INTELLECTUAL CAPITAL REPORT AS AN ASSESSMENT INSTRUMENTS FOR STRATEGIC GOVERNANCE OF RESEARCH AND TECHNOLOGY NETWORKS

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Abstract

This case study describes the combination of the Intellectual Capital framework and the System Theory framework to define a new steering instrument for the allocation of public research funds. The article builds on cases from research organizations as well as industry and extends these experiences to research networks. Using the case of NANONET Styria, a network of fife integrated research projects involving 20 industrial and 24 academic partners, the methodology is developed and tested. The most important results effect a sensitivity model which is based on the intellectual capital framework. In combination with valuation approaches from the intellectual capital framework, it provides insight into the status quo of the knowledge base of a network and offers a structured methodology to prioritize management measures.

Keywords: intellectual capital, sensitivity analysis, research network, resource allocation.

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1 Introduction

A member of a panel to allocate research funds is confronted with a long list of proposals far exceeding his/her potential budget. He or she holds general knowledge of the field but lacks the specifics to decide about the individual projects, as each project claims to extend the frontiers of current knowledge in the already very diverse disciplines. The backing authorities of the funds trust the panel members to act on their behalf and to invest the money where it earns the highest marginal utility. Obviously, this is a common yet unsatisfying situation for long serving panel members. They take advantage of established frameworks such as generally defined research program structures and – primarily – financial frameworks that differentiate into expenditures for personnel, infrastructure and cost of operations and travel costs.

However, controlling institutions of both, international bodies such as the European Union or national research funds and private foundations, criticize the efficiency of this allocation procedure in spite of integrated measures of evaluation and review. One of the main arguments refers to the sometimes obscure nature of utilization of the resources. Sometimes severe over-funding coincides with only modest scientific or technological output. Sometimes the strategy to cut back all proposals to such an extent that all reasonably fitting applications are served, leads to severe under-funding of the individual proposals. The obvious countermeasure of applicants leads to inflated budgets to secure project success under even these extreme limitations of expected generous cuts in their resources. This, in turn, leads to stop-and-go patterns in funding policies: After generous pay outs in the beginning, enthusiasm of ill defined projects evaporates and results are delayed, leaving the impression of immature projects. The likely consequence of a complete cut of funds leads to abandoning of the whole project. This in turn leads to a shift of researchers into new projects. Parallel, the environment for so far unfunded projects turned hostile, even though they might have had better results.

An alternative approach focuses on long-term strategic ambitions and the driving forces of the system at stake. Within this system, several driving forces have stimulating and dampening effects

The problem of assessing the real demand for resources and their optimal allocation to specific research proposals is further complicated by the problems of intangible success factors. The value chain for knowledge intense processes such as research and development is characterized by low transparency. Latent capabilities and intangible competencies yield intangible products that might, over time, contribute to tangible products (Eustace and Youngman 2002; Edvinssin 2003). Thus, three of four major processes are very hard to document. Up-front evaluation from panels is either far away from the knowledge domain (if they are staffed with non-experts) or not completely neutral, as one expert holds court over his or her competing colleagues.

If the funding entity represents some regional institution, impacts of the project to the local knowledge base and its future development are rarely discussed systematically. A strategic orientation to long-term ambitions and alignment with economic as well as technological priorities is advisable. However, these strategies frequently do not exist, and even if they are available, competing interests of (political) parties and lobby groups jeopardize long-term benefits.

Similar problems occur in private industry where funds are even more bound to yield competitive returns of investment. A term coined by Deloitte Research in this context refers to “collaborative research networks” and is defined as follows: “Collaborative knowledge networks link communities of practice and their members together, providing a technical and social infrastructure for collaboration and knowledge management.” (Deloitte Research, 2001. 2).

A new governance approach needs to integrate the main players and take into account the specifics of their environment. System theory offers some insight how to describe such an environment and how to assess its future development. With frameworks from intellectual capital management to measure intangible competencies and latent capabilities, some insights on the already available and the future knowledge base could be added and thus improve transparency of the decision making process.

These challenges apply to the government of the state Styria in Austria. This government is in the process of investing considerable funds into the rather new field of Nano Technology and Nano Sciences. There is the awareness of urgency to invest timely into this so far not established knowledge domain. However, on the other side the inherent risk of wasting the money into the blue sky should be minimized. Experts in the established councils lack the specific knowledge to assess the likelihood of success of the proposals. Thus, the public administration chose to apply the relatively new instruments of intellectual capital management to improve transparency and prepare the decision-making authorities with additional data. The project and research methodology as well as implications are documented in the following paragraphs.

2 Theory/Issues

This project focuses on developing a steering instrument for research fund allocation into research and technology networks in the public domain with strong overlaps to private enterprises. The instrument shall improve transparency for all stakeholders involved in order to improve the productivity of the still invisible knowledgebase. Additionally, it should provide for self-coordination of network members.

2.1 Research Networks

Scientific progress leads to *differentiation* processes and the definition of ever new disciplines and research areas. Technology on the other side focuses on *integration* of various scientific expertises into new applications, methods and even products. Most of the work related to both, science and technology development, is done in networks with varying degrees of regulations. Within the network, most players are equal to each other according to the scientific peer – model and cover different roles (Biedermann et al, 2003. 154ff). The networks represent the collaboration space of scientists and technologists. According to Nohira, it represents a modern form of the organization: "If the old model of organization was the large hierarchical firm, the model of organizations that is considered characteristic of the New Competition is a network, of lateral and horizontal interlinkages within and among firms. […] Established firms are trying to restructure their internal organizations along the line of networks. They are also trying to redefine their relationships with vendors, customers, and even competitors […] seeking more collaborative relations that will bind them together into a network." (Nohira and Eccles, 1992: 2)

These binding forces of a network are sometimes countered by internal conflicts of interests. Particularly within research and technology networks, collaboration between publicly funded research institutes and privately funded enterprises faces sometimes frictions when confronted with issues regarding intellectual property exploitation. Here, the differentiation between competitive and pre-competitive research is important, as they call for different strategies.

A research and technology network is dedicated to create a critical mass of a few selected knowledge domains under one header to resolve distinct research problems. However, in many cases, there is no consensus on the power structure within the network, leading sometimes to chaos and anarchy.

Pre-competitive research is defined by high uncertainty and scarce funds. Several hypotheses and options for exploration encounter very limited resources and capacity. Risk of failure might endanger the existence of any single entity, thus risk sharing and joint investment of funds of at least several members of the network seems reasonable. However, once the initial experiments are conducted positively and a market for both – economic and scientific applications – emerges, internal conflicts might arise.

They are poison for competitive research because of their paralyzing effects. Hence, need for clear governance emerges. A steering instrument needs to involve most or all members of the research network and align them to strategic priorities. According to the problematic power structures, shared mental model of how the common goals are achieved with a minimum of resources might improve the chances considerably.

2.2 NANONET Styria

As an empirical reference for the challenges outlined above, serves NANONET Styria. It was initiated by the government of Styria, a province of Austria, to sustainably provide for measures that

- support available competencies
- develop new competencies
- generate new economic and scientific value added
- transfer scientific knowledge to technology, applications, tools, etc.
- support regional, national and international activities

in the domain of Nanotechnology. “Subject of Nanotechnology is the production, analysis and application of structures, molecular materials, internal interfaces and surfaces with critical dimensions or manufacturing tolerances of a few until approximately one hundred nanometer.” (Wiedenhofer 2002. 8). NANONET Styria was founded in 2001 and is based on three pillars: industry, science and research and the province of Styria. It focuses the relevant interests and is active to establish a long term sustainable rooting of Nanotechnology in Styria. It is constituted by 20 private enterprises and 24 (publicly funded) research institutes and will need not only continuing funding of more than 10 million euro for the next years, but also access to human capital and additional industry partners for collaboration.

2.3 Steering instrument

The traditional view to finance research proposals is still determined by the mechanistic model of an organization as a machine. It assumes the investment of financial resources into a more or less linear project structure with clear defined milestones and specified outputs. This is no longer justified, as knowledge and expertise flow freely and organizational boundaries blur. Experts who are formally working for a given entity meet and exchange ideas with colleagues from other entities and during these interactions of the community of practice, break troughs happen. Who benefits from these discussions? Who is able to fund the resulting background research to support the new hypothesis? Who has the technological capacity to run the experiments? Who provides for lead customers to test the innovation?

The answers to these questions lie in the network, which acts more like a living organism with several non-linear relations than like a machine with clear defined processes. This observation is not new (see March & Simon, 1958 or Luhmann, 1976), and yet, there are few mechanisms incorporated into allocation schemes that take them into account. More appropriate management concepts are available such as Sensitivity Analysis (Vester 1980) or System Theory (Senge 1990) and will be discussed in the next chapter in detail. Both take into account the many interdependencies within a given system or network and offer some advice on how to achieve strategic targets.

There are a few requirements for a strategic steering instrument to be met in order to support the above outlined decision processes:

- Involvement of stakeholders: In order to minimize internal frictions and to secure efficient self regulation, the most important players within the network need to share a basic understanding of how the system works. Additionally, their involvement secures the benefit of higher accuracy of the system definition, as only the experts themselves know about the true consequences of their actions.
- Transparency: There should be an opportunity to identify how interactions are affecting the network and what consequences are related to individual actions. Transparency thus allows the application of sophisticated approaches to intervene in a system and achieve optimal productivity of resources.
- Usability: As tangible sources are already scarce and time of research personnel is very limited, experts are not very keen to invest their time into pure management processes. Thus, intuitive understanding and reliable feedback of the contribution of their daily routines to the overall strategy are important.
- Acceptance of results: As one of the prime motivations to develop a steering instrument is to allocate resources, it happens that some part of the networks will be denied their proposals. Given the fulfillment of the above requirements of involvement, transparency and usability, the likelihood of accepting a negative decision without causing major negative effects rises.

An obvious effect relates to the over all network management. Improved transparency and access to detailed data of interdependencies allow for planning and controlling, which are the generic functions of a steering instrument.

3 Methods and Models

To design a steering instrument for research networks, established methodologies and models from two so far independent domains are integrated. The Intellectual Capital framework helps to improve transparency on intangible assets. System Theory models allow to investigate interdependencies of factors and variables and derive management decisions according to a defined set of strategies.

3.1 Intellectual Capital Framework

Intellectual Capital (IC) Reporting represents an approach that can be used to measure intangible assets and to describe the results of the company's knowledge-based activities. When talking about the methodology of IC Reporting, several competing approaches are available with the common attribute of lacking a generally approved framework. There are several bottom-up approaches and models quoted in the literature, ranging from indicator-based ones (Sveiby, 1997, Edvinsson et al, 1997, Roos et al, 1998, Stewart, 1997), derived from managerial information systems and performance monitoring instruments such as the Balanced Scorecard (Kaplan and Norton, 1996) or the EFQM model, to monetary oriented solutions (Lev, 2000) in search of the exact amount of money representing the intangible assets and concepts to measure knowledge flow (Reinhardt, 2003).

Because of the huge amount of intangible investments in a research network, IC Reporting promises to be a useful instrument for research organisations, too (Bornemann & Leitner, 2001). As the first European Research Technology Organisation (RTO) the Austrian Research Centers (ARC) implemented and published four IC Reports in a row for the business years 1999 to 2002. The model already serves as framework for universities (Leitner, 2001). In the following, it will be adapted to the needs of a research network.

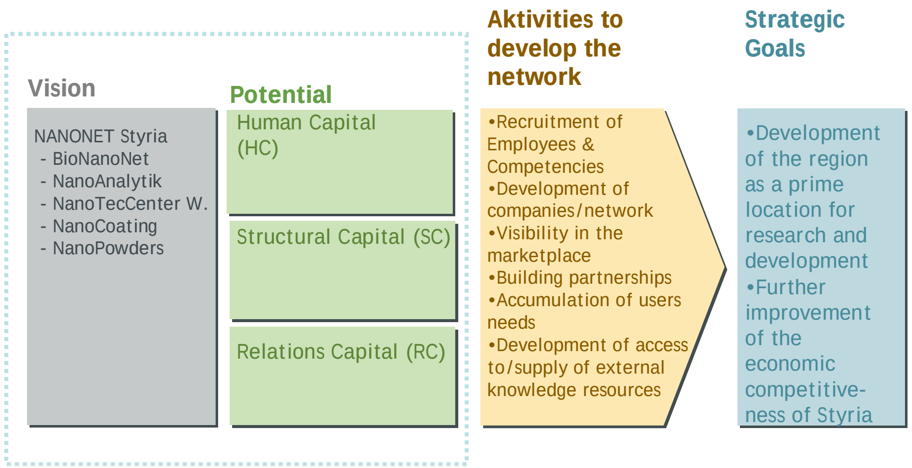

Fig. 1. Model for IC Reporting in Research Networks adapted from ARC 1999

Human Capital (HC), Structural Capital (SC) and Relational Capital represent the Intellectual Capital (IC) of a system – or more specific in this case – a research network. IC represents the available intangible resources or value creating potential. It is used to support the processes necessary to achieve the strategic goals. Several knowledge intense activities were identified and systematized by the "Danish Guidelines" (2003) and adopted for this model. The already in the ARC (1999) identified feedback loops of knowledge, which simultaneously is input and output of knowledge processes, is of special relevance in the system analysis.

So far, the process models suggested more or less linear relations between value adding potentials (IC), value creating processes and results. This serves as a good approximation, but ignores the interdependencies of elements of IC. The reason is the already mentioned attribute of knowledge or IC as input and output. This needs further investigation, which can be conducted with some methodology from System Theory.

3.2 System Theory Framework

Frederic Vester (1980) conducted vast research in the area of System Theory and Cybernetics and developed the concept of Sensitivity Analysis. There is a well-documented sample of cases and projects available on his Website www.frederic-vester.de – thus we refrain from a complete review of the methodology. Similar ideas were published a few years later by Senge (1995) and became widely known as organizational learning. The Sensitivity Analysis was adopted and refined by Gomez & Probst (1995) for strategy implementation and scenario planning and is now tested and applied for developing a steering instrument based on intangible assets. These ideas are elaborated in the following paragraphs on the case of NANONET Styria, but there is no limitation of the methodology to research networks.

3.3 8 steps to develop and implement an Intellectual Capital Statement as a steering instrument:

In the following paragraphs the major steps to define and implement a steering instrument are illustrated by the example of NANONET Styria, where the approach was tested in 2003 and nominated for further applications in another research network (NOEST). A similar project was successfully implemented in the industrial context of a production company Bohler-Uddeholm AG (Sammer et al, 2003) and serves as a benchmark.

1. Definition of the system (limitations) and players

In order to set up intervention mechanisms for a fuzzy concept like a network, system boundaries need to be defined at least to a liberal extend. Without any meaning and purpose, a network is little more than an accidental agglomeration of actors.

For the NANONET Styria, the system definition was available in the outline of the position paper (Wiedenhofer, 2001) that covers the following fife domains of research:

- NanoCoating Center Leoben/Niklasdorf
- NanoTecCenter Weiz
- NanoPowders Styria
- BioNanoNet Graz
- Nanoanalytic Styria

The network was defined to be bound to the regional borders of Styria, even though it can be argued that several relevant partners for some topics are outside this area. The remaining actors are listed and differentiated into industrial partners with economic interests and research institutions with primarily scientific or applied research interests. Several experts are member of more than one network domain and thus serve as multipliers and channels for communication. This is of particular relevance, as it is a central motivation of this instrument to foster self-regulation of the network.

2. Development of strategic priorities and deduction of knowledge goals

After a formal kick off meeting and the development of channels of communication via the network coordinators, the strategic priorities were discussed. Of special relevance were the hereby identified still remaining conflicting long-term ambitions. NANONET Styria paid special attention to identify very clear specifications for a common research agenda to avoid conflict and to optimally use available productivity reserves. However, a few problematic areas can never be completely ironed out and need at least agreement of the existing conflicts.

The overall strategic target of NANONET is to position the region effectively as a player in the field of Nano Sciences and Nano Technology. This shall be achieved until 2007 with massive financial commitments of all stakeholders involved, including structural aid of the European Union framework programs.

The overall target is flexible enough to allow for various smaller initiatives. Each follows its own agenda quite independently. However, there are several issues that would still benefit from a joint strategy. Attracting young researchers as a brain pool and financial resources are among the obvious benefits, marketing and public relations to a certain extend. However, there are more complicated dependencies that have their roots in scientific differentiation. Analytical services and methodologies for example are useful to most of the other domains, but in turn need varying challenges to identify new innovations or applications.

Of special importance was the positioning of the public funding authority, which needed to commit long-term access to funding sources in order to support the scientific and technological ambitions. The research strategy of Styria served as guideline for these definitions.

3. Collection of influencing factors and aggregation to drivers

A top down approach was selected to identify influencing factors to optimally support the strategy. With open questions, structured to the above outlined model, such as "What, according to your experience, influences human capital to achieve the specified strategic targets?" a set of more than 450 factors were identified by more than 80 experts in a series of workshops.

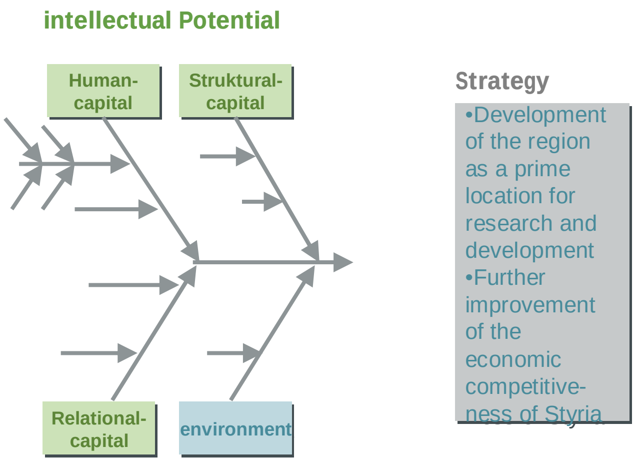

Fig. 2. Collection of factors of influence

Ishikawa diagrams or flow charts (see Fig. 2) serve to visualize influencing factors and indicators to measure their impact on the system. The influencing factors were differentiated into three categories (see Schneider, 1999; Reinhardt, 2003):

- *Flow dimensions* cover the process aspect of intangibles

- *Stock dimensions* cover the object aspect of intangibles

- *Contribution to the strategy* i.e. to what extend were strategic targets accomplished.

4. Definition of driving factors and review

After collecting factors of influence and thus creating a shared awareness for intangibles as a relevant and already widely available, but still untapped productivity reserve, the huge variety needed consolidation into just a few driving forces. For simultaneous cognitive presence, average managers can only handle a very limited number of factors. As a rough estimate, this number is around seven, thus imposing severe limitations to the spectrum of driving forces.

Vester showed that only a few intelligently chosen parameters are sufficient to provide a reliable model for the extremely complex reality. He came up with a number smaller than 18. Thus, for each of the IC categories (HC, SC, RC) 3 to 4 drivers were defined and reviewed by the network players. This proved to be a very time consuming process but is nevertheless necessary to create the required shared understanding and shared language for intangibles.

5. Sensitivity Analysis – cause and effect patterns – impact intensity

The sensitivity analysis relates each of the finally identified drivers to all the others. With the means of a systematic cause-and-effect analysis, the foundation for the sensitivity model is developed. In a table (Fig. 3.), the impact of each factor on all others within the system is evaluated on a scale form zero (no impact) to three (very strong impact).

Wirkung ▸																			AS
Ursache ▾		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	0	
Ausreichende Anzahl des Personals	1	●	0	1	1	1	2	1	1	0	2	1	2	1	2	1	2	1	18,00
ausgewogene Struktur des Personals	2	0	●	2	2	2	1	2	1	0	2	1	2	2	3	2	2	2	24,00
hohe Kompetenzen im relevanten Bereich (Kompetenzprofil)	3	1	1	●	3	2	0	2	2	3	2	1	3	2	3	2	3	3	30,00
strategisch orientierte Weiterentwicklung der Wissensbasis	4	2	2	3	●	2	1	0	1	3	2	1	3	1	3	2	3	4	29,00
gemeinsame Weiterentwicklung von Visionen und Zielen	5	0	1	1	2	●	0	0	1	0	2	1	2	1	2	1	1	5	15,00
Flexible Formen der Forschungsarbeit	6	1	1	2	1	1	●	0	2	0	1	0	2	2	1	1	1	6	16,00
Professionelles Management des Netzwerkes	7	1	1	2	2	3	1	●	2	3	2	2	2	2	3	2	3	7	31,00
gemeinsame Nutzung von Grundlagenwissen, Methoden & Infrastr	8	0	0	1	2	2	0	0	●	2	1	2	2	0	2	3	2	8	19,00
Konzepte für die Verwertung und Nutzung von IPR	9	0	0	0	3	0	0	0	2	●	1	2	1	0	2	0	0	9	11,00
strategische Weiterentwicklung der Infrastruktur	10	1	2	2	2	0	1	0	2	0	●	1	1	1	2	2	3	10	20,00
gemeinsame Öffentlichkeitsarbeit	11	1	0	0	0	0	0	0	0	0	2	●	2	3	2	2	2	11	14,00
Kontakte / Schnittstellen zu Industrie und Forschern	12	1	0	2	2	0	2	0	2	1	2	1	●	1	2	2	3	12	21,00
Kundenorientierung	13	0	2	2	2	2	1	1	0	2	2	2	1	●	1	3	3	13	24,00
Erfüllung der Vision "NanoPowder Styria"	14	0	0	0	0	0	0	0	0	0	0	0	0	0	●	3	3	14	6,00
Stärkung der regionalen Wirtschaft / des Standortes „Steiermark“	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	0	15	0,00
Stärkung des Wissenschafts- und Forschungsstandortes Steiermark	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	●	16	0,00
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
PS		8	10	18	22	15	9	6	16	14	21	15	23	16	28	26	31		

Intensity of influence :0 ... no impact, 1 ... weak impact, 2 ... medium (proportional), 3 ... strong impact

Fig. 3. Impact analysis of driving forces according to Vester 1980

It proved to be extremely important to involve as many members of the network as possible in the discussion process of valuing the interdependent impact. Sometimes, there are extreme differences in perception of relations, and only the search for consensus yields the desired shared understanding of mental models. This dialogue changes the behaviour of network members much more effectively than any presentation of just the refined result. The reason is simple: the matrix in Fig. 3 covers 13 drivers that affect three dimensions of results and thus create more than 120 different perspectives on the system. These iterations force to think systematically and create new mental models and understanding.

Alternatively, if the burden of organizing a joint meeting for aligning the valuations could not be conquered, the resulting micro perspectives do not reflect the accurate status of the system. This could be demonstrated in a separate case study of Bohler-Uddeholm (Sammer et al 2003).

6. Visualization of the network and identification of spirals of growth

The evaluation in the matrix of step 5 serves as input for the visualization of the sensitivity model. Fig 4 represents all drivers identified as the most important for achieving the over all strategic priorities. The system connects to the two targets "Development of the region as a prime location for research and development" (F) and "Further improvement of the economic competitiveness of Styria" (W) via the network vision (V). Feedback loops from the vision to the main drivers are not yet considered, as this would add the dimension of time. However, it is possible to include the delays of influence into the model (see Gomez & Probst, 2003).

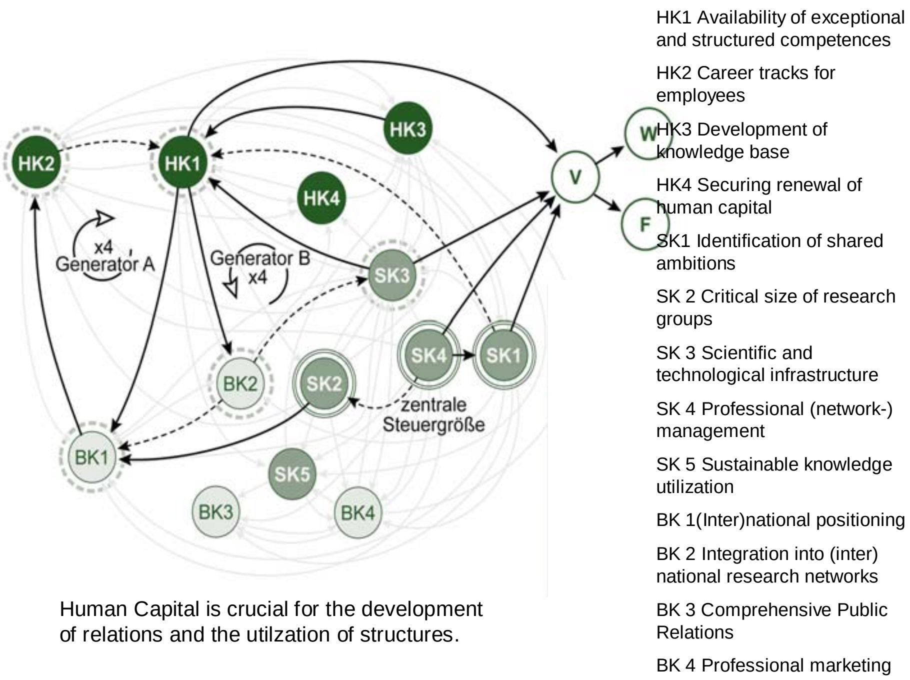

Fig. 4. Sensitivity Model of NANONET Styria

The sensitivity model of NANONET Styria as presented in Fig. 4 consists of driving forces of the established dimensions of Intellectual Capital. The connections are differentiated according to the impact associated in the evaluation matrix in Fig. 3. At least two spirals of growth or "generators" can be identified as a result to the strong stimulation of several factors for the network. They are marked as Generator A and B, and describe strong positive impacts of Human Capital (HK1) to Relational Capital (BK2). The momentum is forwarded to Structural Capital (SK3) and from there accelerates again to Human Capital (HK1). These Generators represent the power sources of the whole system. According to principles of system dynamics, intervention to improve the expression of these drivers has the highest impact to the system and thus offers the most efficient investment. The generators are – according to Vester (1980) – optimally influenced by drivers that are relatively independent from the system (low passive values) but still connect strong to the network.

So far, the fundamentals of the steering instrument are developed. There is improved transparency of the so far hidden black box of the interdependencies of the drivers, which are not contributing linearly to the strategic targets but effect the system by several feedback loops and spirals of growth. Identifying these spirals as well as the elements to manipulate them improves the efficiency of resources spent considerably. The worst case scenario results from spending major parts of the resources into buffering factors with little growth impact.

In the case of NANONET Styria, development of critical size of research groups (SK2) has a stronger immediate impact on the system performance than e.g. improving public relations (BK3). This is not against intuitive understanding and hence supports acceptance within the network members.

7. Self assessment of the status quo within several parts of the network – quality and quantity

A sound understanding of the interactions and interdependencies of driving forces within a defined system is a good start, but not enough for reasonable management intervention. Thus an analysis of the status quo and – if possible – the desired level of the expression of IC drivers is the next step.

Following the so far successfully used approach of integrating the network actors, the valuation of the drivers relies upon self-assessment of the experts. This is done via a survey asking for qualitative and quantitative data related to the drivers of IC on a scale from zero to four. Zero, obviously means no or very little activity, while four represent internationally comparable levels of accomplishment. For some variables, this differentiation is not appropriate and thus limited to actual status quo. To support and justify the accuracy of the assessment, the experts provided indicators as well as narrative explanations.

To secure a shared understanding of the data, as well as to collect ideas and strategies to improve some of the less developed drivers, these data were discussed in workshops.

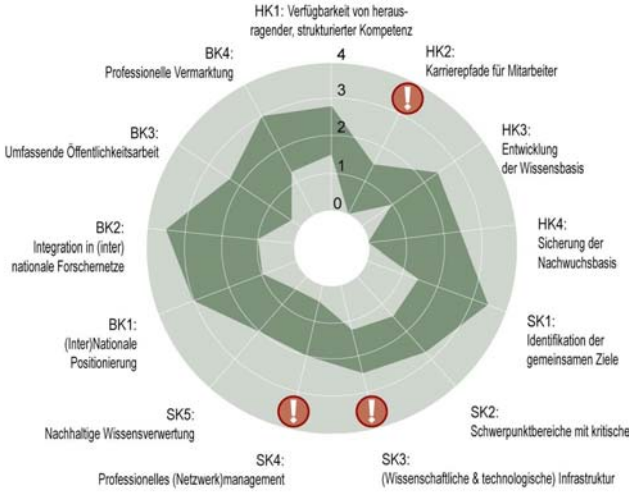

Fig. 5. Assessment of driving forces of NANONET Styria

Fig. 5 represents the results of the valuation. There is a spectrum of values for each of the IC drivers, depending on the positioning of the research group. Clearly, industry oriented groups have different profiles than those oriented to basic research. However, for management intervention three hot spots emerge.

8. Definition of measures to optimally use available resources

Confronted with this new perspective on the interdependencies within the network, measures to further improve the network are relatively easy to identify. In the case of NANONET Styria, special emphasis is put on human capital as well as the development of structural capital.

4 Results

The above outlined eight steps to develop a steering instrument are relative simple to implement and yield immediate returns due to improved transparency of system interactions, a shared awareness, and language of the knowledge base within the network and shared mental models, how a limited set of drivers connects to support the strategic targets. With the case of NANONET Styria, prove of concept is available. However, the concept still needs some work to reduce the costs. There are a few lessons learned from implementing this model into the NANONET Styria:

- Time: In terms of time, the development of dimensions and drivers of IC and the assessment of the measures proved to be very efficient. The initial hesitant motivation to participate in the workshop series vaporized as soon as the first results became visible.
- Commitment: The team based approach integrates many if not all parts of the network. Hence it allows for several perspectives of opinion and – as a result from the discussions – a balanced view of the system interactions.
- Consequences: Apart from the intended effects in term of development of a new shared language about knowledge and shared mental model about the effects of knowledge within the system, the whole network benefits from deeper integration and better alignment of procedures thanks to higher levels of trust and mutual understanding. This parallels with high motivation and supports sense making among the extreme variety of highly specialized experts.

The improved transparency allows for higher readiness to accept the outcomes of internal decisions and supports quick response times and efficient self regulation. Thus, regarding the long-term ambitions of the network, competitive advantages might be generated in comparison to networks without such an experience.

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