Using Trademarks to Measure Innovation in Knowledge-Intensive Business Services

Matthias Gotsch and Christiane Hipp

> *"Branding the innovation can potentially help make the innovation visible, communicate its features, and provide credibility and substance to the perceived innovativeness of the organizational brand."*
>
> David Aaker
> Author of *Innovation: Brand It or Lose It*

We present an empirical approach to measuring service innovation on the company level through the analysis of trademarks. Prior empirical investigations in several industries have shown that a trademark may be used as an innovation indicator. This article explores the use and relevance of trademarks by conducting a survey in the knowledge-intensive business services (KIBS) industries with 278 participating companies. Our survey results explain the use of trademarks as a way to protect innovation and intellectual property for KIBS. In sum, we show that trademarks can be described as adequate and useful indicators to measure new service innovations in the KIBS industries. Additionally, we show that trademarks have the potential to overcome weaknesses of traditional measurement concepts towards KIBS innovation and might make special surveys redundant in the future.

Introduction

Due to the lack of adequate innovation indicators, it is not trivial to measure the innovativeness of the services sector in general (Abreu et al., 2010), and of so-called knowledge-intensive business services (KIBS), which are profoundly related to information and knowledge, in particular (Miles, 2000; Toivonen & Tuominen, 2009). But for all stakeholders, such as entrepreneurs introducing new services, researchers focusing on innovation measurement, as well as policy makers considering support programs for service companies, it is important to have reliable indicators on a company level to applicably compare industries and regions regarding their recent intensity of service innovation.

Because service providers do not produce material goods, in the past they were often classified as non-innovative (Pires, et al., 2008). This view is mostly due to the unsuitability of many traditional innovation indicators, such as R&D expenditures. The indicator's high explanatory power for the manufacturing sector is not necessarily transferable to the services and KIBS sector (Abreu et al., 2010). Also, the non-patentability of many service innovations compromises the significance of patent indicators. Fundamentally, many of the innovation indicators used in the past could be questioned regarding their suitability for KIBS innovation.

Trademark analysis offers a possible solution to overcome the existing weaknesses of traditional innovation surveys and measurement concepts that were mainly developed for manufacturing industries (Hipp & Grupp 2005). Previous empirical investigations have shown that trademark analysis may be used as an alternative approach (e.g., Amara et al., 2008; Gotsch & Hipp, 2012; Mendonça, et al., 2004). The analysis of trademarks could contribute to an improved understanding of innovation in services that goes beyond traditional survey-based indicator concepts (Schmoch, 2003). By doing so, researchers as well as policy makers and entrepreneurs can learn about the possibilities and limitations of trademarks as a new innovation indicator in order to better describe, understand, and benchmark innovation activities in the KIBS industries.

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Knowledge-Intensive Business Services and Innovation

KIBS are firms that provide knowledge-intensive services for other business firms. Since the mid-1990s, interest in KIBS in particular has grown, as reflected in a growing number of publications dealing with their special characteristics (Schricke et al., 2012). KIBS are service companies that provide knowledge inputs mainly to the business processes of other organisations. Examples of KIBS industries include computer services; research and development (R&D) services; legal, accountancy, and management services; architecture, engineering, and technical services; advertising; and market research (Miles, 2005).

KIBS combine knowledge from different sources (Hipp, 1999) and are increasingly considered to be major users, originators, and transfer agents of technological and non-technological innovations. They play a major role in creating, gathering, and diffusing organizational, institutional, and social knowledge in other economic sectors (Iden & Methlie, 2012). The KIBS sector has a role as a knowledge-producing, knowledge-using, and knowledge-transforming industrial sector (Schricke et al., 2012). For this reason, Czarnitzki and Spielkamp (2003) characterize KIBS as bridges for innovation.

However, just because KIBS play an important role in the innovation system of a region, country, industry, or value chain and are often considered as co-producers of innovation for their clients (Hauknes, 1998), this does not necessarily mean that KIBS are highly innovative on their own. Rather, it could be that some KIBS are much better at helping their clients to innovate than in managing their own innovation processes (Christensen & Baird, 1997), therefore it is also important to observe and measure innovation happening inside KIBS companies.

The Oslo Manual for the collection and interpretation of innovation data is a widely used reference for service innovation and classifies four innovation forms: product, process, marketing, and organizational innovation (OECD, 2005). Depending on their specific field of activity, innovation in KIBS may consist of new products and technologies (e. g., customization of software), new processes (e. g., new forms of delivering services), as well as new organizational types or marketing procedures (Schricke et al., 2012). Therefore, service innovation is indeed captured by the Oslo Manual to some extent, but compared to technologically oriented processes in the manufacturing sector, innovation in KIBS is shaped by certain specificities (Tether & Hipp, 2002). For instance, the innovations often are of intangible nature and are characterized by a strong connectivity to customers as production and consumption take place simultaneously (Schricke et al., 2012). The nature of innovation within KIBS is mostly project based, ad hoc, and interactive (Toivonen, 2004). The high importance of human capital results from the fact that, according to Strambach (2008), knowledge is embodied in the people and embedded in networks, while R&D departments in the usual sense are very rare among KIBS (Kanerva et al., 2006).

Innovation Indicators

For entrepreneurs, managers, and policy makers, it is interesting to evaluate impact and leverage effects of KIBS industries and innovations. But how can we measure them in order to better understand, guide, and manage innovation activities? To measure something that cannot be recognized directly, one can use specific indicators, which provide at least an indication of reality (Gault, 2007). Indicators use empirically ascertainable variables to represent different latent quantities that are not directly measurable. Because their predictive power is limited, all indicators should be used restrictively and interpreted carefully (Kleinknecht et al., 2002). Nevertheless, the use of science, technology, and innovation indicators has greatly increased since the 1990s (Lepori et al., 2008), in part because of two interrelated events. First, access to digitized databases has made the collection and analysis of data easier. Second, there has been a corresponding interest in the use of indicators in politics, business, and society.

Indicator data can be collected in various ways, and so the choice of methodology is critical. The data for most indicators can be collected using either empirical surveys or publicly accessible databases. Indicators that can be determined only through empirical surveys are primarily related to internal company resources such as investment in human resources or turnover with new services.

Indicators commonly used in the manufacturing industries typically relate to R&D activities or patent counts (Pavitt, 1982). In the context of a linear innovation model, R&D was established as the source of innovation, and was supported by a relatively simply constructed measurement concept. The Frascati manual standardized and harmonized this R&D-based approach (OECD, 2002). Acs, Anselin, and Varga (2002) point out: "Measures of technological change have typically involved

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one of the three major aspects of the innovative process: (1) a measure of the inputs into the innovation process, such as R&D expenditures; (2) an intermediate output, such as the number of inventions which have been patented; or (3) a direct measure of innovative output."

Patents as indicators of intermediate output are still among the most commonly used innovation indicators (Smith, 2005). Because intellectual property rights, such as patents, are recorded in centralized databases, it is relatively easy to access related indicator data (Flor & Oltra, 2004). Although technological change is not exclusively based on R&D activities or patents, these input and output indicators are often used as single variables for measuring innovation activities, thereby allowing statistical bias to influence the analysis (Kleinknecht et al., 2002).

Innovation in KIBS, as defined in this article, is multidimensional. For example, service innovations often are not generated in special departments (Kanerva et al., 2006), but during daily work in cooperation with customers (Gallouj & Windrum, 2009) or in time-restricted project groups (Howells & Tether, 2004), and they are not necessarily connected to R&D investments. Therefore, a traditional R&D investment indicator is not applicable for KIBS innovation. Instead, human capital, team work, networking and cooperation, customer integration, and the specific role of information technology are important input factors for the success of a service innovation (Tether & Hipp, 2002).

Also, the innovation process in services does not necessarily aim to acquire or generate technical know-how. Therefore, patents have major weaknesses as indicators of service innovation (Coombs & Miles, 2000). Miles Andersen, Boden, and Howells (2000) point out that protection strategies used in the service sector differ from those of manufacturing companies. The authors argue that service companies have grown up without a formal protection culture, and, therefore, most innovations are not protected in the traditional sense. "Innovation studies have tended overwhelmingly to focus on the manufacturing sector. Similarly, research linking together innovation and the intellectual property rights system has been almost exclusively centered on patenting, with its emphasis on protecting physical artefacts centered on new products and processes" (Miles et al., 2000).

Summing up, because innovation in services can take multiple forms, it can be difficult to measure it using traditional input and throughput indicators (Camacho & Rodriguez, 2008). Coombs and Miles (2000) evaluate traditional indicators and measurement concepts as especially disadvantageous for the assessment of service innovation, especially in highly innovative KIBS. Abreu, Grinevich, Kitson, and Savona (2010) argue that "the complexity and variability of the innovation process means that new and different indicators will be appropriate in different sectors of the economy […] though these may make it harder to compare sectors". In this context, Abreu, and colleagues (2010) develop four criteria to be considered as desirable for a new innovation indicator: accuracy, longevity, comparability, and ease of collection. In this article, we propose that these criteria can be met with an indicator based on intellectual property rights, namely trademark registrations. Trademarks are registered with publicly available databases of state authorities; therefore, they are saved over long periods and comply with international regulations (WIPO, 2006). In the following section, we will explore trademarks in detail to illustrate how they might be suitable innovation indicators for KIBS.

Trademarks as Innovation Indicators in Knowledge-Intensive Business Services

Intellectual property strategies for innovative service firms can be linked to the wider development of the strategic assets or core competencies of such firms (Prahalad & Hamel, 1990). One of the potential measures to protect intellectual property for service firms is the use of trademarks. A trademark is a legally protected symbol, which has two main functions. The first function is to clearly distinguish the products and services of one company from those of other firms (WIPO, 2006). We call this the distinction function of a trademark (Greenhalgh & Rogers, 2007), which is primarily used to inform and help potential customers. The second function is a protection function, which means that the trademark serves as a protection of intellectual property and gives monopoly rights by prohibiting other companies from operating with similar or identical trademarks in similar or identical markets (Millot, 2009).

The distinction function of a trademark can help to overcome difficulties resulting from the immateriality of services. Due to limited opportunities to assess information, customers often focus on key information and look for alternative assessment standards (Mangàni, 2006). In this case, a well known and trusted trademark can serve as an indicator of the expected overall quality performance of the service and, in this

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way, reduce the perceived risk of purchase and provide security (King, 1991). Aaker (2007) states that "branding the innovation can potentially help make the innovation visible, communicate its features, and provide credibility and substance to the perceived innovativeness of the organizational brand."

The protection function is more competition oriented and refers to the comparatively simple interchangeability of many services (Mangàni, 2006). Because of this ease of imitation, the need arises to differentiate the offered services. The use of trademarks does not provide full protection against imitation, because the trademark does not protect innovation or novelty in itself; nevertheless, it gives some monopoly rights (Davis, 2005). Moreover, a strong and well-known mark can discourage potential new competitors from entering the market (Aaker, 2007). The trademark increases the barrier to market entry, because high levels of investment would be needed to enter the market (Jensen & Webster, 2004).

The origin of trademark protection can be traced to the gild practices of the Middle Ages. According to Besen and Raskind (1991) "the initial purpose of trademark protection was to make it illegal to pass off the goods of another artisan as those of a guild member." Today, trademark protection also includes the possibility of achieving a mark for service activities. Mangàni (2006) identifies five reasons for the increasing economic importance of service trademarks: i) structural changes in developed economies, ii) market liberalization, iii) increased tradability of services, iv) decreased direct customer contacts, and v) increased quality competition.

A classification of the different forms of service trademarks is possible based on the service object that is primarily protected by the trademark (Flikkema et al., 2010). Common branding strategies apply for a single service (single brand), a bunch of similar services (family brand), all services of the company (umbrella brand), or the company itself (company brand). Registering a trademark gives the company a monopoly on its use, usually for a period of ten years. The registration of the mark can be renewed at any time, but its actual use in the marketplace must be shown (Blind et al., 2003). Trademarks can be registered at the national, regional, or international level. An example of a regional authority is the Office for Harmonization in the Internal Market (OHIM; oami.europa.eu), which grants community trademarks for protection in the member states of the European Union. Worldwide protection is available at the World Intellectual Property Organization (WIPO; wipo.int), at least for signatory countries of the Madrid Protocol (tinyurl.com/66pm8af).

Dealing with the question of whether trademarking could signal innovative activity, prior investigations found a correlation between trademarks and productivity (Greenhalgh & Rogers, 2007) or stock market value (Sandner & Block, 2011), as well as between trademarks and innovation (e.g., Amara et al., 2008; Schmoch, 2003). In a next step, other researchers tried to use trademarks as an indicator of innovation (e.g., Gatrell & Ceh, 2003; Malmberg, 2005; Mendonca et al., 2004; Millot, 2009; Schmoch & Gauch, 2009). For instance, Päällysaho and Kuusisto (2008) found that companies introducing services generally use some kind of protection measure. Thereby, trademarks are primarily used to differentiate a firm's own services from potentially competing services. In particular, when patent protection is not possible, trademarks seem to have a positive impact on innovation success (Schmoch, 2003). Gotsch and Hipp (2012) already showed that international distribution markets, competitive market environments, and highly standardised services increase the number of trademark registrations. Therefore, KIBS with these characteristics are more likely to register trademarks than other companies.

However, there are also arguments against the suitability of trademarks as an innovation indicator. For instance, services that have only a low level of innovation could also be protected by trademarks (Davis, 2009), which may reduce the statistical value of a trademark indicator. Moreover, trademarks are only indirectly linked to innovation (Blind et al., 2003). Primary motives for trademark applications could be to increase the level of public awareness or to support competitive strategies of the company. There are also other formal and informal protective measures in addition to trademarks. According to the situation and the need for protection, different measures are appropriate. Amara, Landry, and Traoré (2008) classify protective measures depending on the tangible or intangible nature of the product and the implicit or codified form of connected knowledge. In this framework, patents are mainly important for material goods with codified knowledge. But, due to the immateriality of services and rather implicit form of knowledge used, trademarks are an essential protection mechanism for service innovations by KIBS.

To protect their innovations, service businesses have adopted a wide range of alternative practices for intellectual property management and protection, which

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are tailored to the specific needs of service innovations. Hipp and Bouncken (2009) describe strategic protection measures as essential tools for preventing misuse or imitation by competitors. These informal and strategic measures for intellectual property protection (e.g., secrecy, lead-time advantage, or complexity of design) are obviously not centrally registered like formal intellectual property rights (e.g., patents, trademarks, copyrights, or industrial designs). To understand how KIBS register trademarks, it is important to understand why business services use trademarks as a protection measure. Given that trademark registrations are supposed to be indicators of innovation, we aim to determine whether or not trademarks are used primarily to protect new products and services. Accordingly, we developed related hypotheses, which we tested by conducting a survey of KIBS, as described in the next section. The hypotheses were as follows:

Hypothesis 1: *KIBS use a bundle of formal and informal protection measures to guard their intellectual property.*

Hypothesis 2*: KIBS register trademarks primarily to protect new products and services.*

A Survey of Knowledge-Intensive Business Services

In our survey, the sample of KIBS includes companies based in Germany and listed in the MARKUS company database provided by Bureau van Dijk and the Credit Reform Association. The item definitions correspond to recommendations given in the Oslo Manual (OECD, 2005) concerning the measurement and interpretation of innovation survey data. A pretest with ten experts from appropriate firms enabled us to optimize the questionnaire. The main survey was carried out as an online survey with a sample of 6,176 KIBS. The return rate after follow-up was 278 KIBS (4.5%), which is in line with other similar Internet-based surveys conducted in Western countries. Below, we present the results of the hypotheses we tested using independent regression models of the survey data. Details of the research design and data handling can be found in Appendix 1.

The first hypothesis develops assumptions concerning the appropriate use of formal and informal protection measures to guard the intellectual property of KIBS. In order to test the hypothesis, we developed an empirical model with a dependent variable reflecting the innovation success of the firm. As a proxy variable of innovation success, we use the share of turnover achieved with new services (i.e., market introduction during the last three years). The results regarding the usefulness of intellectual property protection measures is ambiguous. Although the use of trademarks and industrial design as intellectual property rights have positive and significant effects on innovation success, no such effect is found for either patents or copyrights. Given that patents and copyrights do not have a positive or significant effect on service innovation, and industrial design registrations cannot be evaluated in detail, as can trademark registrations, we can conclude that trademarks best fulfil the criteria of an innovation indicator compared to other protection measures used in the model.

None of the informal protection tools, which we believed to be very important, were statistically significant in our model; even lead-time advantage has a non-significant negative effect on innovation success. The use of informal protection measures may be important for the firm, but because there is no record or registration of their use, they cannot easily be used as an innovation indicator. Special surveys would be necessary to obtain the required information on informal protection measures. Because registered trademarks indeed may be an indicator of service innovation, it becomes even more important to understand the reasons for trademark registration and why business services use trademarks as protection measure. Therefore, we test the second hypothesis that deals with questions concerning the purposes for which firms register trademarks.

All participants of the KIBS survey were asked to give their reasons for registering trademarks and to rank the importance of those reasons on a scale of one to five. The results illustrate that the protection of new products and services is the most important motive for registering a new trademark. For greater precision, we estimated two regression models with the number of trademark registrations as dependent variable. Both models came to the same conclusion: the only variables with significant positive effects on trademark registration are those that protect new products and services. None of the other variables in the simplified models were significant. Therefore, we conclude that the primary reason for KIBS to register trademarks is to protect their newly introduced goods and services against imitation by their competitors.

Research Limitations and Future Research

Indicators provide only an indication of reality, not a direct and complete measure, and are likely to be imperfect. However, the use of patents as an innovation

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indicator in manufacturing industries is a conventional and very similar approach. In this context, an indicator based on intellectual property rights, such as trademark registrations, best fulfils the desirable criteria for an innovation indicator: accuracy, longevity, comparability, and ease of collection. But, even if the relationship between trademarks and KIBS innovation is made clear, larger problems remain.

Obviously, there are difficulties in the data consolidation, depending on the brand strategies selected by particular companies. Depending on whether a company is pursuing a single, family, or umbrella-brand strategy, one trademark application can represent just one or several innovations. Sectoral differences between KIBS industries and weaknesses in the international comparability also exist. Therefore, further research is needed for a full assessment of trademarks as an innovation indicator for KIBS.

Future research could also match trademark databases with corporate databases. The information contained in corporate databases (e.g., information on individual balance sheets, amount of intangible assets) could add a variety of new insights. An enhanced consideration of intangible assets, which give information regarding the monetary value of trademarks, can generate knowledge about the meaning and importance of individual trademarks and would increase the significance of the innovation indicator.

Research Contribution and Managerial Implications

The goal of this article was to show that trademarks are suitable as indicators of KIBS innovation because they provide information about innovation activities and innovation success. Given that there are few other adequate indicators for service innovation activities, the use of trademark registrations as an additional indicator is certainly promising.

First, our study shows that the interrelation between trademark registration and innovation success is positive and statistically significant in the KIBS sector. These findings are in line with Schmoch (2003) and Amara, Landry, and Traoré (2008), who also found a relation between trademarks and innovation for KIBS, and with Flikkema, de Man, and Wolters (2010) who investigated the entire services sector.

Second, we show that trademarks are usually registered by KIBS to protect new products and services. Other motives seem to be of secondary importance, hence there appears to be a connection between trademarks and new services. This finding corresponds to other research on this topic. For instance, Davis (2005) showed that, because of the ease of imitation of services, the need arises to protect services by registering trademarks, which provide at least some protection against imitation. In fact, a trademark does not protect innovation or novelty in itself, but according to Aaker (2007), a strong and well-known trademark can discourage potential new competitors by increasing the barrier to market entry.

According to Acs, Anselin, and Varga (2002) a huge disadvantage of survey-based innovation measures is the emerging cost to generate data and the danger of subjective answers. As a result, the development of appropriate, easy to use, and low-cost indicators to measure innovation in the KIBS sector is certainly useful. Trademarks are a promising alternative indicator to fill this existing gap, because trademark registrations are available in public databases. The great advantages of indicators that can be extracted from databases are the relatively low overhead costs and the comparability of results. The data relating to innovation indicator does not need to be collected discretely, but can be extracted at a suitable location (e.g., a trademark registration database). Thus, special surveys in KIBS industries could be redundant in the future.

Furthermore, KIBS practice can benefit from these results. Entrepreneurs and managers, as well as policy makers, can use trademarks as an innovation indicator in order to better describe, understand, and benchmark innovation activities in the KIBS sector. By doing so, they can identify the degree of innovation in particular industries and derive the degree of competitive rivalry among existing firms. Based on this information, entrepreneurs can decide to whether or not to enter or exit a specific market.

As survey results also have shown, it seems advisable for companies to protect all new service innovations with trademarks. Because a trademark can be registered in a straightforward manner and gives the trademark owner a monopoly on its use, trademark registration should be incorporated in every competition strategy, both for incumbent firms as well as startups. On the basis of these suggestions, entrepreneurs and managers can create better and more successful ventures. By doing so, the use of trademarks as an additional indicator could also contribute to an improved innovation model for business services.

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References

Aaker, D. 2007. Innovation: Brand It or Lose It. *California Management Review,* 50(1): 8–24. http://dx.doi.org/10.2307/41166414

Abreu, M., Grinevich, V., Kitson, M., & Savona, M. 2010. Policies to Enhance the "Hidden Innvation" in Services: Evidence and Lessons from the UK. *The Service Industries Journal,* 30(1): 99–118. http://dx.doi.org/10.1080/02642060802236160

Acs, Z. J., Anselin, L., & Varga, A. 2002. Patents and Innovation Counts as Measures of Regional Production of New Knowledge. *Research Policy,* 31(7): 1069–1085. http://dx.doi.org/10.1016/S0048-7333(01)00184-6

Amara, N., Landry, R., & Traoré, N. 2008. Managing the Protection of Innovations in Knowledge-Intensive Business Services. *Research Policy,* 37(9): 1530–1547. http://dx.doi.org/10.1016/j.respol.2008.07.001

Armstrong, J. S., & Overton, T. S. 1977. Estimating Nonresponse Bias in Mail Surveys. *Journal of Marketing Research,* 14(3): 396. http://dx.doi.org/10.2307/3150783

Besen, S. M., & Raskind, L. J. 1991. An Introduction to the Law and Economics of Intellectual Property. *The Journal of Economic Perspectives,* 5(1): 3–27. http://www.jstor.org/stable/1942699

Blind, K., Edler, J., Schmoch, U., Anderson, B., Howells, J., Miles, I., et al. 2003. *Patents in the Service Industries.* No. EC Contract No. ERBHPV2-CT-1999-06. Karlsruhe, Germany: Fraunhofer Institute Systems and Innovation Research.

Box, G. E. P., & Cox, D. R. 1964. An Analysis of Transformations. *Journal of the Royal Statistical Society. Series B (Methodological),* 26(2): 211–252.

Camacho, J. A., & Rodriguez, M. 2008. Patterns of Innovation in the Service Sector: Some Insights from the Spanish Innovation Survey. *Economics of Innovation and New Technology,* 17(5): 459–471. http://dx.doi.org/10.1080/10438590701362874

Christensen, C. M., & Baird, B. J. 1997. Cultivating Capabilities to Innovate: Booz.Allen & Hamilton. Harvard Business School Case No. 698-027. Boston: Harvard Business School.

Coombs, R., & Miles, I. 2000. Innovation, Measurement and Services: The New Problematique. In J. S. Metcalfe & I. Miles (Eds.), *Innovation Systems in the Service Economy:* 85–103. Berlin: Springer.

Czarnitzki, D., & Spielkamp, A. 2005. Business Services in Germany: Bridges for Innovation. *The Service Industries Journal,* 23(2): 1–31.

Davis, L. 2005. The Strategic Use of Trademarks. Presented at the 5th European Policy on Intellectual Property (EPIP) Conference, Copenhagen.

Davis, L. N. 2009. Leveraging Trademarks to Capture Innovation Returns. Presented at the Copenhagen Business School Summer Conference 2009, Copenhagen: Copenhagen Business School.

Flikkema, M. J., de Man, A. P., & Wolters, M. J. J. 2010. *New Trademark Registration as an Indicator of Innovation: Results of an Explorative Study of Benelux Trademark Data.* No. 0009. Amsterdam: Vrije Universiteit Amsterdam, Faculty of Economics and Business Administration.

Flor, M. L., & Oltra, M. J. 2004. Identification of Innovating Firms through Technological Innovation Indicators: An Application to the Spanish Ceramic Tile Industry. *Research Policy,* 33(2): 323–336. http://dx.doi.org/10.1016/j.respol.2003.09.009

Gallouj, F., & Windrum, P. 2009. Services and Services Innovation. *Journal of Evolutionary Economics,* 19(2): 141–148. http://dx.doi.org/10.1007/s00191-008-0123-7

Gatrell, J. D., & Ceh, S. L. B. 2003. Trademark Data as Economic Indicator: The United States, 1996-2000. *The Great Lakes Geographer,* 10(1): 46–56.

Gault, F. 2007. Introduction. In *Science, Technology and Innovation Indicators in a Changing World Responding to Policy Needs.* Paris: OECD Publishing.

Gotsch, M., & Hipp, C. 2012. Measurement of Innovation Activities in the Knowledge-Intensive Services Industry: A Trademark Approach. *The Service Industries Journal,* 32(13): 2167–2184. http://dx.doi.org/10.1080/02642069.2011.574275

Greenhalgh, C., & Rogers, M. 2007. Trade Marks and Performance in UK Firms: Evidence of Schumpeterian Competition through Innovation. Working Paper, Oxford: Oxford Intellectual Property Research Centre.

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Hauknes, J. 1998. *Services in Innovation – Innovation in Services.* STEP Report series No. 199813. The STEP Group, Studies in Technology, Innovation and Economic Policy.

Hipp, C. 1999. Knowledge-Intensive Business Services in the New Mode of Knowledge Production. *AI & Society,* 13(1-2): 88–106. http://dx.doi.org/10.1007/BF01205260

Hipp, C., & Bouncken, R. B. 2009. Intellectual Property Protection in Collaborative Innovation Activities within Services. *International Journal of Services Technology and Management,* 12(3): 273–296. http://dx.doi.org/10.1504/IJSTM.2009.025391

Hipp, C., & Grupp, H. 2005. Innovation in the Service Sector: The Demand for Service-Specific Innovation Measurement Concepts and Typologies. *Research Policy,* 34(4): 517–535. http://dx.doi.org/10.1016/j.respol.2005.03.002

Howells, J., & Tether, B. 2004. *Innovation in Services: Issues at Stake and Trends.* Brussels: Commission of the European Communities.

Iden, J., & Methlie, L. B. 2012. The Drivers of Services on Next-Generation Networks. *Telematics and Informatics,* 29(2): 137–155. http://dx.doi.org/10.1016/j.tele.2011.05.004

Jensen, P. H., & Webster, E. M. 2011. Patterns of Trademarking Activity in Australia. Working Paper No. 2/04. Melbourne: Melbourne Institute.

Kanerva, M., Hollanders, H., & Arundel, A. 2006. *Can We Measure and Compare Innovation in Services?* Brussels: European Commission.

King, S. 1991. Brand-Building in the 1990s. *Journal of Marketing Management,* 7(1): 3–13. http://dx.doi.org/10.1080/0267257X.1991.9964136

Kleinknecht, A., Van Montfort, K., & Brouwer, E. 2002. The Non-Trivial Choice between Innovation Indicators. *Economics of Innovation and New Technology,* 11(2): 109–121. http://dx.doi.org/10.1080/10438590210899

Lepori, B., Barré, R., & Filliatreau, G. 2008. New Perspectives and Challenges for the Design and Production of S&T Indicators. *Research Evaluation,* 17(1): 33–44. http://dx.doi.org/10.3152/095820208X291176

Malmberg, C. 2005. Trademarks Statistics as Innovation Indicator? - A Micro Study. Working Paper No. 2005/17. Lund, Sweden: Centre for Innovation, Research and Competence in the Learning Economy (CIRCLE), Lund University.

Mangàni, A. 2006. An Economic Analysis of Rise of Service Marks. *Journal of Intellectual Property Rights,* 11(4): 249–259.

Mendonça, S., Pereira, T. S., & Godinho, M. M. 2004. Trademarks as an Indicator of Innovation and Industrial Change. *Research Policy,* 33(9): 1385–1404. http://dx.doi.org/10.1016/j.respol.2004.09.005

Miles, I. 2000. Services Innovation: Coming of Age in the Knowledge-Based Economy. *International Journal of Innovation Management,* 04(04): 371–389. http://dx.doi.org/10.1142/S1363919600000202

Miles, I. 2005. Knowledge Intensive Business Services: Prospects and Policies. *foresight,* 7(6): 39–63. http://dx.doi.org/10.1108/14636680510630939

Miles, I., Andersen, B., Boden, M., & Howells, J. 2000. Service Production and Intellectual Property. *International Journal of Technology Management,* 20(1): 95–115.

Millot, V. 2009. *Trademarks as an Indicator of Product and Marketing Innovations.* No. 2009/6. Paris: OECD.

OECD. 2002. *Frascati Manual* (6th Edition). Paris: Organisation for Economic Co-operation and Development.

OECD. 2005. *Oslo Manual* (3rd Edition). Paris: Organisation for Economic Co-operation and Development.

Paallysaho, S., & Kuusisto, J. 2008. Intellectual Property Protection as a Key Driver of Service Innovation: An Analysis of Innovative KIBS Businesses in Finland and the UK. *International Journal of Services Technology and Management,* 9(3): 268–284. http://dx.doi.org/10.1504/IJSTM.2008.019707

Pavitt, K. 1982. R&D, Patenting and Innovative Activities: A Statistical Exploration. *Research Policy,* 11(1): 33–51. http://dx.doi.org/10.1016/0048-7333(82)90005-1

Pires, C. P., Sarkar, S., & Carvalho, L. 2008. Innovation in Services – How Different from Manufacturing? *The Service Industries Journal,* 28(10): 1339–1356. http://dx.doi.org/10.1080/02642060802317812

Prahalad, C. K., & Hamel, G. 1990. The Core Competence of the Corporation. *Harvard Business Review,* (May-June).

Rammer, C., & Weißenfeld, B. 2007. *Innovationsverhalten der Unternehmen in Deutschland 2006.* No. 04-2008. Mannheim: Zentrum für Europäische Wirtschaftsforschung (ZEW).

Sandner, P. G., & Block, J. 2011. The Market Value of R&D, Patents, and Trademarks. *Research Policy,* 40(7): 969–985. http://dx.doi.org/10.1016/j.respol.2011.04.004

Schmoch, U. 2003. Service Marks as Novel Innovation Indicator. *Research Evaluation,* 12(2): 149–156. http://dx.doi.org/10.3152/147154403781776708

Schmoch, U., & Gauch, S. 2009. Service Marks as Indicators for Innovation in Knowledge-Based Services. *Research Evaluation,* 18(4): 323–335. http://dx.doi.org/10.3152/095820209X451023

Schricke, E., Zenker, A., & Stahlecker, T. 2012. *Knowledge-Intensive (Business) Services in Europe.* No. EUR 25189: 52. Luxembourg: European Commission.

Smith, K. 2006. Measuring Innovation. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford Handbook of Innovation:* 148–179. Oxford: Oxford University Press.

Strambach, S. 2008. Knowledge-Intensive Business Services (KIBS) as Drivers of Multilevel Knowledge Dynamics. *International Journal of Services Technology and Management,* 10(2/3/4): 152. http://dx.doi.org/10.1504/IJSTM.2008.022117

Tether, B. S., & Hipp, C. 2002. Knowledge Intensive, Technical and Other Services: Patterns of Competitiveness and Innovation Compared. *Technology Analysis & Strategic Management,* 14(2): 163–182. http://dx.doi.org/10.1080/09537320220133848

Toivonen, M. 2004. Foresight in Services: Possibilities and Special Challenges. *The Service Industries Journal,* 24(1): 79–98. http://dx.doi.org/10.1080/0264206041233130114 2

Toivonen, M., & Tuominen, T. 2009. Emergence of Innovations in Services. *The Service Industries Journal,* 29(7): 887–902. http://dx.doi.org/10.1080/02642060902749492

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Verbeek, M. 2008. *A Guide to Modern Econometrics.* John Wiley & Sons.

WIPO. 2006. *Making a Mark: An Introduction to Trademarks for Small and Medium-Sized Enterprises.* Geneva: World Intellectual Property Organization.

Wooldridge, J. 2008. *Introductory Econometrics: A Modern Approach.* Mason, OH: Cengage Learning.

Appendix 1. About the Research

Our online survey yielded 278 responses, which corresponds to a 4.5% response rate. In evaluating the representativeness of our survey, we conducted a unit-non-response analysis to assess whether there are differences between responding and non-responding firms. A standard method to estimate possible differences is a comparison of rapidly responding to late-responding companies, because the latter are most similar to the non-responding companies (Armstrong & Overton, 1977). If both groups show no statistically significant differences, it can be assumed that the survey is representative. In the present case, we used the amount of turnover and the number of employees to compare the two groups. In addition, we carried out a Kruskal-Wallis test to check whether samples differ in the expected value of an ordinal variable, in this case the sector membership of the enterprises. There were no statistically significant differences between the comparison values of the two groups regarding turnover of the companies, number of employees, or sector membership, so we conclude that the survey is representative.

In the case of item-non-response, a complete case analysis was used, which in the regression models consequently ignores the records where one or more of the characteristics is a missing value (Wooldridge, 2009). By doing so, for analysis purposes, only the respectively complete data sets are used.

Research design of first model

The model is partly based on an approach by Rammer (2007), who analyzed the importance of various protective measures, but did not make a distinction between services and KIBS. However, to achieve meaningful results in the very heterogeneous services sector, such a distinction appears essential. Therefore, the present model concentrates on KIBS and additionally accounts for different KIBS industries. We choose an ordinary least squares regression analysis to test the first hypothesis. Because the dependent variable does not have a normal distribution, a Box-Cox transformation (Box & Cox, 1964) was carried out to stabilize the variance of the variable. Table 1 presents the summary statistics and description of the variables used in the model.

For the explanatory variables, we first constructed a dummy variable for each formal intellectual property right that reflects whether the firm uses the protection measure. Trademarks are considered as an additional protection tool, so other intellectual property rights are also taken into account in the model. As informal or strategic measures, we included secrecy, lead-time advantage, and complexity in design, all of which were operationalized as dummy variables that indicate the use of the specific strategic protection tool.

We also controlled for several factors that may influence our dependent variable. The degree of competitiveness is reflected by the number of competitors in Germany. Innovation input is expected to influence innovation output, so we include innovation input in the model, represented by the level of innovation expenditure in relation to the firm's turnover. Firm size is reflected by the number of employees in the KIBS firm. In addition to the explanatory variables, we created dummy variables for the different KIBS industries. To avoid a heteroscedasticity problem, we conduct a robust regression analysis, which is presented in Table 2.

We calculated the variance inflation factors (VIF) to test for multi-collinearity of the explanatory variables. All variables show uncritical values with a mean VIF of the explanatory variables of 1.33. However, a possible existence of endogeneity or simultaneity between dependent and explanatory variables cannot be completely excluded and has to be considered during data interpretation. Seeing the control variables in the model, all show expected signs, with the exception of the amount of competitors, which must be investigated in detail. For the number of competitors in Germany, we observe a very low effect. Within an alternative regression analysis with the exclusion of one extreme value of the variable, only the coefficient is significant because of this specific runaway. Therefore, we must be very careful in interpreting the coefficient for the number of competitors, but the model in general is not influenced.

Research design of second model

All participants of the KIBS survey were asked to give their reasons for registering trademarks and to rank the importance of those reasons on a scale from one to five. The results are shown in Figure 1.

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Table 1. Descriptive statistics of variables used in the first model

Variable	Description	Mean	S.D.	Min.	Max.
Turnover with new services	*Percent of turnover achieved with services introduced in the last three years*	*46.47*	*7.46*	*0*	*100*
Use of trademarks	Firm uses trademarks as protection tool	0.45	0.50	0	1
Use of patents	Firm uses patents as protection tool	0.21	0.40	0	1
Use of copyrights	Firm uses copyrights as protection tool	0.28	0.45	0	1
Use of industrial designs	Firm uses industrial designs as protection tool	0.04	0.19	0	1
Use of secrecy	Secrecy is used for protection	0.35	0.48	0	1
Use of lead-time advantage	Lead-time advantage is used for protection	0.45	0.50	0	1
Use of complexity	Complexity is used for protection	0.35	0.48	0	1
Competitors in Germany	Number of competitors in Germany	1 196	8 992	1	10 000
Innovation expenditures	Total innovation expenditures/turnover	16.16	15.29	1	80
Number of employees	Number of persons employed in the firm	71.12	153.29	3	1 045

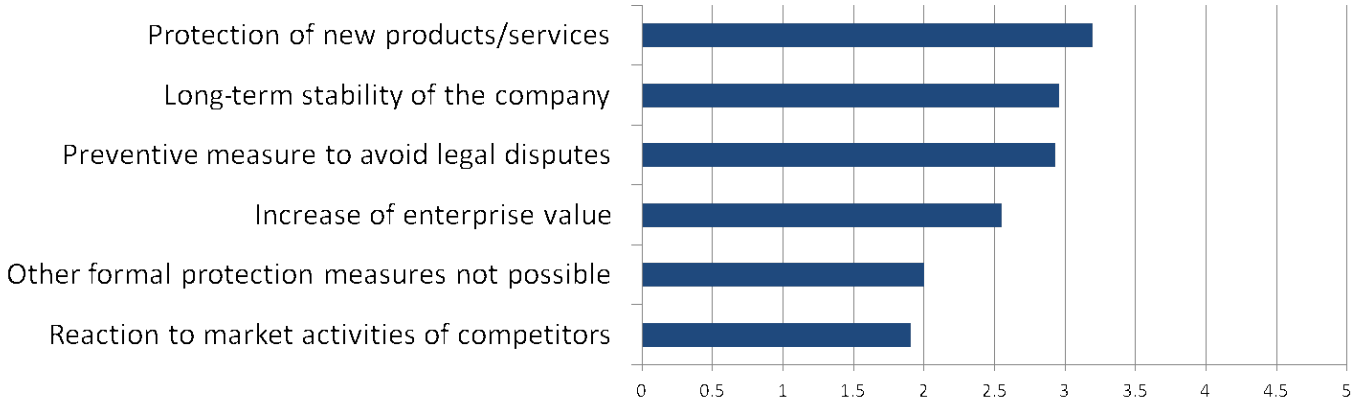

Figure 1. Importance of reasons for KIBS to register trademarks

Answers of responding firms considered in model 3 (n=96), response options ranked from low importance (0) to high importance (5)

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Table 2. Results of the first model

Item	Turnover with new services
Use of trademarks	2.53*
Use of patents	-0.71
Use of copyright	-1.88
Use of industrial design	5.41**
Use of secrecy	0.90
Use of lead-time advantage	-0.80
Use of complexity	1.56
Competitors in Germany	0.000088***
Innovation expenditures	0.059
Number of employees	-0.011***
Publishing of books, periodicals, and other publishing activities	-5.07*
Software publishing	-0.055
Computer programming, consultancy, and related activities	-0.067
Data processing, hosting, and related activities; web portals	-5.55*
Architectural and engineering activities	-4.17**
Technical testing and analysis	0.38
Research and development on natural sciences and engineering	0.56
Research and development on social sciences and humanities	5.13*
Observations	130
R^2	0.267
F	6.41
Prob > F	0.00

OLS regression with KIBS Survey, showing coefficients.
Dependent variable is Box-Cox transformed. Sector "Others" serves as base.
Significance levels are denoted by: *** p<0.01, ** p<0.05, * p<0.1

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To make more precise statements, we first estimated an ordered logistic regression model to examine the impact of a range of explanatory variables on a dependent variable that takes a finite set of ordered values. This process conforms to the first alternative to ordinal-scaled trademark registration with five response options as the dependent variable. In the second alternative, we use a continuous variable that reflects the number of trademark registrations of the firm. This process conforms to the numeric scaled trademark registration as the dependent variable. In this case, we chose a tobit regression analysis over the more common least squares method, because the dependent variable has a censored distribution with a lower threshold of zero percent trademark share on the protection measures. As explanatory variables, we limited the model to the response options presented in Figure 1 and company size, measured by number of employees. Of course, this limitation leads to a model that is not comprehensive, but it is effective to examine the motivations for trademark registrations. Table 3 shows the values of all used variables.

The r-squared values, which are the proportions of variability accounted for by the explanatory variables used in the statistical model, are very low in both alternatives. However, because there is no claim to be complete, according to Verbeek (2009) the comparatively low r-squared values can be ignored in this case. The second alternative also results in a comparatively low significance of the whole model (Prob>chi-square=0.12) due to the fact that our model is consciously and artificially limited to the given response options and therefore completely ignores other explanatory variables. The results of the regression models are presented in Table 4.

Table 3. Descriptive statistics of variables used in the second model

Variable	Mean	S.D.	Min.	Max.
(3a) Trademark registration (ordinal)	*2.28*	*1.21*	*1*	*5*
(3b) Trademark registration (numeric)	*13.96*	*109.00*	*0*	*1 100*
Protection of new products/services	3.25	1.66	1	5
Long-term stability of the company	2.96	1.57	1	5
Preventive measure to avoid legal disputes	2.93	1.58	1	5
Increase in enterprise value	2.59	1.45	1	5
Other formal protection measures not possible	2.02	1.38	1	5
Reaction to market activities of competitors	1.93	1.15	1	5
Number of employees	70.32	152.78	1	1 044

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Table 4. Results of the second model

Reason for Trademark Registration	Trademark Registration (ordinal)	Trademark Registration (numeric)
Protection of new products/services	0.47**	29.51*
Long-term stability of the company	-0.11	-11.17
Preventive measure to avoid legal disputes	-0.23	19.35
Increase in enterprise value	0.28	2.41
Other formal protection measures not possible	-0.01	-11.34
Reaction to market activities of competitors	-0.28	-9.22
Number of employees	-0.0006	-0.032
Observations	96	96
Chi-squared	14	10.26
Pseudo R^2	0.052	0.012
Prob > chi-square	0.051	0.17
Uncensored Observations		61

Ordered logistic regression with KIBS Survey; Tobit regression with KIBS Survey, showing coefficients.
Significance levels are denoted by: *** p<0.01, ** p<0.05, * p<0.1

Citation: Gotsch, M., & Hipp, C. 2014. Using Trademarks to Measure Innovation in Knowledge-Intensive Business Services. *Technology Innovation Management Review*, 4(5): 18–30. http://timreview.ca/article/790

Keywords: knowledge-intensive business services, KIBS, trademarks, innovation, innovation indicator