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Measuring Gains in Organisational Knowledge and Competence

Introducing IndiGO - Indicators of Gains in Organisational Competence

INDIGO
Indicators of Gains in Organisational Competence

Introduction

In this paper, a method for assessing gains in knowledge and competence on organisational – as opposed to individual – level is introduced; this method is called IndiGO: Indicators of Gains in Organisational Competence.

Organisational knowledge and competence are crucial for any policies aiming at improving the innovative ability of organisations, especially industrial organisations (companies). To evaluate such policies and according programmes, it is desirable to use theory-based, but practically applicable and pragmatic instruments. The work described here is intended to contribute to this desideratum.

In the following chapter, the theoretical background for the methodology is discussed. Chapter 3 contains a detailed description of the methodology, and chapter 4 provides exemplary data. In the final chapter, conclusions are drawn and issues for further action are discussed.

The theoretical background

As a first step, it is necessary to identify a suitable theoretical framework linking individual learning to organisational learning and, finally, innovation.

A seminal work in this domain is the concept of absorptive capacity, proposed by Cohen and Levinthal in their article on "Absorptive Capacity: A New Perspective on Learning and Innovation" (Cohen & Levinthal, 1990).

Absorptive capacity is one of the most crucial aspects of an organisation´s innovative ability. Cohen and Levinthal describe absorptive capacity as the "ability to recognize the value of new information, assimilate it, and apply it to commercial ends (op. cit., p. 128)".

Absorptive capacity in this original meaning refers to the organisation´s general ability to use external information and opportunities (e.g. new technologies, or new forms of organisation) for its own innovative purposes.

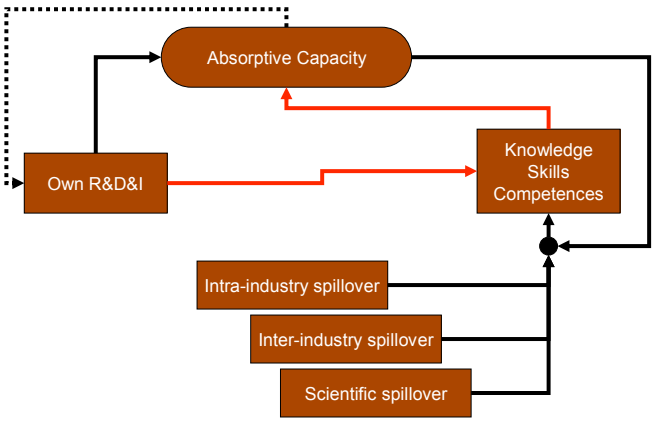

Figure 1: Absorptive Capacity and sources for organisations´ technical knowledge (modified from Cohen & Levinthal, 1990, p. 141)

Figure 1 shows the relations between absorptive capacity, external knowledge, own research, development and innovation (R&D&I) activities of the company in question, and knowledge, skills and competence within the company[1]. The absorptive capacity of an organisation determines, as said before, to which extend it is able to recognise and use external information, be it relevant knowledge from the same industry (intra-industry spillover), from other industries (inter-industry spillover) or from scientific research (science spillover).

1 In the original article, the term 'technical knowledge' is used. From today´s perspective, this concept is much to narrow, also taking in account Cohen´s and Levinthal´s own argumentation, relying heavily on 'learning to learn' abilities, which today would rather be coined as 'competences', in the sense as defined by Erpenbeck & Heyse (2007).

The absorptive capacity itself is determined by the level of relevant knowledge, skills, and competence (KSC) in the organisation. This does not only refer to specialised 'gatekeepers' watching external developments, but ultimately to all kinds of personnel affected by these innovations:

"Even when a gatekeeper is important, his or her individual absorptive capacity does not constitute the absorptive capacity of his or her unit within the firm. The ease or difficulty of the internal communication process and, in turn, the level of organizational absorptive capacity are not only a function of the gatekeeper's capabilities, but also of the expertise of those individuals to whom the gatekeeper is transmitting the information. Therefore, relying on a small set of technological gatekeepers may not be sufficient; the group as a whole must have some level of relevant background knowledge, and when knowledge structures are highly differentiated, the requisite level of background may be rather high." (Cohen & Levinthal 1990, p.132)

Absorptive capacity also stimulates own R&D&I activities within the company, which in turn has a positive effect on absorptive capacity, and, in a positive feedback loop, on own R&D&I. Another positive feedback loop concerns interdependencies between absorptive capacity and KSC development: The higher the absorptive capacity, the higher – mediated by R&D&I activities – learning potentials building up expertise (KSC), and high levels of KSC again boosting absorptive capacity. These positive feedback loops can constitute spiralling up and spiralling down dynamics in organisational innovative ability: The more innovative ability there is, the easier is further development in innovative ability, and conversely, the less innovative ability, the harder – and more unlikely – are gains in innovative ability.

To assess the impact of interventions on the innovative ability of organisations, some concepts from research on intellectual capital have proven to be useful. A common distinction between concepts relating to intellectual capital refers to three classes of phenomena (Alwert, 2005; Steward, 1998):

- Human capital: The knowledge, skills, competences, motivation and other performance-related properties of the members of an organisation.
- Structural capital: The organisational structures and processes allowing the sustained operation and innovation of the organisation.
- Relational capital: Relations to all relevant groups outside of the organisation, like stakeholders, customers, suppliers, associations etc.

Human capital	**Structural capital**	**Relational capital**
Domain-related knowledge and skills	Corporate culture	Relations to customers
Practical experience	Cooperation and communication within the organisation	Relations to suppliers
Social competences	Equipment regarding information technology, software, and other technological systems	Relations to investors / shareholders
Motivation	Knowledge transfer and storage	External cooperation with educational institutions
Leadership skills	R&D for product innovation	External knowledge acquisition
Corporate education and Personnel development[2]	R&D for process innovation	Engagement in Associations, Engagement in Corporate Social Responsibility (CSR)
	Structural organisation	Image / Brand
	Process organisation	

Table 1: Human, structural and relational capital as determinants of innovative ability (modified from Alwert, 2005, p. 23)

2 Corporate education and personnel development is in itself no aspect of human capital, but rather of structural capital, as it refers to organisational structures and processes, rather then individual properties. But as these activities are geared towards maintaining and developing human capital, they are put here in the left column.

These three aspects of intellectual capital may also be regarded as dimensions of organisational competence and innovative ability, or absorptive capacity. The more an organisation is tuned towards maintaining, identifying, internalising and developing knowledge with respect to its employees, the organisation itself, and the networks the organisation is part of, the more it is able to use this knowledge in generating innovation (Mertins et al., 2008). Conversely, research and development for product and process innovation are important aspects of structural capital (cf. Table 1).

INDIGO

Indicators of Gains in Organisational Competence

In the development of the tool for assessing impacts on knowledge gains on organisational level, it was specifically emphasised that the tool should be generally usable for any kind of intervention which might have an effect on organisational knowledge and competence. Examples of possible interventions within this scope are:

- Traditional (vocational) education and training programmes
- Organisational development programmes
- Knowledge management programmes
- Programmes focusing on the cooperation between companies (especially SMEs) and education and research institutions
- Cluster policies

The concept of human, structural, and relational capital as components of intellectual capital – as proposed by Alwert (2005) – was used as a framework for the development of this tool. Table 1 shows the specific elements of human, structural, and relational capital. On the basis of this table of elements, items were generated for a questionnaire. For all these elements (e.g., domain-related knowledge and skills, product innovation, external knowledge acquisition), a set of questions was generated, in each case following the same structure, as detailed below:

- Before the project, was any effect expected regarding "…". (e.g. domain-related knowledge and skills, or any other element from Table 1.)
- If yes, how was the expected magnitude of the effect (to be rated on a scale from 0 to 3, as indicated in Table 2).
- How was the magnitude of the effect actually observed (to be rated on a scale from -3 to +3[3], as indicated in Table 3).
- Please describe the actual effect! (qualitative description)
- Is any effect expected for the future? If yes, which effect? (qualitative description)
- Was the actual effect a single occurrence or a more sustainable impact, enduring over some time?
- Besides the employee immediately involved in the project, were there any effects on other employees, or departments of your organisation? If yes, how was the magnitude of these effects? (to be rated separately for other employees and other departments on a scale similar to the one shown in Table 3)
- If yes, please describe this/these effect(s) on other employees / other departments! (qualitative description)

No effect	Small effect	Medium effect	Big effect
0	1	2	3[4]

Table 2: Scale for assessing expected effects

Negative effect				Positive effect		
big	medium	small	no effect	small	medium	big
-3	-2	-1	0	1	2	3

Table 3: Scale for assessing actual effects

In the exploration and development phase, the tool was devised as a face-to-face interview. Meanwhile, it has been transformed into a CATI[5] questionnaire. An online questionnaire was also considered as a design variant, but was discarded regarding the complexity of the questions, and the intended target group (SMEs).

3 The negative part of the scale was introduced to allow for the possibility of detrimental effects of the respective projects; in practice, no such negative effects were observed until the time of writing (June 2010).

4 A ‚big' effect was defined as the maximum effect to be reasonably expected from an intervention of this kind. As examples, the effects of a one-day workshop – even if perfectly designed – should be small compared to the effects of a three-year R&D project. So, effects of one-day workshops (or three-year R&D projects) should be assessed relative to what might be reasonably expected from a 'perfect' one-day workshop (or three-year R&D project, respectively).

5 Computer Assisted Telephone Interview

The interview partner is a representative of the cooperating company, usually on some managerial or executive level. The person should be close enough to the project to be able to assess it and its effects, but should not have been directly involved; specifically, the interviewee must not be the practice supervisor of the student or junior researcher, respectively. Usually, the interviewee is the immediate superior of the practice supervisor. In SMEs, this is frequently the CEO of the company.

Exemplary results

In the following, a preliminary and exemplary analysis of IndiGO interview data for 'Forschungsassistenz' and 'Exzellenztandem' projects is presented.

The programmes 'Forschungsassistenz (Research Assistance)' and 'Exzellenztandem' (Excellence Tandem) at Beuth Hochschule für Technik – University of Applied Sciences in Berlin[6]. are funded by the Berlin Senate Department for Economics, Technology, and Women´s Issues, supported by the European Social Fund (ESF).

In 'Forschungsassistenz', a junior scientist cooperates in a practice-related research project with a company, usually a small or medium sized enterprise (SME). The junior scientist is jointly supervised by a professor and a practice supervisor at the company.

The other programme, 'Exzellenztandem' is similar, but in this case, it is a student performing his or her final thesis (Bachelor or Diploma thesis), rather than a junior scientist. As in 'Forschungsassistenz', however, the student is jointly supervised by a professor and a practice supervisor.

It should be kept in mind that these data serve only illustrative purposes. The data are based on fifteen interviews conducted during the exploration and design phase of the tool. These results are shown here because they provide some illustration as to how future analyses of knowledge gains on organisational level brought about by various interventions might look like. Thus, all following discussions of these data need to be regarded as preliminary and hypothetical, or rather hypotheses-generating.

Furthermore, it might seem peculiar that only a few of the impact dimensions (intellectual capital dimensions) tend to score high in the graphs presented in the following. Here, it has to be kept in mind that the impact assessment tool for organisational knowledge gains is designed to be applicable across a broad range of interventions and programmes. Each of these programmes will be designed for different sets of impacts. Thus, the selectivity of the impacts to be discussed below reflects the planned selectivity of the programmes under consideration.

Figure 2 shows data regarding effects of 'Forschungsassistenz' and 'Exzellenztandem' projects on human capital. To interpret these data, two aspects should be considered. Firstly, although the organisational level is at the focus of the overall analysis, gains in knowledge and competence on the individual level are also important for the organisation. Thus, they are covered here.

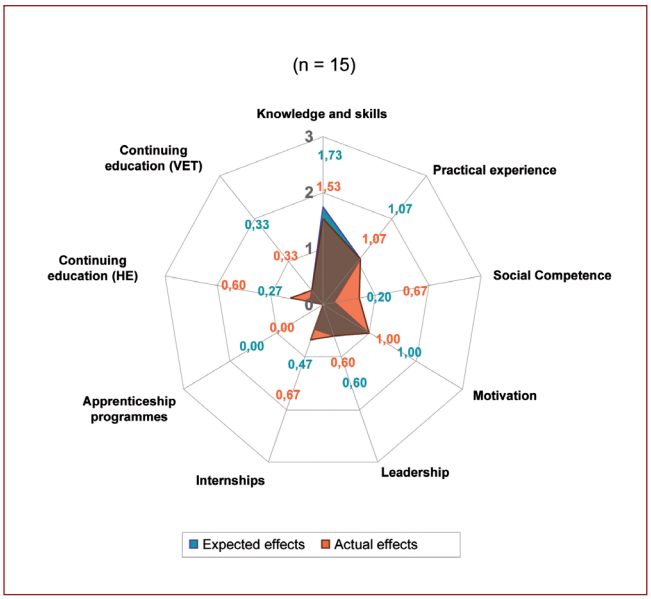

Figure 2: Effects on human capital (Preliminary data for illustration purposes only, n=15)

Secondly, all effects on individual level refer to the practice supervisor of the student or junior researcher, respectively, because it is knowledge gains on the company side that are in focus here. These effects do not refer to the students and junior researchers themselves. In most cases, the impacts – knowledge gains – would be much higher for the students and junior scientists, as compared to their practice supervisors.

Figure 2 shows data regarding expected effects in blue, and regarding actual effects in red. Generally, it is obvious from the graph that actual effects tend to be higher than expected effects. Surprisingly, the impact on knowledge and skills – of the in-company practice supervisor – are lower than expected, although still roughly of medium size. This might be – as a hypothesis – explained with a ceiling effect: The supervisors will usually have been

6 www.beuth-hochschule.de/forschungsassistenz
www.beuth-hochschule.de/exzellenztandem

academically educated people, often with significant R&D experience. On the other hand, it is surprising that the effects regarding practical experience tend to be higher than expected. One explanation might be that the projects were successfully geared towards the company´s needs, and the relevant fields of practice. Also surprisingly high is the impact on social competence, which might be explained referring to the challenge to mediate between academic and industrial environments, including the respective habits, implicit codes of conduct, and, generally, cultures. Finally, the peak in the dimension 'internships' indicated that the companies tend to continue internship-like projects, based on good experiences from 'Forschungsassistenz' and 'Exzellenztandem'.

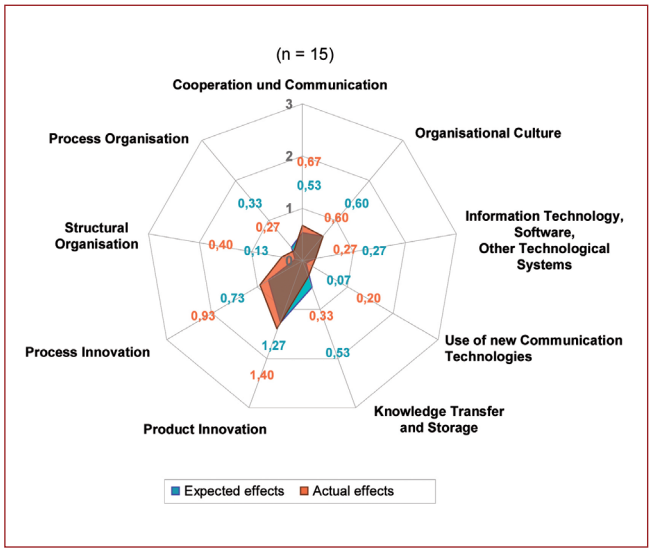

Figure 3: Effects on structural capital (Preliminary data for illustration purposes only, n=15)

The actual effects on structural capital also tend to be higher than the respective expected effects (Figure 3). Interestingly, and most important regarding the core issues of this paper, the main impacts are in the innovation domain. Whereas the score for actual product innovation is higher (predictably, because this was one main intention of the 'Forschungsassistenz' and
'Exzellenztandem' projects), the difference between expected and actual effects is much bigger for process innovation, indicating significant effects beyond expectations. It should be noted that the interviews yield not only abstract ratings of effects, but also qualitative descriptions of the specific innovations achieved, allowing some internal validation of these impacts.
Figure 4 finally shows effects on relational capital. The researchers had, before the interviews, merely expected effects on cooperation between industry and higher education, and – closely related – on external knowledge generation from the perspective

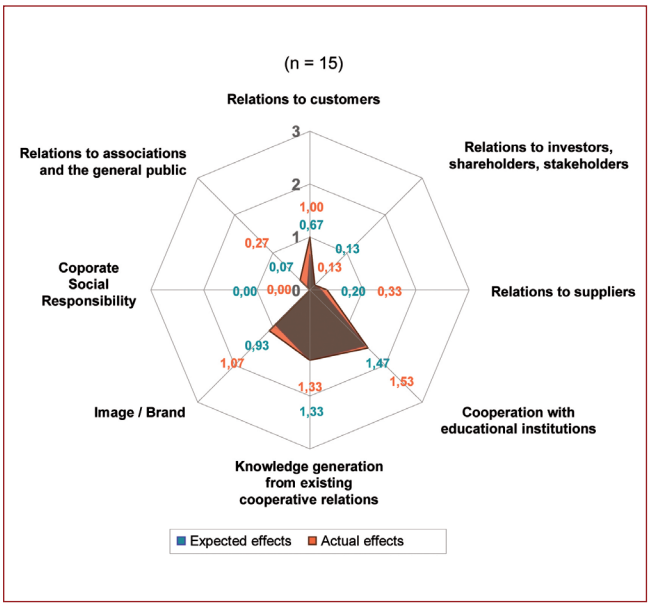

Figure 4: Effects on relational capital (Preliminary data for illustration purposes only, n=15)

of the companies. Both impacts actually emerged (although less expected by the companies), but there was also – as expected by the companies – some effect on the image of the company and the reputation of the respective brand(s). As an example, some of the companies presented results of the research projects at industry fairs, thus promoting their image as innovators.

Conclusions and Discussion

A theory-based and pragmatic tool – IndiGO – for assessing gains in organisational knowledge and competence has been developed and exemplary applied in the context of investigating effects of interventions within funded programmes.

The applicability of the methodology could be demonstrated. The preliminary results suggest that specific intended effects of the programmes are reflected in the structure of the instrument and in the – preliminary – results.

For the future, it is desirable to collect more data from the programmes mentioned here to substantiate the preliminary results.

Furthermore, systematic comparisons between different types of interventions are desirable to explore the potential uses of this instrument.

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