpha_{dyn}$ the dynamic acceptance rate. As can be seen, the denominator is identical to eq.1. However, $N_{pat}(y_{reg}, t_{obs})$ has become a variable of the registration year and the observation time $t_{obs}$ .

In Fig. 5 the view is backward over time from the indicated points in time $t_{obs}$. From a particular year of observation to another year $t_{obs}$ licensing activity and the elimination of those patents, not likely to be licensed, is carried out. Therefore, the dynamic acceptance rate drops from the blue curve of 2008 to the current red curve of 2010.

On average, with the assumption of a similar patent quality for each registration year $y_{reg}$, the dynamic acceptance rate will drop to the licensing rate, that is, the total number of licensing contracts divided by the total number of active patents. This holds exactly, only if individual licensing rates for each year are considered. For all practical means, the average licensing rate over the total portfolio suffices. In the case of PTB, the licensing rate is about 35%. This is where the lower threshold of the dynamic acceptance rate results from. If the acceptance rate falls below 40% for the most recent year, it is very likely that “good” inventions are not taken into the patent pool.

The licensing rate of PTB is relatively high, as it is addressing many metrology niche markets, in which the patent easily fills an empty technological spot. The trade off is that typically relatively few pieces of instrumentation are sold in these niche markets by our license holders.

From this discussion it can be concluded that this benchmark corridor stems from a particular R&D profile and may be quite different for another institution.

## 7 BSC cockpit

Derived from the filtering techniques, the most crucial dynamic indicators are displayed in a BSC-cockpit in Fig. 6a to 6d. To keep this paper focused, only the most important features are highlighted. Fig. 6a gives a detailed portfolio view on the status of all inventions for each registration year $y_{reg}$ . Naturally the number of granted patents (violet) is declining towards the present year, whereas the number of patent applications (dark green) is the highest in the most recent years. One example of a resulting activity maybe, that through the colour coding, unusual processing times of patent applications by the national patent licensing office are noticed and corrected.

Fig. 6b shows the incoming inventions for each month and compares then to the previous three years; this was discussed in the context of Tab. 1. Fig. 6b supplies an online view of whether the total number of desired inventions will be reached by the end of the year; it undergoes some typical yearly cycles.

Fig. 6c shows the dynamic acceptance rate, already discussed in detail. Work is currently in progress to reduce this parameter to 40% for older patents. This will either leave the licensed patents in the portfolio or those, where a longer time period is expected until its first application, such as novel semiconductors or medical instrumentation.

Fig. 6d is the financial outlook. For the past years it represents the balance sheet, from which rough trends can be seen. For the current year, it gives the forecast, as indicated in subsection 4.2. Bright colours show the realized values, whereas the dull colours show the forecast till the end of the year.

There is not an exact correspondence to the perspectives of Fig.3, but the dominant influence of the data can be given: The portfolio picture (6a) influences "generation" and "public tasks", the inventions per month (6b) refer mainly to the "generation" perspective. The dynamic acceptance rate (6c) is correlated to the "generation" perspective, but strongly influences the "financial" cost factor as well. The cost and income (6d) shows the trend of the past for the "financial" part, but the forecast for the current year is an action-based indicator for the "marketing" perspective.

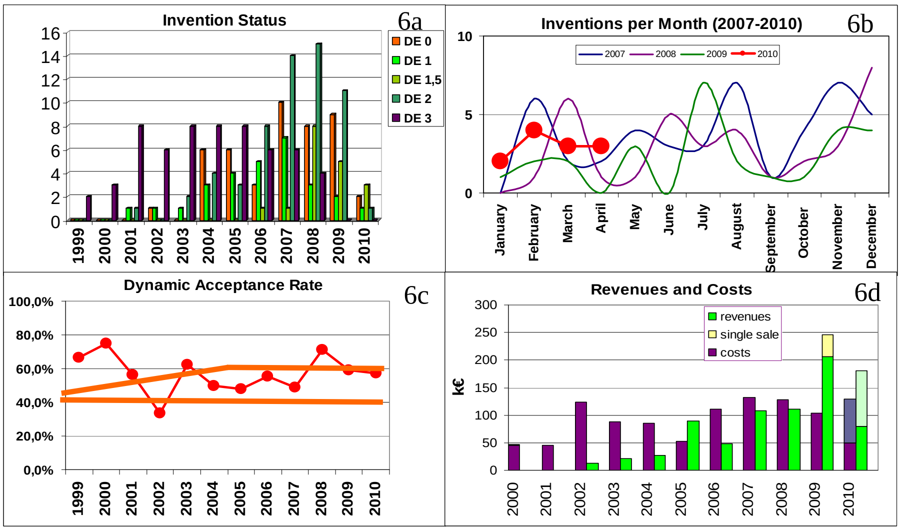



Fig. 6 **Excerpt of BSC Cockpit:** 6a) Invention status per year; DE-parameter: invention rejected (0), know how transfer(1), patent application(1.5 or 2), granted patent(3); 6b) Invention rate per month; 6c) Dynamic acceptance rate and benchmark levels; 6d) Finances of portfolio, cost and income forecast for the recent year

In comparing 6a with 6d, please note, that the number of active patent processes has considerably increased since 2004, whereas the patent costs for PTB remained almost constant. This is one net result of the broad portfolio management, outlined in this paper.

## 8 Conclusions

We have shown that in the process of normal administrative registration of IP assets into a properly designed data warehouse, a variety of valuable information can be generated at almost no extra staff time. With the support of the specific BSC approach, implemented for micro-management of the IP asset portfolio at PTB, guidelines and benchmarks can be derived to reconcile seemingly conflicting requirements for a public institution.

Data fusion of IP asset development into a data cockpit visualizes trends for the most important indicators. It furnishes data for decisions for the technology transfer office as well as for the management of the institution for long term development in an organic growth scenario.

In our specific case, patent costs were kept under tight control, while the patent number almost doubled. Income grew organically and now considerably exceeds the patent costs. At the same time criteria regarding neutrality and dedication to macro-economic welfare are fulfilled.

While not being a blueprint, the BSC approach appears to be a helpful tool for management to realize all significant factors that have a significant role in IP asset management. By varying the input data on a theoretical level, it may also serve as a system to develop scenarios and to weigh the benefits and costs of a specific long-term strategic approach.

## References

Bernhard, M. G. and Hoffschröer, S. (2004) Report Balanced Scorecard, Symposium Publishing GmbH

EC (2008) "Council Resolution on the management of intellectual property in knowledge transfer activities and on a Code of Practice for universities and other public research organisations", EC 10323/08, 04-06-2008

Kaplan, R. S., and Norton, D. P., (1996), The Balanced Scorecard, Translating Strategy into Action, Harvard Business School Press, Boston, Massachusetts

Paul R. Niven, P. R. (2008) Balanced Scorecard: Step-by-Step for Government and Nonprofit Agencies, Wiley

PTB (2005) "Mission statement on technology transfer", www.technologytransfer.ptb.de

Reinecke, S. and Tomcsak, T. (2006) Handbuch Marketing Controlling, p.12, GWV Fachverlage GmbH, Wiesbaden

Ten Have, S. (2003), Key Management Models, Pearson Education Limited, Harlow, Essex

Yeung, A.K. and Connell, J. (2006) "The application of Niven´s balanced scorecard in a non-profit organization in Hong Kong: what are the factors for success?", J. Asia Business Studies, Sept. 22, 2006

## Bibliographical Notes

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