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The Innovation Mode of Doing, Using and Interacting: Learning within Regions

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Joachim Lange

Vorwort

Innovationen sind zentral für die Dynamik der wirtschaftlichen Entwicklung, sie können aber ebenso den Weg zu größerer Nachhaltigkeit bereiten und gesellschaftlichen Zielen dienen. Während die öffentliche Wahrnehmung dazu tendiert, Innovationen als wissenschaftsbasiert und technologieorientiert wahrzunehmen, spielen auch informelle Austausch-, Anwendungs- und Lernprozesse eine wichtige Rolle im Innovationprozess. Diese Art der Innovation ist insbesondere für Kleine und mittlere Unternehmen von Bedeutung, denen gerade in Deutschland eine große Bedeutung im Wirtschaftsprozess zukommt.

Doch liegt es in der Natur dieser oft informellen Prozesse, dass sie schwerer zu erfassen sind und daher in der innovationspolitischen Debatte oft nicht hinreichend berücksichtigt werden.

Um diese Innovationsprozesse und die Möglichkeiten ihrer Erfassung und stärkeren Berücksichtigung in der Innovationspolitik näher zu untersuchen, veranstaltete die Evangelische Akademie Loccum gemeinsam mit den Universitäten Göttingen, Hannover und Jena im Rahmen deren BMBF-Projektes „InDUI – Innovationsindikatorik für den Doing-Using-Interacting-Mode von KMU“ im März 2021 eine Tagung, die aufgrund der COVID-19-Epidemie als Online-Veranstaltung durchgeführt wurde. Dies ermöglichte auch in diesen schwierigen Zeiten die Mitwirkung der zahlreichen internationalen Mitwirkenden.

Der vorliegende Band enthält eine kurze Einführung in das Konzept des Doing-Using-Interacting-Modus der Innovation, einen Tagungsbericht und weiterführende Schlussfolgerungen für die Innovationspolitik. Allen, die am

Zustandekommen der Tagung und der Entstehung des vorliegenden Bandes mitgewirkt haben, sei an dieser Stelle für ihr Engagement und ihre Kooperationsbereitschaft herzlich gedankt.

Loccum im März 2021

Harm Alhusen, Philipp Bäumle, Kilian Bizer,
Uwe Cantner und Rolf Sternberg

Einleitung

Der Doing-Using-Interacting-Modus der Innovationstätigkeit und seine Bedeutung für Kleine und mittlere Unternehmen

Kleine und mittlere Unternehmen (KMU) sind ein zentraler Bestandteil des deutschen Mittelstands und tragen mit ihrer Innovationstätigkeit zur Leistungsfähigkeit der deutschen Wirtschaft bei. Dabei basiert die Innovationsfähigkeit von KMU oftmals nicht auf formalisierter Forschung und Entwicklung (F&E), sondern stattdessen auf informellen Lernprozessen innerhalb der Unternehmen und mit externen Akteuren. Für dieses Innovationsmodell werden in der Literatur die drei Prozesse „learning by doing – using – interacting (DUI)" diskutiert.

Der DUI-Modus zeichnet sich durch die Nutzung von implizitem Wissen aus. Dieses Wissen wird von Mitarbeitern durch alltägliche Problemlösungen entwickelt, ist nur schwer kodifizierbar und in lokalen Netzwerken verankert. Innovationen entstehen zum einen durch das Lernen aus täglicher Arbeitserfahrung, welches zur Steigerung der Produktionseffizienz und der Verbesserung von betrieblichen Geschäftsprozessen beiträgt (learning-by-doing). Zum anderen entstehen Innovationen im DUI-Modus durch die Nutzung und enge Einbindung externer Wissensquellen wie z.B. Zulieferer, Innovationsberater und Konkurrenten (learning-by-interacting). Der DUI-Modus resultiert v.a. in inkrementellen Innovationen. Der DUI-Modus kann aber durchaus auch neue, oft sehr kundenspezifische Produkte hervorbringen, welche durch die Nutzung und das Feedback externer Anwender verbessert oder entwickelt werden (learning-by-using).

Gleichwohl fehlte bislang in der Forschung ein quantitatives Messkonzept, das die Wirkung und das Vorkommen dieser Lern- und Innovationsprozesse umfassend abbilden kann. Im BMBF-Projekt „InDUI – Innovationsindikatorik für den Doing-Using-Interacting-Mode von KMU" wurde im Rahmen der dreijährigen Laufzeit (2017-2021) ein breites Indikatorenset erarbeitet, das auf einer Serie von Unternehmensinterviews basiert.[1] Mit diesem Messkonzept können Innovationsprozesse in nicht-FuE-intensiven KMU umfassender abgebildet werden.

Die vom 22. bis 23. Februar 2021 gemeinsam mit internationalen Experten aus dem Forschungsfeld durchgeführte Online-Tagung "The Innovation Mode of Doing, Using and Interacting: Learning within Regions" diskutierte vor diesem Hintergrund die Ergebnisse des Projekts und deren Relevanz innerhalb der verschiedenen verwandten Forschungsstränge. Der vorliegende Tagungsband dokumentiert die zentralen Ergebnisse und Thesen der Vorträge und formuliert die Politikimplikationen der Tagung.

[1] Alhusen, H.; Bennat, T.; Bizer, K.; Cantner, U.; Horstmann, E.; Kalthaus, M.; Proeger, T., Sternberg, R.; Töpfer, S. (2021): A New Measurement Conception for the 'Doing-Using-Interacting' Mode of Innovation. In: Research Policy (Vol. 50, Issue 4), doi: https://doi.org/10.1016/j.respol.2021.104214.

Harm Alhusen, Philipp Bäumle, Kilian Bizer,
Uwe Cantner and Rolf Sternberg

Conference Report

The Innovation Mode of Doing, Using and Interacting: Learning within Regions

Session 1: Intra-firm learning processes and the modern theory of the firm

The first session of the conference started with *Jörg Thomä's** paper on *Non-R&D, interactive learning and economic performance: Revisiting innovation in small and medium-sized enterprises.* Focusing on a traditional linear perception of innovation processes leads to an often-cited over-emphasis of traditional R&D activities for innovation. However, several empirical works indicate that DUI-related activities represent a crucial prerequisite for successful SME innovation. Research insights into the "German Mittelstand" – i.e. small and medium-sized firms – show that non-R&D activities provide firms with a nutritious seedbed for more complex innovation processes. In this context, adopting a systemic approach to innovation enables a more efficient incorporation of non-R&D activities and the interplay of various actors in governing SME innovation processes. Hence, promoting DUI-related activities appears promising for two main reasons. First, future STI (science-technology and innovation) activities can be conducted more effectively if the firms have already developed certain DUI competencies as the prerequisite for STI-based innovation. Second, combinatorial innovation modes that incorporate DUI as well as STI approaches have been shown to yield a higher innovation performance at the company level than the ideal type STI mode.

Taking into account the importance of both innovation modes, the development of an effective governance structure naturally includes the search for the appropriate policy mix of harmonized, interlocked instruments. This mix needs to incorporate STI-related components, DUI-related components as well as components that are related to the dynamics between both modes. STI-related components include traditional in-house and cooperative R&D support as well as investments in the external R&D structure. On the other side, DUI-related components include the promotion of organizational innovation and the ability to engage in cooperative endeavors with external partners. Regarding the promotion of STI/DUI dynamics, it holds utmost importance to incorporate different starting points. While a firm currently employing a DUI-centered mode and aiming for a "DUI plus STI mode" requires support to enhance its absorptive capacity and engage in technology transfer activities, a firm coming from an STI-centered mode rather needs support in transforming the results of scientific research in marketable products or services. Supporting mutual dynamics between different modes would require embedding SMEs into a dense inter-organizational innovation network.

In order to incorporate this multitude of policy instruments, several actors at different spatial and political levels need to cooperate and harmonize their activities. First, the different ministries need to coordinate their responsibilities and activities at a supra-regional level. Second, the search for the suitable policy mix needs to be executed at a regional level. STI/DUI dynamics have been shown to be more effective when companies are embedded in strong regional networks. Finally, at the company level, effective DUI mode learning requires a continuous monitoring of potential (regional) partners and a focus on core drivers of employee-driven innovation processes.

In conclusion, policy-makers require far-reaching information on the different modes of innovation among innovating SMEs to develop an effective policy mix for governing SME innovation processes. This governance must be based on a systemic perception of innovation that extends beyond a static approach and enables incorporating multi-directional dynamics regarding SMEs' modes of innovation. Finally, good governance of DUI mode innovation requires the interaction of various actors at different levels.

Natalja Apanasovich's paper dealt with the *DUI mode and firm's performance: Evidence from Belarus.* Post-Soviet innovation systems and their recent transitions represent a unique and interesting case. Emanating from a highly centralized, traditional, and linear innovation approach, a new, progressive and DUI-based innovation mode has arisen during the recent decades. While the former state-led approach remained static and only allowed for pre-defined inter-organizational cooperation processes, the liberalizing transition process meanwhile led to a decentralized and dynamic innovation approach. In contrast to the former traditional Soviet approach towards innovation – which focused on large firms that relied on extensive state subsidies and concentrated on improved product quality in regional markets without being integrated in regional value chains – the emerging technology-based firms focus on technological know-how to keep pace with international competitive dynamics and meet user requirements around the globe. The DUI mode of innovation has been shown to be a crucial driver of this transition as it enabled the formation of a completely new group of post-Soviet entrepreneurial firms that focus on customizing products for international markets.

The historically unique socio-economic framework of post-Soviet innovation systems yields numerous starting points for the further scholarly enquiry of system-level dynamics between a static STI-based and a dynamic, entrepreneurial DUI-based mode of innovation. In this context, the innovation system approach represents a promising starting point: if firms operate at the technological frontier of innovation, they require support in internalizing cutting edge STI elements. On the other hand, companies lagging behind the technological frontier can be expected to require basis DUI mode capabilities to internalize and diffuse external inputs.

Session 2: User-producer relations and the demand-pull concept

The second started with *Uwe Cantner's** paper prepared together with *Martin Kalthaus* and *Stefan Töpfer* on *Innovation by using – Demand side issues in the learning economy.* According to him, demand is a major determinant of

economic and innovative activity. First, customer demand incentivizes firms to innovate, since needs and preferences are revealed. Second, customers can provide knowledge and information to the firm to improve, augment or adapt products and services. In some cases, customers serve as innovators themselves and complement a firm's innovation process. Overall, they are an important source of learning, especially for firms that do not carry out in-house R&D activities. Based on qualitative interviews with firm representatives and regional innovation consultants, insights on the heterogeneous role of customers in the innovation process as well as the processes to capture, redirect, and utilize the knowledge flows from customers.

Firm representatives reveal an ambivalent perspective on the role of customers in innovation activity, ranging from a perspective that customers are not relevant up to a viewpoint where customers are considered to solely determine a firm's innovative activity. On this background, three different kinds of knowledge flows between firms and customers relevant:

1. Customers articulate their demand and thereby reveal their preferences and needs
2. Firms interact with customers and actively search for knowledge and feedback
3. Firms, as passive recipients of feedback, are approached by customers.

Via these flows of knowledge, firms learn about demands and receive knowledge for improvements. These can enrich their innovative activity, in ways such as quality improvements, functional add-ons, or new fields of application. In some cases, firms develop completely new products in order to meet customers' individual needs or suggestions.

A firm, however, in order to effectively search and capture the knowledge from the customers' needs to have respective facilitators in place. Furthermore, the knowledge needs to be re-directed from the recipient, e.g. the sales service, to the respective unit which can utilize the knowledge, e.g. the production department. Hence, proper facilitators are crucial in collecting, re-directing and finally utilizing knowledge flows from customers. That conducted in the right way, firms increase their performance and even establish joint develop-

ment processes with customers and learn from each other, for example in co-development of prototypes or mutual R&D activity.

In conclusion, customers represent a highly relevant source of knowledge and opportunity of learning, which has been addressed by a variety of streams of literature. As yet, however, no systematization of the different forms of learning and the innovation process has been put forward. Based on the conducted interviews juxtaposed with the existing literature a first sketch of such a systematization is put forward containing the different flows of knowledge, the facilitators required in the firm and the innovative outcomes of interaction with customers.

According to *Christina Raasch's** paper on *DUI innovation – A perspective from Open and User Innovation research*, firms are not the only innovators, users – that is, consumers – also play an important role for innovative activity. Such user innovators are innovators who originally do not seek to benefit from innovating by selling their innovation but by using it themselves or within their community. Innovations by such users have been disruptive in many cases. Users tend to freely reveal their innovation-related information to other users as well as firms. However, user innovations tend to be under-diffused – an inefficiency that is ameliorated by the rise of digitization, which changes the costs and benefits of free revealing.

For firms, such user innovations can be of importance. Comparing the processes of creation and diffusion between user and producer innovation processes and their interplay reveals four distinct ways of interaction between them: First, design spillovers from collaborative user innovation and improvement processes can be incorporated into producer R&D processes. Second, producers can support or alter the direction of user innovation processes by providing resources, information, and tools. Third, user and producer innovations can complement each other. Fourth, user and producer innovations can compete in product markets. Understanding and incorporating users' various contributions to firms' innovation processes seems to be a promising avenue for further research. From a microeconomic perspective, it seems self-evident to consider the demand side as a crucial source of innovation. User innovators' rationale to contribute to "knowledge commons" makes them an important

topic for public goods theory. Further theorizing and measurement of the user innovation phenomenon is required, which is underscored by its recent inclusion in the Oslo Manual.

Session 3: Interaction in the region and the concept of regional innovation systems

The third session started with *Arne Isaksen's* paper on *Interaction in the region: the role of regional industrial culture*. The emergence, growth, and innovative outputs of regional clusters are known to depend on a multitude of regional and supra-regional determinants. The concept of *regional industrial culture* incorporates the predominant approach to inter-firm relationships and above firm-level motivation to contribute to regional development processes and innovation infrastructure. Analyzing a cluster of co-located DUI firms from different industries promises an enhanced understanding of how industrial culture can stimulate (or impede) the development from a cross-industrial agglomeration towards a 'real' cluster. The analyzed cluster (iKuben, Molde, Norway) grew from 18 members in 2011 to about 60 in 2021, and comprises DUI-focused firms from various industries that nevertheless seem to benefit from cooperating with each other but decided to develop a "culture of cooperation" prior to their collaborative endeavors. Hypothetically, this culture emerged alongside a shift from a self-interested rationality towards a community rationality initiated by the cluster agency.

The predominant type of rationality steering firms in their inter-organizational endeavors determines the industrial culture of a region. Self-interested rationality is affected by a firm-level agency and supports the emergence of Porterian clusters characterized by competition and cooperation within one particular regional industry or value chain. By contrast, community rationality is enabled by a system-level agency aiming for a fully-fledged cluster characterized by joint policy activities among cluster actors.

In sum, the iKuben Project turned an industrial milieu of traditional DUI firms that partially competed in 2000 into a 'real', fully-fledged cluster includ-

ing unexpected collaborations between formerly-distant members that did not imagine having anything in common that promised a fruitful collaboration. Accelerated by system-level actors, leaders, and the cluster organization, iKuben managed to generate a culture of cooperation and community rationality. The regional industrial culture seems to have a significant impact on cluster development and can be altered comparatively quickly. From a policy perspective, it also seems important to find partners from outside of the region, and include firms from various industries – both related and seemingly unrelated – to build and promote a community rationality among the cluster members.

*Tatjana Bennat's** and *Rolf Sternberg's** paper on *Innovating by interacting in SMEs: actors and barriers* asserted, that in order to draw a complete picture of external interaction within the DUI mode of innovation, comprehensive approaches need to incorporate the extra-regional recursive transfer of knowledge and other innovation-related resources. This transfer in turn strongly depends on the varying individual institutional and organizational support structures across the analyzed regions. Qualitatively contrasting three regions with partially overlapping but mostly different socio-economic characteristics by interviewing SME employees as well as regional innovation consultants promises far-reaching results regarding inter-regional commonalities and differences in diverging infrastructural contexts. The analysis sheds light on the antecedents of various aspects of interaction with different types of external actors by DUI-focused SMEs, while also providing some precise suggestions concerning how to measure the interacting part of the DUI mode of innovation.

Concerning regional competitors, the analysis reveals a limited importance of interaction. Against the background of the relatively positive (pre-Covid-19) overall economic situation, most interviewees reported friendly relations instead of restrictive competitive behavior. Hence, competitor interaction only proved to be relevant in terms of unilateral screening to imitate competitors' activities and in terms of commonly tackling hot topics such as labor shortages. Broadening the scope of assessment by firms that are not competing within the same industry in turn reveals a strong relevance in the context of accelerating digital transformation processes with the help of external IT firms obtaining novel ideas via observing non-related firms. Finally, regular interaction with

local economic policy actors has proven to be a reliable catalyst for applications for public funding schemes and participation in regional activities such as innovation competitions. Entering into contact with local policy organizations in turn requires networking events and informal contacts. In sum, many SMEs face severe challenges in acquiring contacts for external interactions as they often rely on personal networks and lack comprehensive databases for an overview of potential collaborators. This challenge of finding the most promising contact person(s) represents a major barrier for interaction. Further, several SMEs report psychological issues in finding interactors, whereby they misperceive their own roles and potential contributions to R&D, which leads to a lack of network contacts that extend beyond one's own value chain. In terms of measurement, the main result is that the interacting dimension of the DUI mode innovation is suggested to be measured in terms of quantity and quality by five categories, 15 indicators and 15+ items. Finally, SMEs face several resource-related constraints that impede a greater amount of external interactions. Restricted financial and personnel resources make it challenging to engage in any endeavors not relating to their everyday business, especially if they are tied to excessive administrative activities and report duties that exceed one's own administrative capacities, indicating a certain mismatch between current funding schemes and SME demands.

To conclude, while interactions with external actors yield numerous potential benefits for DUI innovating SMEs, current approaches do not yet seem capable of overcoming central barriers in the acquisition of external collaboration partners and continue to maintain a focus on the STI mode of innovation. When it comes to policy implications, it is recommended that innovation policy seriously considers – if data is available – including indicators of DUI interacting in their measurement system (at both the regional and national level), supplementing STI indicators.

Session 4: DUI and learning mechanisms

The fourth session started with *Elaine Horstmann's** paper on *Learning by doing, using, interacting: introducing a novel experimental design*. Empirical research in innovation often restricts itself to qualitative case studies and quantitative panel data regressions. Consequently, experimental designs remained largely overshadowed due to the requirement of precisely-defined termini that are still missing in the STI/DUI concept. Thus, despite some remarkable progress over the recent years, the transformation of a posteriori innovation processes into the required a priori definitions remains a major challenge in "bringing innovation to the lab". Nevertheless, the steady refinement of DUI core elements provides a promising starting point for developing experimental research designs.

The experimental DUI design mainly comprises a group task in which groups of three participants each translate letter strings into numbers from a pre-defined interval. Thereby, the innovation process lies in the decryption of the underlying translation pattern, which helps participants to tackle the task more efficiently while not being a crucial prerequisite to execute the task. The core DUI elements are incorporated in terms of performing the task (D) by applying current decryption ideas (U) and benefiting from inter-group communication with other participants (I) and thereby solving repeating decryption patterns. By adding motivational elements from goal-setting theory into the design, it leads participants towards setting appropriate goals in terms of performance, learning, or specificity and challenge. The first results from this context indicate that setting the latter fosters innovative behavior among participants and – in line with extant goal-setting research – efficiently-addressed performance goals lead to increased output whereas learning goals reduce participants' inputs. Further, learning goals have proven to be more effective in promoting DUI innovation compared with performance goals.

In sum, the design represents a promising approach that – while already delivering interesting insights – paves the path for incorporating and testing a broad variety of additional indicators derived from qualitative research designs such as monetary incentives, training, or competitive pressure under the circumstance of optimized and more complex decryption tasks.

Michael Frese's paper on *Training and learning for entrepreneurship from a psychological perspective* asserted that large-scale intervening research designs promise far-reaching insights into DUI mode innovation in different socio-economic contexts, in order to complement laboratory experimental designs. Against the background of 210 million people currently making a living on less than $15 a day and either already managing small businesses or looking forward to create new ones, facilitating entrepreneurial capabilities and mindsets among these people via doing and using related training and learning mechanisms appears to be a fruitful scholarly enquiry.

During the focal randomized controlled field experiment, a group of 500 people from Togo participated in a specialized business training program for developing countries, while another group of 500 participated in a personal initiative training program including an additional four months of coaching, and another 500 people represented the control group. The business training mainly comprised accounting, marketing and HR inputs, whereas the personal initiative training fostered the ability to identify opportunities, set appealing goals, find creative ways to deal with emerging barriers instead of giving up, and apply the newly-acquired skills in the form of a "personal project" concerning the respective participants' own business.

The results show significant differences between the three groups in terms of comparably high monthly and weekly profits as well as regarding innovative endeavors and product diversification among the members of the personal initiative training group. Overall, the participants of the personal initiative training group scored remarkably better results regarding their businesses during the following months. One potential explanation can be derived from the basic principles of the action theory of learning and training. Accordingly, people are generally active learners, being willing and able to apply recently-acquired inputs in various situations and maintain them for future enquiries. However, blind action does not yield comparable learning effects but instead results in routines and unconscious processes. Relating these psychological insights to the DUI mode of learning, the self-starting program resembles a future-oriented (i.e. doing and using) as well as purposive (doing) approach and can be interpreted along these dimensions.

Panel discussion: DUI as a policy target

The conference's previous contributions have demonstrated the importance of DUI mode innovation for innovative activity. This leads to the question if and how DUI mode innovation needs to be supported by policy. The panel discussion with the speakers *Georg Licht, Kai Weber, Gisela Philipsenburg* and *Edward Lorenz* therefore sought to address the four following topics:

1. Normative dimensions of DUI oriented innovation policy
2. Policy support needed/requested by DUI firms
3. Practical experiences with DUI oriented policy programs
4. Designing and targeting DUI oriented innovation policy programs

Georg Licht* stated, that from a normative perspective, it can be argued that there are market failures related to DUI mode innovation activity. In addition, DUI innovation activity needs to be assessed in a setting of industry relationships and systemic failures potentially coming up there. On this background, especially important for DUI innovation are diffusion-oriented externalities and coordination failures along the value chain. DUI policies will have to identify and address these failures in order to be successful. At the same time, those policies will have to be specific and targeted at clearly defined problems.

Kai Weber* mentioned, that for the current innovation policy implemented, especially in Germany, several shortcomings can be identified. Participants emphasized that innovation policy is often targeted at firms which already conduct formal R&D activity and firms which do not innovate in the STI mode are left out of most funding schemes, for example R&D tax incentives. On another level, higher education institutions (HEI) and their transfer of knowledge into application, their third mission, often fails to address DUI innovation. Furthermore, DUI actors struggle to find the right partners and, consequently, ask for improved and transparent consulting structures.

Gisela Philipsenburg* asserted, that regarding programs fostering DUI mode innovation in Germany, some funding schemes address DUI mode learning, e.g. the bottom-up promotion programs for innovative clusters and networks. They promote networking, interaction and application-oriented R&D,

tackle change and transformation and have a regional focus. However, none of these programs was specifically designed to promote DUI mode innovation. Further policy making should thus experiment more with new funding instruments and formats and continuously evaluate their effects. This leads to a need for appropriate indicators to evaluate innovation policy programs more clearly. Furthermore, activities to develop skills should be better integrated into the funding schemes and the balancing of the policy mix should be considered carefully.

Edward Lorenz* acknowledged that there are no targeted policy programs for DUI. Formats of innovation policy that focus on R&D and the training of scientists and engineers are of little help here. New directions need to be taken, and one possible way might be to pay attention to the organizational dimensions of firms, the format of workplace innovation, employee training, and technology adoption, all of which are related to the DUI mode: New prototypes and innovations must be implemented in the marketplace. This requires an organizational environment in which employees and managers turn inventions into innovations. In terms of workplace innovation, the government in Finland encourages such innovation initiatives, which are characterized by a bottom-up approach. Another component of the Finnish example is a strong focus on employee training and technology adoption, two dimensions strongly associated with DUI innovation.

To summarize, the importance of DUI as a policy target is emphasized by all participants. There is an agreement that policies need a specific target and evaluation. There was also an agreement that DUI firms struggle to find appropriate innovation partners, either regional or national, and future innovation policy programs should take this into account. New innovation policy approaches should also have a bottom-up approach to make sure that they meet the needs of employees and firms.

Keynote Lecture: Finding the right innovation policy for SMEs in Europe

In his keynote lecture, Andrés Rodríguez-Pose highlighted, that overall, STI-related innovation supports continues to be the dominant policy strategy. For example, the Lisbon Strategy set 3% of GDP investment in R&D as a goal for all member states of the European Union. This precludes a more holistic approach to innovation support and a DUI-inclusive innovation policy.

These programs exist but have remained relatively small. This leads to several implications for SMEs:

In terms of innovation, SMEs are different from larger firms. SMEs produce innovation differently, whereby R&D plays a much more important role in larger firms. Non-R&D-based SMEs often follow a different innovation path based on managerial and process innovation, which is complemented with external sources of innovation. This results in a mismatch between the dominant innovation policy and the requirements of SMEs. Policies are often blind and do not take into account the notion that SMEs operate differently. The fact that innovation policies and resources are mostly targeted at research prompts the question of what kind of innovation policy is suitable for SMEs. An innovation policy for SMEs could be based on the knowledge about regional innovation systems and feature assistive programs. Such an approach would require an institutional dimension, which has been ignored in a headline target innovation policy. A context-sensitive DUI policy should target low-skilled sectors and firms in periphery regions. Here, innovation policy could borrow context-sensitive approaches from development policies, such as smart specialization.

A more DUI-oriented innovation policy results in the need to decipher the drivers of SME innovation across different European regions. A macro-level analysis of 220 European regions and five innovation indicators has been presented, which is based on several hypotheses regarding innovation in SMEs:

1. Innovation depends on internal and external drivers, private and public R&D.
2. Innovation in SMEs is less strongly correlated with public R&D, especially in peripheral regions.

3. Collaboration with external partners like customers, suppliers, and research institutions is important.
4. Less innovative regions rely on SME collaboration, and – to a lesser extent – non-R&D activities and scientific contributions.

Regard the results, the study shows that in general private R&D is an important driver of SME innovation, whereas public R&D is not. This is probably due to a mismatch between research in public research centers and the innovation needs of SMEs. Other important drivers of SME innovation are external SME collaboration and public-private co-publications. In a next step, a logistic regression shows important results across a regional innovation spectrum. Here, SME collaboration is the only innovation driver across the whole innovation spectrum.

In conclusion, the EU and its member states focus on R&D policy and are devoting more funding to scientific research. However, development is neglected, which makes this strand of research policy less effective. In this context, overlooking SMEs and their approach to innovation reduces the innovative performance for the whole economy. SMEs operate in different regional contexts and differences exist both between and within countries that need to be addressed by innovation policies. Overall, it is important to explore novel innovation policies that better target SMEs by being more place-sensitive. Current approaches do not fit regions and SMEs with DUI approaches to innovation.

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Jörg Thomä und Kilian Bizer

Weiterführende Schlussfolgerungen für die Innovationspolitik

Mit Blick auf den deutschen Mittelstand konnte die durchgeführte Online-Tagung verschiedene Hinweise für eine stärkere Ausgestaltung einer DUI-orientierten Innovationspolitik zusammentragen. Damit dies gelingt, stellt sich hierauf aufbauend die Frage nach der richtigen Governance und deren Struktur. Im Kern sind hierbei vier Ebenen differenziert zu betrachten: die Unternehmen selbst, Verbände und Kammern, die regionale Dimension von Innovationssystem sowie die Ebene der Landes-, Bundes- und Europapolitik.

Auf Unternehmensebene sind als zentrale Adressaten von Fördermaßnahmen sowohl die Unternehmensführung als auch die Beschäftigten zu nennen. Unternehmer haben mit ihrer jeweiligen Persönlichkeit eine Schlüsselrolle bei der internen Umsetzung von Lern- und Innovationsprozessen inne. Dabei ist eine Förderung unternehmensexterner Kooperationen innerhalb regionaler Innovationssysteme zentral, durch die innovatives Wissen in das Unternehmen gelangen kann. Diese können sich sowohl auf Universitäten und Forschungseinrichtungen – mithin STI-nähere Institutionen – als auch auf DUI-Akteure entlang der Wertschöpfungskette konzentrieren. Entscheidend ist in jedem Fall die Integration in regionale Innovationssysteme und deren Kooperationsstrukturen und Netzwerke, die mit höherer Innovationsleistung und wirtschaftlichem Erfolg einhergehen. Im Hinblick auf den zentralen Beitrag der Beschäftigten für die interne Implementierung des DUI-Modus ist daneben eine Orientierung am Ansatz der mitarbeitergestützten Innovation, der „employee-driven innovation", zentral, da hierdurch die Lern- und Inno-

vationspotentiale aller Mitarbeiter eines Unternehmens aktiviert und nutzbar gemacht werden können. Die vier Dimensionen des entsprechenden Managementkonzepts sind dabei individuelle Innovationsbeiträge, teambasierte Innovationstätigkeit, organisatorische Innovationen und die Etablierung einer allgemeinen Lern- und Innovationskultur im Unternehmen. Innovationspolitik auf Unternehmensebene kann die Verstärkung dieser Dimensionen erreichen und so in DUI-geprägten Unternehmen eine Erhöhung der Innovationsdynamik zur Folge haben.

Die berufliche Bildung – als ein wesentlicher Treiber des DUI-Innovationsgeschehens in Deutschland – wird daneben in hohem Maße auf der Ebene von Verbänden und Kammern beeinflusst. Ihre Stärke liegt in der gleichzeitigen Ausrichtung auf berufsbezogene, breit qualifizierende Inhalte sowie parallel dazu auf eine intensive betriebsspezifische Ausbildung. Die duale Ausbildung prägt damit entscheidend die DUI-Kompetenzen der Mitarbeiter und auch künftigen Inhaber von Betrieben. Insofern schafft insbesondere die fortwährende Anpassung von Ausbildungsinhalten an geänderte technische Rahmenbedingungen und eine Orientierung am Leitbild des lebenslangen Lernens eine wichtige Grundlage für die Innovationsfähigkeit von KMU. Ebenso fungieren Kammern und Verbände als Bindeglied zwischen Betrieben und der Wirtschafts- und Innovationspolitik der verschiedenen föderalen Ebenen, da sie besser als andere Akteure in der Lage sind, praxisrelevante Bedarfe zu erkennen und zu kommunizieren sowie zwischen den verschiedenen Akteursgruppen einer Mittler- und Moderatorenrolle einzunehmen. Insofern ist ihre enge Einbindung in die Formulierung DUI-spezifischer Innovationspolitik eine entscheidende Voraussetzung für die Wirksamkeit dahingehender Maßnahmen.

Die regionale Ebene ist wichtig, da Innovationsaktivitäten von DUI-Unternehmen in erheblichem Maße räumlich eingebettet und regional-lokal verankert sind. Regionen und ihre Innovationssysteme wiederum sind häufig sehr heterogen, zum Beispiel in Hinblick auf Humanressourcen, das Vorhandensein verschiedener Stakeholder sowie die Intensität der formellen und informellen Kooperationen. Daher ist zu betonen, dass Innnovationspolitik, die sich an

regional verankerte Unternehmen richtet, sich in ihrer Struktur erheblich an der Struktur des regionalen Innovationssystems orientieren muss. Die Suche nach einem erfolgreichen Policy-Mix muss daher verschiedene regionale Stakeholder einbeziehen, um die regionale Komposition der Unternehmenslandschaft auf der einen Seite und der regionalen Wissensinfrastruktur auf der anderen Seite zu verstehen und in ein produktives Verhältnis zueinander zu bringen. DUI-bezogene Innovationspolitik, die es schafft, Unternehmen in lokal-regionale Wissens- und Innovationsnetzwerke einzubeziehen, sollte dabei auf die Vermittlungsfunktion regionaler Intermediäre setzen. Diese können die spezifischen Innovationshemmnisse von KMU einschätzen und gezielt unternehmensspezifische Angebote machen, aber auch die regionalen Innovationsstrukturen langfristig an die Bedürfnisse der Unternehmen anpassen.

Die Landes-, Bundes- und Europapolitik ist derzeit vor allem von der starken finanziellen Förderung von Forschung und Entwicklung, insbesondere über das Universitäts- und Forschungssystem geprägt. Insofern ist ein strukturell einseitiger STI-Fokus vorhanden, der Innovationschancen durch die Förderung von DUI-Prozessen potenziell ungenutzt lässt. Als zentrales Argument dient dabei, dass direkte Forschungsförderung höhere positive Externalitäten für die Gesamtwirtschaft aufweist. Gleichwohl kann argumentiert werden, dass durch eine strukturelle Förderung von DUI-Innovationsprozessen in der Breite des Mittelstands eine Grundlage für eine höhere Effektivität von Wissensspillovern und Diffusionsprozessen in der Gesamtwirtschaft geschaffen wird, da hierdurch die Absorptionsfähigkeit von neuem Wissen in einer Vielzahl an KMU positiv beeinflusst wird. Eine erfolgreiche Förderung von DUI-Kompetenzen in kleineren und mittleren Unternehmen kann dadurch zur schnelleren und weiteren Verbreitung von innovativem Wissen beitragen. Für die effektive Förderung von DUI-Kompetenzen ist wiederum eine enge Verzahnung verschiedener Ressorts erforderlich: Es müssen sowohl klassische Aspekte der Forschungs- und Innovationsförderung betrachtet werden, als auch arbeitsmarktpolitische Dimensionen, Bildungsprojekte, Digitalisierungsinitiativen und z.B. gesetzlichen Rahmenbedingungen im Bereich Aus- und Weiterbildung. Insgesamt ist daher ein breit gefasster Innovationsbegriff zu-

grunde zu legen, der umfassender als bisher die vielfältigen Lern- und Innovationsprozesse der Unternehmen umfasst und über die Verengung auf den FuE-Bereich hinausgeht.

Der verbindende inhaltliche Rahmen der Politikempfehlungen liegt in der Notwendigkeit der Messbarkeit der betreffenden Lern- und Innovationsprozesse, die auf den verschiedenen genannten Ebenen adressiert werden können. Das Projekt „InDUI – Innovationsindikatorik für den Doing-Using-Interacting von KMU" hat dafür eine umfassende Liste von Lern- und Innovationsprozessen erarbeitet.[1] Diese bilden die verschiedenen Bestandteile des DUI-Modus innerhalb von Unternehmen ab und können quantitativ erhoben werden. Dieser neue Messzugriff ermöglicht den Akteuren auf den verschiedenen Ebenen, die für sie relevanten Prozesse zu identifizieren und mit geeigneten Politikinstrumenten zu beeinflussen, um so eine Erhöhung der Innovationstätigkeit bei DUI-Unternehmen zu erzielen. Insofern kann die nun mögliche Messung der Lern- und Innovationsprozesse sowohl zu einem breiteren wissenschaftlichen Verständnis von „Innovation ohne F&E" beitragen als auch konkrete Ansatzpunkte für Unternehmen, Verbände und Kammern, Regionen sowie die Landes-, Bundes- und Europapolitik liefern.

[1] Alhusen, H.; Bennat, T.; Bizer, K.; Cantner, U.; Horstmann, E.; Kalthaus, M.; Proeger, T., Sternberg, R.; Töpfer, S. (2021): A New Measurement Conception for the 'Doing-Using-Interacting' Mode of Innovation. In: Research Policy (Vol. 50, Issue 4), doi: https://doi.org/10.1016/j.respol.2021.104214.

ANHANG

Conference Program

MONDAY, FEBRUARY 22, 2021

13.30 **Introductory words by the conference hosts**
Rolf Sternberg, Leibniz University of Hannover
Joachim Lange, Protestant Academy of Loccum

13.45 **Session 1: Intra-firm learning processes and the modern theory of the firm**

Non-R&D, interactive learning and economic performance: Revisiting innovation in small and medium enterprises
Jörg Thomä, ifh Göttingen

DUI mode and firm's performance: Evidence from Belarus
Natalja Apanasovich, Belarusian State University

Discussion
Georg Licht, ZEW – Leibniz Centre for European Economic Research, Mannheim

15.15 Break

15.35 **Session 2:**
User-producer relations and the demand-pull concept

Innovation by using –
Demand side issues in the learning economy
Uwe Cantner, Friedrich Schiller University Jena

Embedded lead users. Users inside the producer firm
Christina Raasch, Kühne Logistics University, Hamburg

Discussion
Edward Lorenz, University of Côte d'Azur, Nice and University of Aalborg

17.05 Break

17.25 **Session 3: Interaction in the region and the concept of regional innovation systems**

Interaction in the region: the role of regional industrial culture
Arne Isaksen, University of Agder

Innovating by interacting in SMEs: actors and barriers
Tatjana Bennat & *Rolf Sternberg*, Leibniz University of Hannover

Discussion
Thomas Brenner, Philipps University, Marburg

18.55 End of Conference Day 1

TUESDAY, FEBRUARY 23, 2021

09.00 **Session 4: DUI and learning mechanisms**

Learning by doing, using, and interacting – introducing a novel experimental design
Elaine Horstmann, Georg-August-University of Göttingen

9.20 **Training and Learning for entrepreneurship from a psychological perspective**
Michael Frese, Leuphana University Lüneburg and Asia School of Business, Kuala Lumpur

9.40 **Discussion**
Harm Alhusen, ifh Göttingen

10.30 Break

10.50 **Panel discussion: DUI as a policy target**
Georg Licht, ZEW – Leibniz Centre for European Economic Research, Mannheim
Kai Weber, NEWIN – Network of Economic Development Units in Lower Saxony, Hannover
Gisela Philipsenburg, Federal Ministry of Education and Research, Berlin
Edward Lorenz, University of Côte d'Azur and University of Aalborg
Moderator: *Prof. Dr. Uwe Cantner*, Friedrich Schiller University Jena

11.35 **Keynote Lecture**
Finding the right innovation policy for SMEs in Europe
Andrés Rodríguez-Pose, London School of Economics

12.20	**Closing remarks** *Kilian Bizer*, Georg-August-University of Göttingen
12:30	End of the Conference

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