

Identifying European Cross-Industry inventions in the timeframe from 1980 to 2013 – A Combination of PATSTAT and Amadeus search

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Abstract

In many cases, the borders between different industries are blurring. In such cases, companies need the knowledge from another industry to create inventions and – as follow up - innovations. Mostly companies need to cooperate with companies from other industries. This so-called cross-industry innovation is a phenomenon in different industries which has already been well investigated. Cross-industry innovation is observable at different “smart” products like smart home solutions or smart televisions in which companies combine solutions from formerly different industries.

A very instructive example for cross-industry innovation is given by the steering device “iDrive” from BMW (Enkel, Duermueller 2011, p. 220-221). In the course of time, the number of control elements and devices within a car has increased significantly and the customers were challenged with the operation. BMW was looking for new possibilities to reduce the large number of control devices and to operate the various functions within the vehicle intuitively and simply. By adapting the joystick as a steering device and using a well-known software-based human-computer interface, BMW has created an intuitive control system inside of a vehicle. In this example knowledge from three different industries have been combined, namely games, computers and automotive, to achieve a solution which the customer could use easily and the manufacturer could produce based on standardized components.

The concept of cross-industry innovation is investigated in various research publications (e.g. Brockhoff et al. 1991; Couchman, Beckett 2006; Enkel, Gassmann 2010; Enkel, Heil 2014; Gassmann et al. 2010; Heil 2015; Levén et al. 2014; Lew, Sinkovics 2013; Sammarra, Biggiero 2008), it is based on two strategic approaches (1) the knowledge based view and (2) the open innovation theory which was introduced by

Chesbrough (2003).

The majority of these studies concentrates on cases in which two (and not more) companies cooperate. This leaves the question open if cross-industry innovation takes place in cases with more than two companies, and if so what relevance this – now sharpened – phenomenon has.

To answer these questions, we operationalize cross-industry innovation with the proxy of European patents. We describe a method to identify European cross-industry patents. To get the relevant data we use a patent search on the patent database PATSTAT and a company search on Amadeus database for the industry assignment. We apply time-series analysis on the whole data set and group the received patents by means of cluster analysis.

The core of our method is the identification of European cross-industry patents. In the following we will outline this method in three steps, first commenting on the key characteristics of patent search, second on the industry assignment, third on the validation.

Key characteristics of patent search: We use PATSTAT to identify candidates for cross-industry patents. Therefore, it's necessary to write a search algorithm in SQL. Table 1 gives a short overview of the used key characteristics of patent search. Thus the observed time is restricted between 1980 and 2013. The period after 2013 wasn't observed because patents have got a secrecy time of 18 months, hence this leads to a distortion of the results. We focused on EP patents because the application of EP patents enables companies to get a comprehensive protection. But as these applications are quiet expensive, we assume that companies protect primarily important innovations. To reduce the number of naturally persons in the field applicant it's necessary to implement the application and inventor sequence number. PATSTAT is a relational database and the goal is to prevent redundant data. As a consequence, the name of a person or company is only saved in one field. With two additional fields (applicant sequence number and inventor sequence number) it could be distinguished if the entry in the field person name is an applicant or an inventor or both. For our query the applicant sequence number should be greater as 0 because this and the inventor sequence number should be 0. With the database query 20943 patents could be identified as possible cross-industry patents. Furthermore, these results have to be examined in more detail.

Table 1: Key characteristics of patent search

field	restriction
application filling date	1980-2013
ipr type	PI
application kind	A
application authority	EP
application sequence number	>=1
inventor sequence number	0
number of applicants	>=3

Industry assignment: In a second step the companies of the field applicant have to be assigned to an industry sector. For this step we use the company database Amadeus. This is a database for information about European companies provided by Bureau van Dijk. For technical reasons we have to filtrate the received patents from step one with two filtration phases. In the first filtration phase we remove companies stemming from outside of the EU. In the second filtration phase we filter out the remaining persons (applicants who are not inventors). The remaining number of companies is 4280 which have to be assigned to an industry sector. Therefore we conduct a concordance analysis.

Validation of CI²: In the third step we validate if a candidate for a cross-industry patent is really a cross-industry patent. We checked manually if our conditions are fulfilled for each patent at hand. We found 332 cross-industry patents and defined two major categories (cross-industry patents, R&D cross-industry patents). We call a patent cross-industry patent if it contains at least companies out of three different industries as applicants. As it turned out, the constellation of a cooperation between a company, a university and a research institute represents a high number of hits. We refer to this kind of patents henceforth as R&D cross-industry patents.

With our method, we are able to identify 332 cross-industry patents with at least three different companies or institutions in European patent data (see figure 1). We can observe an overall rise in the number of patents per year. In the 1980ties we could not measure any activity regarding cross-industry patents. In the 1990ties cross-industry patents started on a low level but the number increased in this timeframe. In the timeframe from 2000 to 2009 the number of cross-industry patents grew again, although there was some variance. In the timeframe from 2010 to 2013 we see cross-industry patents on a high level, again with some variance.

While we are able to report first findings for the whole data set, the work is still going on to group the cross-industry patents and to analyse their specifics. This will be done in the next few weeks.

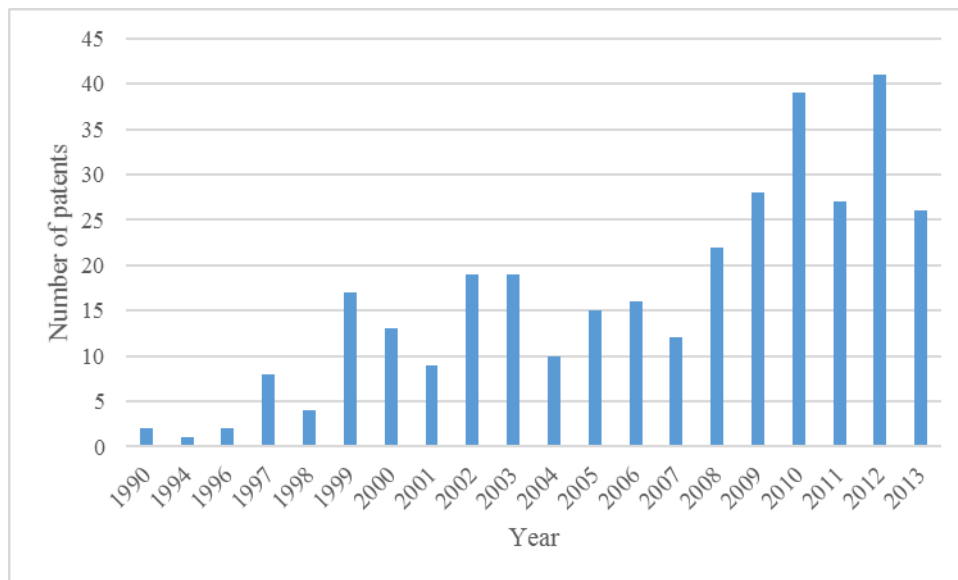


Figure 1: Identified cross-industry patents

Our work has several implications. For academic research we shed light on the relevance of cross-industry innovation in particular on such with three or more companies or institutions. Some questions, that have already been answered for the case of two companies must be evaluated and studied under these sharpened restrictions. For instance, one of these questions is the role that cognitive or geographical distance may play for cross-industry innovation.

For practitioners we present a method to identify cross-industry patents. The results of this method can be used for the identification of the hotspots of cross-industry innovation as well as for competitive analyses (identify competitors with a high rate of cross-industry activities; identify attractive industries and companies therein for cooperation).

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