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IP Dashboard: Measuring and Managing IP performance

Tatjana Samsonowa

IPERF, International Institute for Industrial Research Performance,
Friedrich-Ebert-Anlage 19, 60117 Heidelberg, Germany.
E-mail: tatjana.samsonowa@iperf.eu

Peter Bittner

I[3]PM, International Institute for IP Management,
Friedtalweg 5, CH-9500 Wil, Switzerland
E-mail: peter.bittner@i3pm.org

Bent Lundsager*

Zacco, Hans Bekkevolds Alle 7, DK-2900 Hellerup, Denmark.
E-mail bent.lundsager@zacco.com
* Corresponding author

Abstract: The rapidly increasing relevance of intangible assets, i.e. non-monetary but identifiable assets that lack physical substance, poses great challenges for managers at operational, tactic and strategic levels. Given the accelerating demand for innovations today, intangible assets in general and intellectual property (IP) in particular need to be at the core of a firm's strategy. Thus, there is a growing need for managers to professionally account for and support value creation attributed to intangible assets and intellectual property rights in particular. With this paper we address the particular issue of measuring and managing IP performance in industrial R&D functions, more particularly measuring and managing patent portfolios from a value based perspective. In order to provide managers a practical toolset for managing IP, we evolve the IPERF model that has been developed for performance management in R&D functions. In this paper we present a managerial toolset, a dashboard, for industrial performance measurement and measurement of intangible assets in the form of IP and we specifically show how IP management can be operationalized at all the levels suggested by the IPERF model.

Keywords: Innovation Management, Performance Measurement and Management, Key Performance Indications (KPI), Intellectual Property (IP), Research and Development (R&D), IP Management, IP strategy, Patent portfolio.

1 Introduction

Maximizing the value of in-house research activities is an important current topic for many organizations. Investments into research are of a rather long-term nature. Depending on industry, it takes 3 to 5 years in high-tech and up to 20 years in pharmacy before results contribute to the bottom line. On the one hand, such investment is a strong sign to shareholders and shows that companies think long-term and invest into the future. On the other hand, short-term developments in stock exchanges often push management

to more carefully allocate budgets into the research projects. This situation forces research departments to account for their spending and compete for new budgets. In this situation, systematic performance measurement and management becomes an essential precondition in order to efficiently and effectively spend and allocate research budgets.

One of typical goals[1] of a research department is to "Create and Protect Intellectual Property". The rapidly increasing relevance of intangible assets, i.e. non-monetary but identifiable assets that lack physical substance[2], poses great challenges for managers at operational, tactic and strategic levels. Given the accelerating demand for innovations today, intangible assets in general and intellectual property (IP) in particular need to be at the core of a firm's strategy[3] and become a cornerstone of a university's strategy[4]. Thus, there is a growing need for managers to professionally account for and support value creation attributed to intangible assets and intellectual property rights in particular. This is, however, not an easy task, given the immaterial, intangible quality of these assets that makes measuring their values especially challenging. Companies often tend to use quantitative KPIs in order to assess the above-mentioned goal, such as the number of IDFs (Invention Disclosure Form) or the number of patents granted to the company originating from the research department.[5] While different approaches and KPIs are used in practice to assess the value of created IP, this has not led to a systematic improvement and better yields of IP creation within companies. The problem with using pure quantitative KPIs is that aspects of quality are often neglected and wrong behavior can be stimulated based on the motto: "the more the merrier". Innovative companies seeking protection for their innovations and taking the associated costs are at risk of investing in less valuable IPR's and ultimately erode the profits.

With this paper we address this issue of measuring and managing IP performance in industrial R&D functions, and specifically focus on measuring and managing patent portfolios from a value-based perspective, i.e. maximizing the benefits of activities related to the creation of IP.

To do so, we extend an existing performance management model—the IPERF model—that stems from long-term investigation of industrial R&D functions. This model already includes performance clusters that relate to IP creation and links them with overall corporate goals. We evolve the IPERF model by adding an advanced IP portfolio classification method (SIPAC) that overcomes the named deficiencies.

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[1] Altogether eight different typical research goals were identified in earlier investigations: (1) Alignment with and transfer to internal development and other (business) units, (2) Create and protect intellectual property, (3) Improve the internal and external image of the research department and/or the company (4) Generate and evaluate future business opportunities, (5) Recruit and develop excellent talent, (6) Achieve a high standard of operational excellence, (7) Establish and maintain strategic partnerships and/or collaborative research, (8) Drive technology innovation and technology leadership in: Samsonowa, T. (2012) *Industrial Research Performance Management: Key Performance Indicators in the ICT Industry*, Springer Heidelberg, p. 249.

[2] International Accounting Standards Board (2004) *IAS 38*, http://www.iasplus.com/en/standards/standard37, retrieved 13 April 2013

[3] Blaxill, M., and Eckardt, R. (2009) *The Invisible Edge: Taking Your Strategy to the Next Level Using Intellectual Property*, Penguin Group

[4] "Effective IP management must become a cornerstone of every university's strategy. Taking a strategic view on their intellectual assets can help universities put their research results to better use for society. This will enhance their relevance to society and, at the same time, support economic development,", EPO Vice-President Raimund Lutz quoted in EPO newsletter, May 2013.

[5] Samsonowa, T. (2012) *Industrial Research Performance Management: Key Performance Indicators in the ICT Industry*, Springer Heidelberg.

In this combination, managers gain a practical toolset for managing IP, a dashboard, for industrial performance measurement and measurement of intangible IP assets. Using the dashboard, managers can quickly identify IP performance and the needs for corrective actions in relation to the overall corporate strategy. The dashboard applies at different hierarchical and functional levels, from inventors to top-level executives, and also supports communication and decision making of IP strategy.

The paper is structured as follows. First, in chapter 2, we present the IPERF model, provide a brief overall description and, in chapter 3, detail its relevance for IP assets. In chapter 4, we present the SIPAC method on strategically classifying IP portfolios. In chapter 5, we integrate SIPAC into IPERF. In chapter 6, we introduce the resulting management dashboard to guide R&D efforts toward pre-defined agreed IP creation goals. We discuss our results and conclude the paper in chapter 7.

2 The IPERF Model

The most pronounced problem in performance measurement and management practice is that performance management systems are often interpreted as mere measurement activities. They are not integrated into the management cycle with the pertinent strategy definition expressed in organizational goals. The IPERF model[6] addresses these shortcomings and holistically defines the process within the organizations along five levels. It takes into account that in practice often the collection of research KPIs and its evaluation is traditionally independent from planning activities.

The following four constitutive elements (Figure 1) of the performance management cycle are integrated within the model: planning, measurement, analysis and review/ improvement justified by the following purposes (Figure 2) of performance management and measurement collected from literature:

Goal setting: (a) communication, (b) alignment

Evaluating Goal Achievement: (a) status-quo, (b) prediction

Motivation: (a) organizational, (b) personal has been classified and mapped to the four key elements of performance management.

[6] Samsonowa, T. (2012) *Industrial Research Performance Management: Key Performance Indicators in the ICT Industry*, Springer Heidelberg.

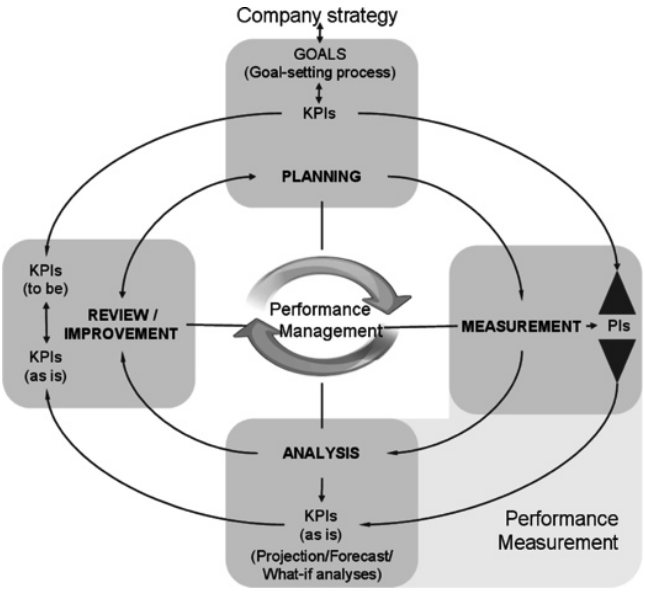


Figure 1: Four constitutive elements of the IPERF model

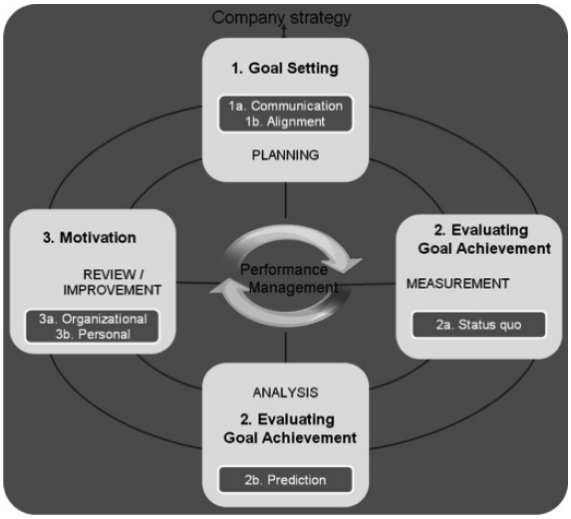


Figure 2: Purposes of the each element

The IPERF model (Figure 3) has been developed as a tool to help managers to systematically manage performance of research departments. It consists of five levels comprising the relations between the inputs, activities, outputs and outcomes of a research department.

Level 1: (strategic) represents the corporate goals of a company. These are to be broken down into department goals (level 2). This process is rather a “negotiation”, or a bilateral agreement between two levels: company level and receiving department level.

Level 2: (strategic) embodies the research goals. There are eight generic research goals identified.

Level 3: (tactical) consists of the performance clusters reflecting sets of activities that are typical for industrial research organizations. The model encompasses eleven performance clusters.

Level 4: (operational) comprises KPI classes abstracted from a set of concrete KPIs facilitating the decision making in identifying the artifact to be measured in terms of on the one hand: input, process, output or outcome. On the other hand specifying whether the quality or quantity is being assessed. There are 37 KPI classes integrated into the model.

Level 5: (operational) consists of concrete KPIs, these are KPIs collected from industrial research departments representing a catalogue of more than 160 different KPIs.

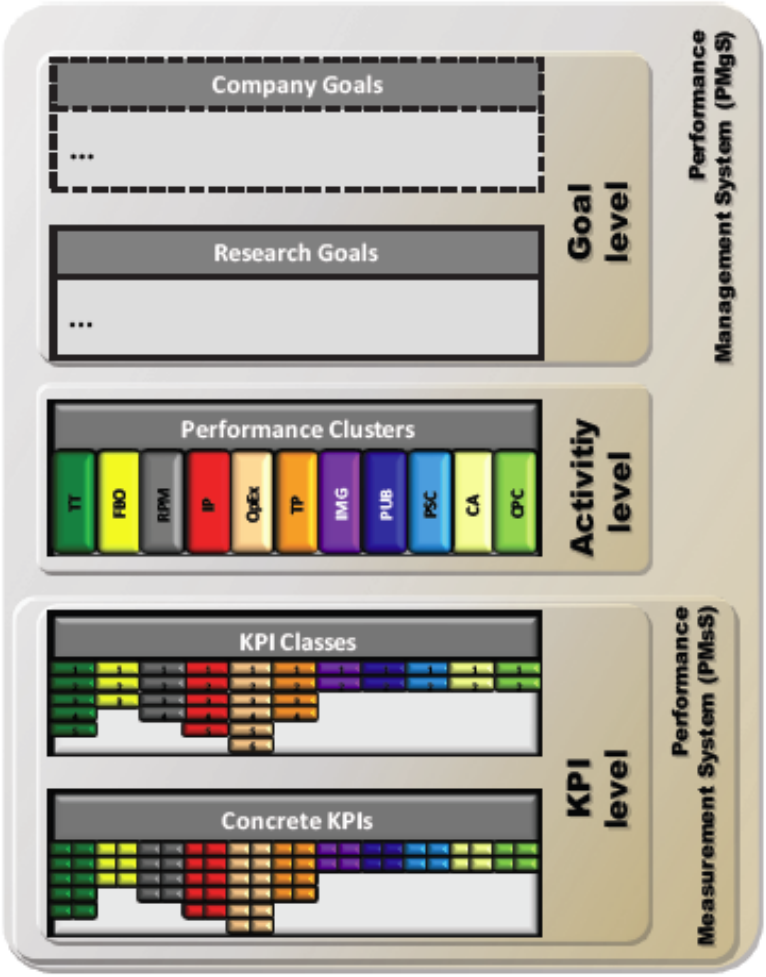


Figure 3: A five-level IPERF model

The model represents the convergence of a bottom-up and top-down integration. It allows a bottom-up consideration of existing resources, especially within the goal-setting process, provides with a possibility of bottom-up proposal of ideas, as well as serves as a platform during the negotiation processes between researchers and management, serving therefore as a communication tool. It furthermore facilitates design, selection and enables better prioritization processes considering the context of research activities.

Depending on the maturity level of the organization and the status quo regarding the performance management practice, once the model is in place for assessing the current contribution to the company goals, a better learning can be achieved. This implies the fact of collecting the relevant data, once the data is collected which can be compared and conclusions can be drawn from the comparison, the information emerges allowing for improvement recommendations to be considered within the planning activity for the next performance cycle.

3 IP Management within the IPERF model

For the development of the IP dashboard within this paper at least four performance clusters (level 3) need to be detailed*: Intellectual Property Creation (IP)*, *Identify Future Business Opportunities*, *Develop a Talent Pool*, and *Publish Research Results*. Further performance clusters are also related to the field of IP management. Among those we find: *Transfer Research Results*, *Create Thought Leadership Image*, and *Operational Excellence* (OpEx).

Therefore, we introduce the clusters:

- The Intellectual Property (IP) Creation cluster comprises KPIs that address research output and outcome in the form of ideas and inventions that are (1) created by researchers and that the company is trying to protect for a certain period of time; or (2) published by researchers in order to prevent others from protecting the idea or invention. The ideas and inventions are generally captured by invention disclosures. Depending on the IP strategy of the company these might for example be filed as patents, kept as trade secrets or made public as defensive publications.

- Identify Future Business Opportunities (FBO) cluster summarizes activities around the variety of research output and outcome, from fuzzy ideas to concrete business plans, all of which have the potential to lead to new income streams. The FBO cluster deals with the evolution of ideas within the overall innovation process and the contribution of the research department to this process. Both the need and importance of innovation, and the fact that innovation takes place on the market and is closely connected to commercial success are undisputed. Therefore, the FBO performance cluster is fundamental to innovation management, especially in industrial research. It encompasses aspects of idea generation and incubation, as well as new business development. It also includes facets of entrepreneurship in response to identified opportunities.[7]

- Talent Pool (TP) cluster summarizes activities that refer to recruiting people into the research department, their continuous development inside the department, and eventually their transfer into other parts of the organization or back into its eco-system. The processes within the Talent Pool Cluster are all people-related processes. Historically, labor law enforces many formal processes, which all companies have to comply with. These processes embrace, for example, the employment, deployment and development of employees as well as the termination of work contracts. This explains the pronounced tendency of existent formalized processes in this cluster.[8]

- The Publications (PUB) cluster comprises activities that produce research output in the form of scientific and non-scientific publications, including journals, books,

[7] Heuser L. (2006) *Ideenmanagement und Corporate Venturing – Fallbeispiel SAP*. In: Sommerlatte T., Beyer G., Seidel G. (eds.) Innovationskultur und Ideenmanagement, Strategien und praktische Ansätze für mehr Wachstum, Symposion, Düsseldorf.

[8] The OECD saw the necessity to produce an extra document addressing human resources aspects within R&ED: the Canberra Manual. OECD (1995) Canberra manual, Manual on the measurement of human resources devoted to S&T, The measurement of scientific and technological activities, Paris.

proceedings, etc. Journals typically refer to peer-reviewed publications devoted to disseminating new research results and developments within specific disciplines, sub-disciplines or fields of study. These include original articles, research letters, research papers, and review articles.

- The Technology Transfer (TT) cluster comprises all activities that are relevant to hand over research results to other groups of a company, typically development or production units. The transferred results must have exploitation potential (commercial) and the recipient must have an interest and/or plan in place for how to exploit them. Exploitation is in general deemed to be commercial and has two facets: cost saving and revenue generating. Therefore, the important aspect of the TT cluster is to capture and assess the output and/or outcome of research and transfer activities. Output includes the tangible artifacts that are transferred, their refinement during the transfer process, as well as all activities that help to convey the knowledge upon which the artifact is built or is based in order to ensure further (product) development by the receiving unit.

- The Image cluster (IMG) comprises all activities that contribute to the reputation of an industrial research department. In order to attract the best talent, the creation of a strong positive image is, for an industrial research department, at least as important as for the corporation. In fact, a research department may also contribute greatly to the image of a company by way of perceptions about its innovativeness. It is also worth mentioning that the image of a research department not only has to consider people external to the company but also to people within the company.

- The Operational Excellence (OPEX) cluster deals with the efficiency of process execution in an organization. It contains a set of auxiliary processes that support the operational structure of an organization as a whole, or its constituent parts.

A critical performance cluster for research organizations is the cluster “Intellectual Property Creation” as one component in measuring the innovative potential of the organization. In most organizations this cluster was correlated with activities around patents. It seems as if most organizations perceive “Intellectual Property” (IP) as patents, which of course is a far too narrow interpretation and can lead to serious problems when managing the IP management performance of an organization. IP management should be an integral component of any innovation strategy and is a key success factor for any sustainable business model of innovative technology centered organizations.

The other performance clusters listed above also have a strong link to IP management and IP creation performance and are important for evaluating IP management performance of the organization.

Levels 4 and 5 of the IPERF model finally break down the performance clusters to the KPI level. Companies use primarily quantitative KPI classes for measuring IP creation performance where the input is seen as the idea or invention and the output is finally a patent application or a patent resulting in an outcome of an improved financial situation. Qualitative aspects are taken into account by performing filtering on the harvested ideas according to company specific criteria. Typical KPIs for measuring the IP Creation performance are: # invention disclosures, # patent applications filed, # patents granted.

Cluster	KPI class description	Artifact classes	Artifact property	Examples
Intellectual Property Creation	13. Input volume: volume of potentially protectable inventions submitted into IP pipeline	P Op	#	# invention disclosures
	14. Output volume: volume of first filings out of the IP pipeline	P Op	#	# first filings, defensive publications, trade secrets
	15. Outcome volume: volume of patents granted	Op Oc	#	# patents granted to the company
	16. Input quality: quality of granted patents	Oc	Q	# submitted inventions addressing the IP strategy
	17. Outcome quality: alignment of research activities with the IP strategy of the company	Oc	Q	economic value of the granted patent

Figure 4: KPI classes within the cluster: Intellectual Property Creation[9]

With a view to Figure 4, KPI class 13, 14 and 15 measures IP creation in terms of volumes of IDFs, filings and granted patents. But there appears to be no measuring of what strategic goals they support apart from a "the more the better" grand total goal. The KPI classes 13, 14, and 15 appear to measure performance of the IP pipeline.

KPI class 16 and 17 are directed to the quality of granted patents and alignment with the IP strategy. The IP strategy may very well support a strategy for value creation, however these KPI classes appear to measure performance at a late stage and leave only limited possibility for (performance) management. Several years (or performance management cycles) may pass before any discrepancies are discovered and corrective measures can be taken even on an operational level.

The analyzed KPI's and KPI classes in the Intellectual Property Creation cluster are directed to the rather formal processes of IP, have a long-term time pattern, and have a company internal (controllable) focus.

At the cluster level, Intellectual Property Creation, KPIs and KPI classes (operational levels 4 and 5 of the IPERF model) are aggregated e.g. by weighing and summing into more high-level measures (level 3). Thereby measurement of performance in the Intellectual Property Creation cluster is aggregated into more abstract measures. Such aggregation significantly diminishes any (strategic) manageability of IP creation. Thus, the Intellectual Property Creation cluster (level 3 of the IPERF model) is supported only weakly at the upper hierarchical levels of the company i.e. at the strategic level 1 of the IPERF model ('where to go') and at the tactic level 2 of the IPERF model ('how to do').

In general it is perceived a complicated task to measure performance of Intellectual Property Creation in terms value creation[10] – and in terms of strategic assets for the company. Possibly that's why we see those observed KPIs and KPI classes – because they can be measured in a consistent way. However, many may be tempted to jump to the conclusion that IP value creation is controlled at a strategic level. This is not necessarily the case.

Only focusing on such KPIs and (aggregated) numbers when assessing IP performance may lead to situations where the following activities are rewarded:

- In organizations with high innovation potential the creation of invention disclosures may be limited to meet the set KPI target. High value inventions or ideas may be suppressed once the target is reached. This may stifle innovation activity of

[9] Samsonowa T., and Gerteis, W. (2009) *Towards a Systematic Performance Management System for Industrial Research Organizations*. ISPIM conference: the dynamics of innovation, Bilbao, 6–9 June 2010.
[10] Ernst, H., and Omland, N. (2011) *The Patent Asset Index*, in: World Patent Information, p. 34-41

organizations with a larger innovation potential. The creation of potential high value IP assets may be missed.

- In organizations with low innovation potential the creation of invention disclosures may be exaggerated to meet the set KPI target. Low value inventions or ideas may be encouraged to reach the target. This may lead to additional burden for the organization for low value activities and result in spending money on low value IP assets.

- The generation of invention disclosures is focused on those fields where people have most experience and know the prior art very well. There is a high probability to file patent applications with incremental improvements over the prior art for current products markets but not related to future solutions/markets resulting in IP assets which are not directed to new technologies enabling future products or solutions.

Simply measuring the above KPI quantities may – in an extreme situation – create the perception that the IP performance of the organization is superb because all goals are outperformed although the generated IP assets only have very low value. In other words, the established KPIs don't tell if you do the right things. They can also indicate good performance if you produce useless things at the expected quantities. They are actually more directed to measure the legal process aspects of IP creation – namely if the IP function is capable to convert anything into a respective patent application or patent.

Most companies today use quantitative IP performance measures, which typically are weakly or not at all related to the value of the IP assets. As a result of such performance measures there is low probability for high value IP asset creation. Further there is a low or even negative correlation with the overall company performance leaving plenty of room to improve the value creation of the organization. Improving the value creation however requires a fundamental understanding of the value principles applicable to intangible assets.

In the further development of the IPERF model we make the following assumptions:

- Based on the above study, using conventional KPIs in the IP creation cluster of the IPERF model stimulates goal achievement in terms of quantity.

- Inventor's inventive activity may be decoupled from strategic relevance and future value to the company.

Inventors tend to bring about new inventions, either in areas where they possess skills and have a deep understanding of technical problems and solutions, in this area they contribute by gradual improvements. Alternatively, as a result of structured and well-funded research, inventions to ground breaking new technology may emerge. However, inventions may also be made in a more Serendipity like manner where spontaneous ideas (frequently) turn into valueless inventions or (more rarely) turn into business disrupting new inventions. However, inventive activity may be decoupled from strategic relevance.

Based on the author's experience as patent attorneys it is observed that patent strategies approved by management (not rarely) lack any definition of what technology to take out patents for. In that case other factors may dominate which inventions there are filed patent applications for. Such other factors may be a patent attorney's assessment of

what he has experience in will proceed to grant; the inventor's deep specialist knowledge or interests or other non-strategically founded factors.

It is also observed that some patent strategies contain a management's definition of what to file patent applications for, but in broad, headline terms – rarely updated and rarely communicated (within the organization). Also, in this case, other factors may dominate which inventions there are filed patent applications for.

Drafting, filing and prosecuting patent applications to inventions decoupled from strategic relevance incur costs and may lead to a non-observed failure to take out patents in strategically important areas. This may happen despite full goal achievement on conventionally defined KPIs is observed.

Patent value is highly dependent on its business context[11]. However, a patent to a strategically important technology will, all other things being equal, have a higher value.

4 The SIPAC Method

The challenge for innovative companies is to own the right (valuable) IP allowing to make a premium thereon as a basis for continuous innovation. Therefore, meaningful performance measures regarding IPR creation should measure if the right IPRs are created, namely high value IP assets. As the above examples show this can hardly be achieved with the currently used performance measures. Instead, the following questions need to be addressed:

- How to generate the right Intellectual Property assets for the company to support a sustainable profitable business?
- How to measure that the right IP assets have been created according to the strategy?

To answer such questions Value Based IP Management (VIPM) integrates an IP Strategy with the Corporate Strategy with the ultimate goal to stimulate Strategic IP Asset Creation (SIPAC). We know that intangible assets typically follow a lognormal value distribution[12] where 10% of the assets contribute 90% of the portfolio value (cf. Fig. 5). The goal of the firm's IP Strategy should be to beat this distribution in the firm's IP portfolio by managing the portfolio according to value based principles leading to a portfolio value distribution, which is closer to the curve with dashed line.

[11] Bader, M et al (2011) Final report for EU Tender No 3/PP/ENT/CIP/10/A/NO2S003 Creating a financial market for IPR, http://www.moez.fraunhofer.de/content/dam/moez/de/documents/Final%20report_creating-financial-market-for-ipr-in-europe_enx.pdf retrieved June 2, 2013

[12] Tao, J., Daniele, J., Hummel, E., Goldheim, D., and Slowinski, G. (2005) *Developing an Effective Strategy for Managing Intellectual Assets*, in: Research-Technology Management, Volume 48, Number 1, January-February, pp. 50-58 as well as Harhoff, D. (2003) *Measuring and Estimating Patent Value*, WIPO-OECD Workshop on Statistics in the Patent Field, September 18-19, http://www.oecd.org/science/inno/33882355.pdf, retrieved June 2, 2013.

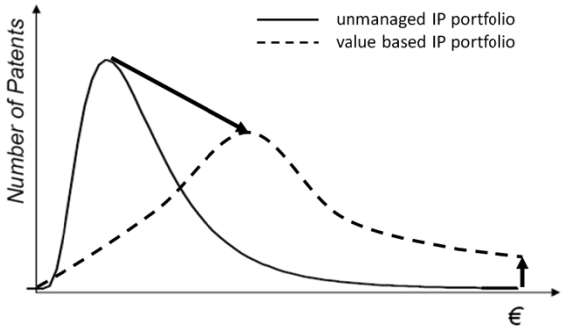


Figure 5: Value distributions of intangible goods (e.g., patents)

As we know, the value of IP substantially depends on three factors[13]:

- the intrinsic value potential of the IP,
- the complementary assets needed to make value added use of the IP, and
- the exploitation processes available to realize the value.

These factors determine the overall value of an asset and may have components which are related to the environment of the firm (external components) and components related to the firm's internal properties (internal components). That is, each of the value factors can be broken down into internal and external value components (cf. Fig. 6).

IP Value Factor	Internal Value Components	External Value Components
intrinsic value potential	skills within the firm's organization	innovation potential
	resources in the organization	technology attractiveness
	funding of projects	potential market size
	Contribution Potential	
complementary assets	own complementary assets	competitive intensity
		existence of standards
		Strategic Relevance
exploitation process	firm's ability to extract value out of the IP assets	

Figure 6: IP Value Factors

Internal value components are governed by properties of the organization. External value components are governed by the market and externalities. Most value components can be grouped into two major dimensions:

- Strategic relevance, and
- IP contribution potential.

[13] Wurzer, A. (2008) *General Principles of Proper Patent Valuation: the Forthcoming European Standard*, http://www.mszh.hu/English/ipv/IP_Valuation_Budapest_2008_Wurzer.pdf, p. 24, retrieved June 2, 2013.

Those dimensions turn out to be the relevant dimensions for IP asset creation in a value based IP management approach. Fig. 6 shows examples of value components defining the respective dimensions. It is to be noted that such value components can be different for every company. The internal and external value components of IP drive the IP asset building process and ensure a tight integration of the IP Strategy with the Technology/Product/Market Strategies of the company. The SIPAC method will increase the probability to generate high value IP assets for the firm's IP asset portfolio.

This is achieved by analyzing the firm's technology road map and breaking it down into enabling technologies. An enabling technology in this context is defined as being a key technology for future products or solutions of the firm. For each enabling technology an assessment is performed with regards to the strategic relevance of this technology in view of the respective value components. Further, an assessment of the organization's IP contribution potential for the enabling technology is made along the respective value components. At the end of this exercise for each enabling technology the strategic relevance and the organization's IP contribution potential are known.

Fig. 7 illustrates the SIPAC method for IP portfolio development along the dimensions of strategic relevance (SR) of an enabling technology and the respective IP contribution potential (CP). Contribution areas include enabling technologies with high SR and high CP. In such technologies the probability for creating high value IP assets is highest. Such contribution areas are communicated to the R&D staff in the company to actively stimulate IP asset creation.

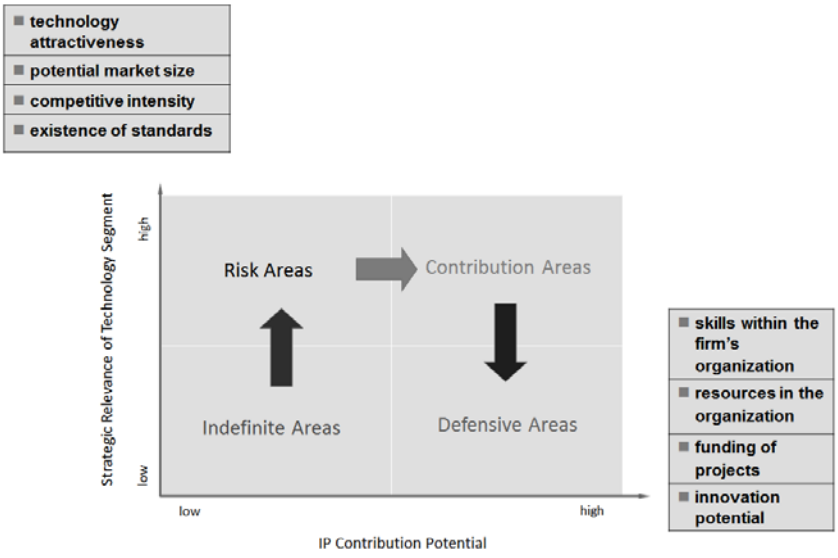


Figure 7: SIPAC IP portfolio development

Further aspects of the SIPAC method will now be explained in the context of the above IPERF model.

5 Using SIPAC method in IPERF model

By using SIPAC in the context of the IPERF model it is possible to implement changes in managing the IP performance in organizations by building on the above-identified IP relevant performance clusters. Instead of simply waiting for ideas as input to turn them into IP assets SIPAC suggests a more active way for stimulating smart innovation by managed ideas. The input thereby is an IP strategy giving guidance to the organization about where the most promising IP is to be expected and how the organization should transform over time. The output is increased R&D efforts in fields with high probability for high value IP creation.

As already explained, the basic idea of SIPAC is to develop an IP portfolio with regards to enabling technologies for future solutions along the dimensions of available IP contribution potential in the research organization (regarding the respective enabling technology) and the strategic relevance (SR) of the enabling technology. Relating this approach to the IPERF model shows that the performance clusters “identify future business opportunities” and “develop a talent pool” become very relevant in an integrated IP management performance framework. Identifying future business opportunities is closely related to the strategic relevance of respective enabling technologies because those enabling technologies supporting the future business opportunities will become the most relevant technologies from a strategic perspective. Developing a talent pool is closely related to the IP contribution potential of the organization. Where skilled people can work on projects dedicated to the strategic enabling technologies with sufficient funding there will be an increased probability that significant contributions can be made over the existing art.

The IPERF performance cluster “create intellectual property” can be related to the SIPAC quadrant of contribution areas where the probability is highest that high value IP assets can be created because the organization is able to deliver substantial contributions of substantial strategic relevance. Setting specific KPI goals for contribution areas stimulates the IP creation according to value-based principles. However “create intellectual property” may not necessarily mean to create patents. A patent application will be published. This may be counterproductive in case of technologies, which may rather be treated as trade secrets. Therefore, KPIs need to distinguish between such strategic scenarios in order to avoid misleading the organization by setting the respective goals.

The IPERF performance cluster “publish research results” cannot be seen as independent from the “create intellectual property” cluster. In SIPAC the “publish research results” cluster relates pretty much to the defensive quadrant with high CP but low SR. This quadrant includes enabling technologies which are already on their declining edge of the life cycle in terms of relevance for future solutions but at the same time many people in the organization have accumulated a large knowledge base. In organizations without strategic guidance for IP creation typically invention disclosures are primarily generated in those fields. However, often such innovation is only incremental and a defensive publication may be preferable over an investment in a potential low value patent. A KPI simply measuring publications in total may miss the different flavors of innovation and lead to harmful publications for innovations, which should be protected by IP assets before.

SIPAC further covers risk areas (high SR, low CP) providing input for organizational development with the long-term goal of high value IP asset creation in areas where

currently there is low CP but high SR. This is achieved by transforming risk areas into contribution areas over time, for example, by developing a respective talent pool. That is, KPIs related to the performance cluster “develop talent pool” might have a dramatic impact on the future IP performance of the organization.

One aspect of SIPAC goes significantly beyond existing performance systems. Ideas for technologies, which are not on the radar of the organization at all, will have (per definition) low SR and low CP because the organization has not seen a demand so far and has probably no competencies in this field. SIPAC allows dealing with intentional IP creation for such ideas which are not along the defined strategy but which may become enablers for disruptive innovation.

As discussed above, in connection with the IPERF model, the observed KPIs and the processes they are measuring are centered on the IP pipeline. The IP pipeline taps inventions from R&D and funnels selected and patentable ideas into granted patents with a certain value. The IP pipeline is thus apart of the company’s value chain and is sometimes considered a core process (identified in IPERF as the ‘IP creation cluster’).

6. The Dashboard

As discussed above, IP creation is not sufficiently supported at strategic levels of the IPERF model. The SIPAC method makes it possible to keep a strategic focus while being highly operational.

A foundation for the SIPAC method is technology enabling innovation and competitive advantage and in particular a breakdown of that technology into a number of enabling technologies.

Figure 8: Enabling technologies

Figure 8 shows enabling technologies T1, T2 and T3 that are each assigned to a goal, #G, and an achievement, #A. Also, each of them is assigned to a strategic relevance indicator value and a contribution potential value. In terms of KPI classes, above KPI class #14 “volume of first filings” may be modified to be a multidimensional value with a value element per enabling technology. Definition of enabling technologies is a precondition for measuring Value based IP performance.

The strategic relevance and contribution potential indicator values are computed from a set of value indicators computed for a respective enabling technology. The value indicators may be aggregated into a respective indicator value by weighing.

An invention is assigned to an enabling technology and then mapped by a respective CP, SR value to a portfolio coordinate.

Having defined enabling technologies and computed CP, SR values, inventions can be mapped to the strategic view. This view is expedient for reviewing previous performance from previous IP creation activities. The authors argue that most patent portfolios will show heaviness towards the ‘defensive’ area.

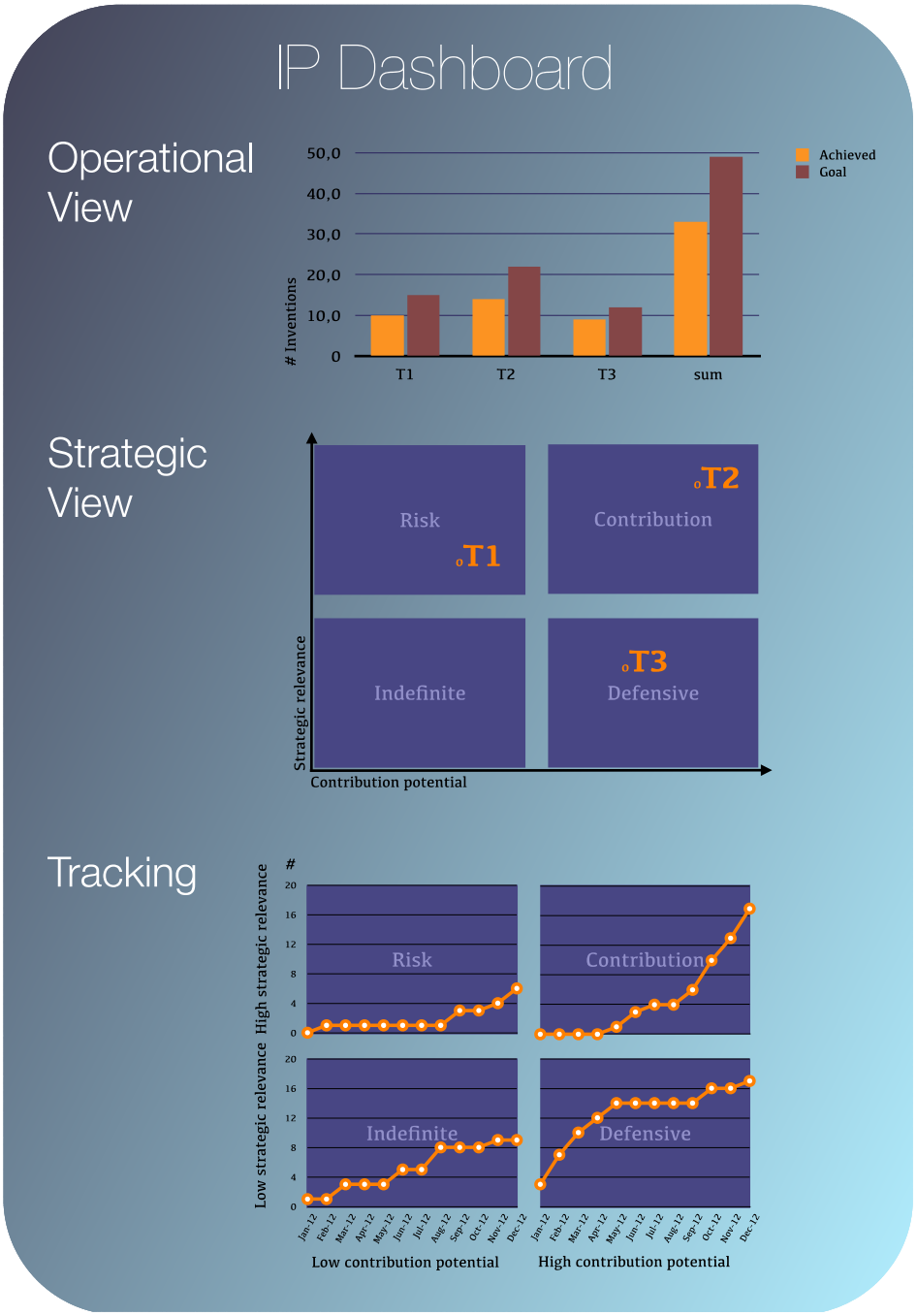
Planning and negotiations involving goal setting at the strategic and tactic level of the IPERF model may evolve around the strategic view.

Once the goal for activities in the areas: uncertainty, risk, contribution, and defensive has been agreed upon, an IP asset building component of the IP strategy is at least partially in place on a strategic level. The advantage compared to the conventional praxis under the IPERF model is that top-management can control e.g. IP related risks, investment in possibly disruptive technologies (with high degree of uncertainty) and prioritize investment in contribution areas over defensive areas. Such strategic considerations vanish when conventional weighing aggregates KPIs.

The strategically agreed goals are distributed to enabling technologies, e.g. as visualized in the above bar chart, and serve as a tool for communicating the strategically agreed goals on an operational levels of the IPERF model. Enabling technologies are defined by a designation of the technical field e.g. in the form of a short title. It is thereby possible to communicate e.g.: “the organization needs 4 more inventions in the particular field of [designation of technical field]”. Such designations are developed in cooperation with senior technical staff or CTOs to secure anchoring on an operational level. In this context quantity based KPIs can be used to measure IP performance.

Measurement of performance and adherence to the agreed strategy can be measured both on the operational level and on the strategic/tactical level, confer the above figure.

The proposed dashboard now integrates all IP management related IPERF performance clusters in one value oriented KPI overview for monitoring the performance of IP management over time in line with the corporate strategy with the goal for increasing the probability for the creation of high value IP. Adding a time dimension to the portfolio view as an abscissa axis and plotting accumulated numbers of inventions (#inventions) along the ordinate axis is considered to enhance the management aspect of IP asset creation under the IP strategy since analysis and review and improvement of the performance intuitively connects with a time dimension (figure 9).



technologies T1, T2 and T3 (top left, operational view) and, corresponding CP, SR coordinates in the portfolio view (top right, strategic view). Portfolio view extended with a time dimension to each portfolio area (bottom).

7. Discussion & Conclusion

Managing performance of IP creation is found to be a related to the formal processes around IP in a company. This result may stem from the fact that it is not an easy task to measure the value of a patent or a patent portfolio. In turn it is especially not an easy task manage IP value. Considering the need to secure profits from innovation in a still more competitive market there is a need for improved performance management around IP value creation.

We have proposed a decomposition of technology into enabling technologies and for each enabling technology provided a model for attributing a strategic relevance value and a contribution potential value, which spans two dimensions, where the latter one can be controlled by the company in terms of stimulated inventions. Stimulated inventions differ from inventions as they are conventionally 'harvested' in that inventors are asked to invent in those areas that are estimated to be strategically important for the company in the future. Considered from a higher strategic level this also stimulates to invent in a balanced way securing IP in risk areas, indefinite areas, where disruptive technologies may occur and to bolster existing IP positions under a defined IP strategy. In this way IP strategy supports business strategy to a higher degree. We presented the SIPAC method that provides strategic control and goal setting while being highly operational, as a performance management metric and as a communication tool for communication of IP strategy at all hierarchical levels in the organization.

The cornerstones of 1) a decomposition to enabling technologies, 2) a communication tool, and 3) integration into an existing performance management model, the IPERF model provides strategic control handles that makes it possible to align IP creation (the company's contribution) with the company's estimate of maximum profit generating future complementary assets in terms of its innovation strategy. Exploitation processes are still not included in this model. Despite value creation in reality (mainly[14]) occurs once exploitation processes are in place, this should be less of a concern since the addressed and long-term processes related to the factors of 'IP contribution potential' and 'complementary assets' are optimized for subsequent value extraction. The SIPAC method introduces a feed-forward correction scheme (stimulation) to the IPERF model whereas existing performance models around IP tend to either neglect any corrective measures in terms of value creation or tend to include a hugely time-lag impacted feedback loop measuring economic benefits of the created IP—leaving IP value creation unmanaged at a strategic level.

Building on these conceptual thoughts, the IP dashboard proposed in this paper provides managers a toolset managing IP assets that allows tackling the complexity systematically in a straightforward manner.

[14] IP value can be considered to be created automatically by publication e.g. causing prior art effects and acknowledgement of inventors, but value is in general only generated once patents are exploited by active pursuing opportunities generated by patents.