

The technological acquisitions paradox in the beauty industry

Technological
acquisitions
paradox

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Abstract

Purpose – We address the following research questions: (1) Is the innovation trajectory of the acquirer affected by previous acquisitions? (2) In which direction knowledge recombination from the acquisition is pushed further? (3) Is the technological acquisition more a means for knowledge exploration and radical innovation or, on the contrary, a way for consolidating previous technological specialization?

Design/methodology/approach – The nature of this study is exploratory; therefore, we opted for an inductive approach based on the L'Oréal case study analysis. Data were triangulated from different sources: (a) the L'Oréal website and press releases collected in the 2009–2015 period; (b) journal articles and books on the global cosmetics industry and the insightful work of Jones (2010); (c) the Questel Orbit database containing data on patents; and (d) the Zephyr – Bureau van Dijk database containing information on the acquisitions of firms.

Findings – Empirical evidence from a patent data analysis reveals a paradoxical path. On the one hand, acquisitions enable the company to explore new technological spaces; on the other hand, they allow it to reinforce a preexisting technological trajectory, even when the knowledge base of the target is distant from that of the acquirer. Thus, in our case study, the absorption and recombination of knowledge from a variety of domains support specialization more than diversification technology strategies.

Originality/value – We add to innovation management literature a new perspective, by offering a detailed analysis, through patent data, of the knowledge recombination process, led by technological acquisitions.

Keywords Technological acquisitions, Knowledge acquisition and recombination, Specialization and diversification technology strategies, L'Oréal, Open innovation

Paper type Research paper

1. Introduction

Our work offers an original perspective of analysis on how technological acquisitions and knowledge recombination shape the innovation trajectories of the acquirer company. It does so by embracing an inductive research design, drawing on a single but very powerful case study, which analyses detailed acquisitions and patent data information of a market leader in the beauty industry, namely L'Oréal. As well put by [Chiaroni et al. \(2011\)](#), innovation research is often based on the observation of innovation strategies of high-tech companies, disregarding the wider portfolio of companies innovating in other industries, largely considered as low-tech. The beauty industry represents a peculiar and paradoxical case that illustrates the complexity of the knowledge recombination process, which deserves scientific attention from the innovation management scholars ([Kumar et al., 2006](#)).

Firms' innovation processes have been widely investigated from different perspectives. The current dominant paradigm is the open innovation model ([Chesbrough, 2003](#)), which has come to constitute a new organizational imperative. The model has been implemented in a variety of ways. Some authors have focused on strategic alliances ([Mowery et al., 1996](#); [Doz,](#)



1996; Das and Teng, 2000; Dyer *et al.*, 2001; Rosenkopf and Almeida, 2003; Grant and Baden-Fuller, 2004; Phelps, 2010), while others have studied the breadth and depth of collaborations aimed at innovation (Laursen and Salter, 2006). A small number of studies have highlighted the role of mergers and acquisitions (M&As) in supporting the innovation activity of firms (Cloodt *et al.*, 2006; Puranam and Srikanth, 2007; Grimpe and Hussinger, 2014; Sears and Hoetker, 2014; Orsi *et al.*, 2015), still not precisely addressing the direction of their impact. Although the strategic use of acquisitions to acquire new knowledge and capabilities has become a well-institutionalized corporate phenomenon (Vermeulen and Barkema, 2001; Uhlenbruck *et al.*, 2006), empirical evidence of how firms have recombined acquired knowledge remains scarce. However, it has been demonstrated that open innovation is more effective than closed innovation, and increases employees' performance (Alawamleh *et al.*, 2018). Moreover, while several studies have focused on the role of technological relatedness in leveraging absorptive capacity during acquisitions (Ganzaroli *et al.*, 2016), few have extended their interest to unrelated knowledge (Hagardon, 2003; Schoenmakers and Duysters, 2010) to explore the effect of this kind of knowledge acquisition on the specialization- or diversification-led technological orientation of the acquirer. We analyze these phenomena by defining knowledge as similar, complementary or unrelated to existing knowledge of the acquirer, in accordance with the technological classes in the patent portfolios of the acquiring firm and its target firms. By doing so, we add to innovation management literature by offering a detailed analysis, through patent data, of the knowledge recombination process led by technological acquisitions. In particular, we address the following research questions: (1) Is the innovation trajectory of the acquirer affected by previous acquisitions? (2) In which direction knowledge recombination from acquisition is pushed further? (3) Is the technological acquisition more a mean for knowledge exploration and radical innovation or, on the contrary, a way for consolidating previous technological specialization?

In order to answer the research questions, our work identifies various ways of using the target's knowledge and the different forms of recombination that can affect the technological patterns of knowledge accumulation and growth (Antonelli *et al.*, 2010; Gruber *et al.*, 2013). Technological acquisitions enable acquiring companies to access the target's knowledge, which may be related (similar or complementary) or unrelated to the knowledge of the acquirer. After the acquisition, the acquirer's capacity to exploit this external knowledge (acquired knowledge) depends on the ability of the acquirer to recombine new and owned knowledge to realize novel technological combinations, or to refine known combinations for new uses and applications – developed knowledge (Kogut and Zander, 1992; Carnabuci and Operti, 2013). By matching the characteristics of acquired knowledge and developed knowledge, we can identify how a technological acquisition affects the technological trajectory of the acquirer.

Specifically, thanks to the findings coming from the L'Oréal case study analysis, we have identified and contrasted two possible post-acquisition technological trajectories: specialization and diversification. An acquirer that follows a trajectory of specialization seeks to innovate in its core technology class or in classes with similar technological principles. Conversely, an acquirer following a trajectory of diversification seeks to innovate in new technology classes that are far from its existing knowledge domain. The capacity to balance diverse kinds of acquired and developed knowledge might be the result of ambidexterity or a punctuated equilibrium strategy (Gupta *et al.*, 2006), and might affect both the breadth and the depth of the acquirer's technological portfolio. From this perspective, acquired and developed knowledge respectively represent the input and the output of the recombinant process involved in the technological acquisitions (Hitt *et al.*, 1998).

Data were triangulated from a variety of sources, including press releases, journal articles, books and database records on patents and acquisitions. The paper is structured as follows. Section two presents the theoretical background. Section three explains the methodology.

Section four presents our major findings, which are further discussed in section five. Finally, section six summarizes our main contribution, the implications for theory and practice, and, as usual, limitations and directions for future research.

2. Theoretical background

The speed of technological innovation and the rapid technology obsolescence in high-tech environments has forced innovative companies to shorten the time they spend on research and development (R&D) and to reduce risks while keeping their competitive advantages (Tsai *et al.*, 2018). To be innovators or fast followers in dynamic and highly competitive technological markets, organizations must balance their internal R&D capabilities with external knowledge (Schildt *et al.*, 2005), which they can acquire through collaborations, strategic alliances, joint ventures and acquisitions (Ahuja and Katila, 2001).

Technological takeovers have specific advantages that do not apply to other acquisition modes, since they enable companies to acquire external and consolidated technological inputs quickly, and focus their internal resources and capabilities on recombining acquired knowledge, instead of developing new knowledge *ex novo*, thereby hastening innovation performance, and reducing the time to market. Several studies have shown that a firm's recombination capabilities mainly depend on its absorptive capacity (Cohen and Levinthal, 1990). Zahra and George (2002) distinguished between potential and realized absorptive capacity. Whereas the former involves acquisition and assimilation, the latter focuses on transformation and exploitation. Todorova and Durisin (2007) stressed the iterative links between assimilation, transformation and exploitation. More recently, Patterson and Ambrosini (2015) reconceptualized absorptive capacity for research-intensive firms by focusing on the iterative nature of the assimilation process, which must be developed during, rather than solely after, the acquisition process, and should be continually adjusted throughout the transformation and exploitation phases. These contributions indicate that acquisition and assimilation are necessary but not sufficient conditions for innovation, because they must be complemented by recombinant capabilities (Carnabuci and Operti, 2013; Verhoeven *et al.*, 2016; Nagle and Teodoridis, 2020). On this point, Deng (2010) argued that some firms can acquire and assimilate new external knowledge from targets but may fail to transform and exploit it successfully. Similarly, Vasudeva and Anand (2011) and Orsi *et al.* (2015) focused on knowledge utilization, measuring the extent to which acquirers can use external acquired knowledge to generate innovations.

The importance of existing complementarities between the acquired and the target knowledge bases has been widely emphasized in more recent studies on acquisition processes (Rothaermel and Boeker, 2008; Junni *et al.*, 2015; Makri *et al.*, 2010; Zaheer *et al.*, 2013; Bauer and Matzler, 2014). M&As provide opportunities for firms to complement and renew their knowledge base (Bresman *et al.*, 1999). Thus, knowledge acquisition and knowledge recombination, which involves the exploitation and exploration of internal and external knowledge flows, enable firms to expand their knowledge base by capitalizing on opportunities for both incremental and radical innovation (Chesbrough, 2003; Love and Roper, 2009; Lichtenthaler, 2009). Similarly, Makri *et al.* (2010) highlighted that technological similarity supports incremental processes of innovation while complementary acquisitions lead to discontinuous strategic transformations.

Access to external knowledge sources, combined with internal R&D, might boost a more creative recombination process (Rothaermel and Alexandre, 2009; Lin and Wu, 2010), conducive to explorative rather than exploitative innovation performance (Lavie *et al.*, 2010; Ganzaroli *et al.*, 2016). From this perspective, multiple technological acquisitions can enable companies to develop an ambidexterity strategy to support exploitative and explorative performance by combining technologically differentiated types of knowledge. A repeated

acquisitions strategy provides opportunities for learning (Öberg, 2011) and establishes a routine of exploration, enabling firms to explore “adjacent possible” trajectories (Kauffman, 2000). Such a strategy is conducive to the development of novelties and innovations. The benefits of multiple technological acquisitions depend on a firm’s capacity to recombine similar, complementary or even unrelated external knowledge. This can extend the breadth and depth of the firm’s technological domains (Katila and Ahuja, 2002). In contrast, this process might involve a trade-off between external technology acquisition and internal R&D expenditure when available resources are limited (Kang *et al.*, 2015).

3. Method

Based on the theory of technological acquisitions and knowledge recombination, our work aims at answering three original research questions: (1) Is the innovation trajectory of the acquirer affected by previous acquisitions? (2) In which direction knowledge recombination from acquisition is pushed further? (3) Is the technological acquisition more a mean for knowledge exploration and radical innovation or, on the contrary, a way for consolidating previous technological specialization?

Because the area of investigation is relatively novel, the nature of this study is exploratory; therefore, an inductive approach is appropriate. We focus on the collection of rich quantitative and qualitative data through case study research (Yin, 2003). We do not test hypotheses statistically, but instead, we aim to offer some useful propositions, which we discuss in light of theory and that can be further tested using a deductive approach (Eisenhardt, 1989). In particular, this research uses a single case study design to provide an in-depth analysis of a real-world case (Yin, 1981, 2014; Eisenhardt, 1989). As suggested by Siggelkow (2007, p. 22), “research involving case data can usually get much closer to theoretical constructs and provide a much more persuasive argument about causal forces than broad empirical research can”. The benefits of a case study approach include the ability to combine a broad knowledge of the context with a higher level of detail, supporting a more in-depth understanding of the innovation process in the context of an acquisition strategy. Evidently, focusing on a single case study limits the generalization of results. However, it inspires some interesting propositions able to positively feed the debate concerning the interplay between technological acquisitions and knowledge recombination process. This case study focuses on L’Oréal [1], a large company operating within the beauty industry. This company was chosen for two main reasons. First, L’Oréal is a particularly innovative company, which invests approximately 3% of its yearly sales revenue in internal R&D (Belussi *et al.*, 2016) and has an impressive patenting record. L’Oréal’s portfolio currently includes more than 14,000 patents in 289 four-digit (and 1,372 seven-digit) technological classes (according to our search in the Orbit database). Second, in its history, L’Oréal has carried out many acquisitions, which indicates a strong external growth strategy.

Following Mathison (1988), we aimed to improve the reliability and validity of our research findings through data triangulation. Data were triangulated from different sources. First, qualitative data were retrieved from the L’Oréal website and press releases collected in the 2009–2015 period, as well as journal articles and books on the global cosmetics industry and the insightful work of Jones (2010), in order to explore the L’Oréal’s acquisition strategy and to better classify “technological” acquisitions with respect to “strategic” acquisitions. Then, quantitative data were collected from Zephyr – Bureau van Dijk database, which provided information about acquired targets, and Questel Orbit database, which provided data on L’Oréal and acquired targets’ patent portfolios.

Preliminarily, we started by mapping L’Oréal’s acquisitions from 1928 (the year of the company’s first acquisition) to 2015. We retrieved this information from the Zephyr – Bureau van Dijk database. We counted 52 acquisitions and classified these as either “technological”

or “strategic,” following a widely accepted conceptualization based on two criteria (Ziedonis, 2004; Hung and Tang, 2008; McCarthy and Aalbers, 2016). First, a technological acquisition is defined as involving a target firm that exhibits patenting activity. Where the acquired target continued to operate independently after the acquisition, we also consider its patenting activity after the acquisition. Second, the patents of the acquired firm should be cited in the patent documents filed by the acquiring firm after the acquisition. Patents that are co-assigned to both target and acquirer are excluded, since they are derived from cooperative research activity. Therefore, we analyzed the 14 technological acquisitions in which the target firm had at least one patent cited by L’Oréal after its acquisition. Additionally, we controlled for information collected throughout qualitative data in order to ensure the technological motivation of acquisition.

Then, we followed a three-step empirical strategy, as shown in Figure 1, whereby we first identified the characteristics of what we labeled acquired knowledge (first step). Second, we identified the characteristics of what we labeled developed knowledge (second step). Finally, we assessed the degree to which the acquired knowledge matched the developed knowledge, which informed us about the technological trajectory of the firm after its acquisitions (third step).

Operationally, in the first step, we collected all patents of targets cited by L’Oréal after an acquisition, and then compared the technological classes of the cited patents with those of L’Oréal before the date of acquisition (depending on the target). This enabled us to measure the distance between existing and acquired knowledge according to the technological classes, and in turn to identify the characteristics of the acquired knowledge. Technological classes were defined according to the International Patent Classification (IPC) provided by the World Intellectual Property Organization (WIPO). In so doing, we distinguished between similar, complementary and unrelated knowledge. Acquired knowledge was classified as similar when its technological class was detected in L’Oréal patents portfolio at the seven-digit IPC level. It was considered complementary if it was only detected in the L’Oréal patent portfolio at the four-digit IPC level. Finally, it was considered unrelated if it was completely new to the L’Oréal portfolio of technologies [2].

In the second step, we primarily collected all citing patents (patents filed by L’Oréal that cited targets), in order to compare the technological classes of the citing patents (at the four-

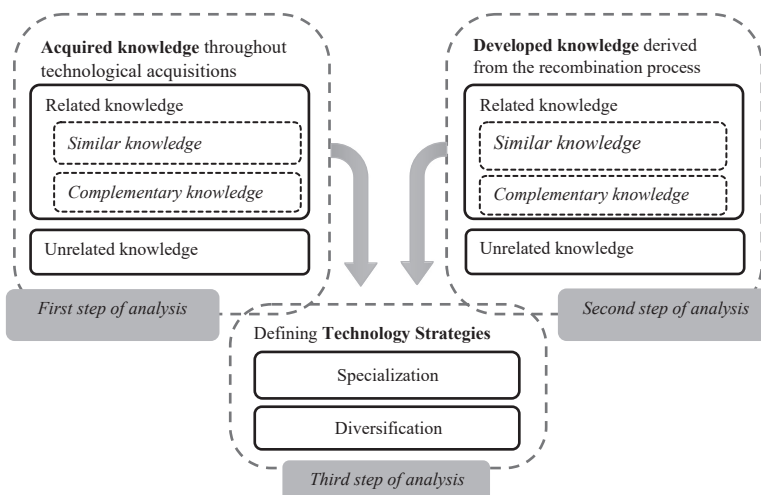


Figure 1. Analytical framework matching acquired and developed knowledge to define the technological trajectory after acquisition: A three-step empirical strategy

and seven-digit IPC level) to the existing technological classes of L'Oréal's portfolio until one year before the priority date. Adopting the same methodology discussed above, we distinguished between similar, complementary and unrelated developed knowledge.

Finally, this enabled us to compare acquired and developed knowledge and to assess (in the third step) whether the L'Oréal's technological trajectory was oriented more toward specialization or diversification.

4. Results

4.1 Characteristics of L'Oréal's patent portfolio

To deepen our understanding of L'Oréal's technological trajectory, and evaluate how it has been affected by technological acquisitions, we mapped the characteristics of L'Oréal's patent portfolio, focusing on the technological classes of the patents. The graph in Figure 2 shows the technological classes reported in the patent portfolio (each year reports the cumulated number of technological classes within a ten-year window). The distribution of the technological classes at the four-digit IPC level is represented in light grey, while the distribution at seven-digit IPC level is presented in dark grey. Figure 2 informs of the existence of two periods. The first period (1970–2010) shows exponential growth in the number of technological classes, suggesting a tendency toward knowledge diversification, while in the second period (2011 onward), a clear pattern of specialization emerges.

4.2 The characteristics of acquired knowledge

To assess the impact of different types of acquired knowledge on the technological trajectory of L'Oréal, we first needed to classify the acquired knowledge (first step in Figure 1). L'Oréal's acquired knowledge is embodied in 91 patents that were exclusively owned by the target and cited by L'Oréal after the acquisition. Knowledge acquired from external sources through

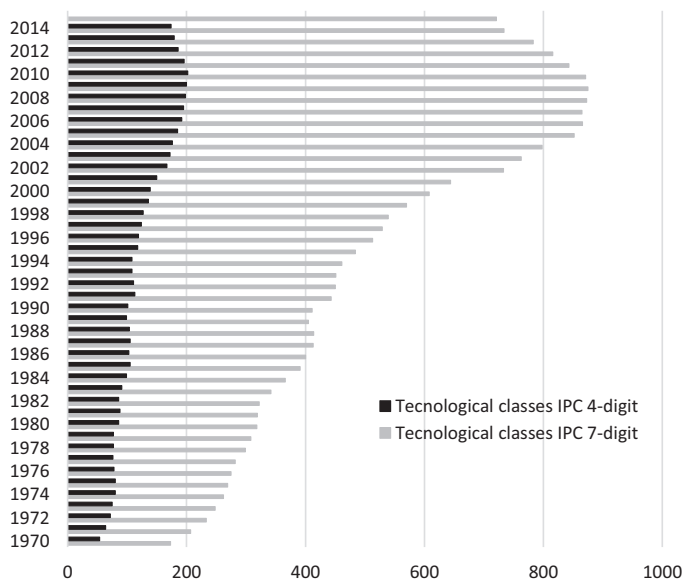


Figure 2.
The evolution of
L'Oréal's technological
portfolio: Distribution
of technological classes
per year (10-year
mobile window)

acquisitions accounted for less than 4% of L'Oréal's invention activity up to 2015, indicating acquisitions had only a minor impact on the innovation performance of the company.

We identified the technological fields to which the patents referred at both the four- and seven-digit IPC level and found that the acquired patents covered 137 technological classes at the seven-digit level and 33 at the four-digit level. We examined the technological classes of the 91 patents of the targets to explore the degree of technological similarity between the acquired knowledge and L'Oréal existing knowledge base before the acquisitions. Operationally, the technological classes (at both the four- and seven-digit levels) of each target patent were compared to the technological classes of L'Oréal patent portfolio before the acquisition to establish whether the acquired knowledge was similar, complementary or unrelated (Table 1).

The data in Table 1 reveal the following important findings.

- (1) Technological acquisitions are based largely on knowledge similarity rather than complementarity or unrelatedness. Table 1 shows that through its acquisitions, L'Oréal mainly acquired knowledge that was similar to its existing knowledge. Of the 137 technological classes associated with the 91 patents from 14 acquisitions, 94 were found in L'Oréal's existing patent portfolio at the seven-digit level, representing similar knowledge; 43 were found at the four-digit level, representing complementary knowledge; and only 11 classes were new to the portfolio, representing unrelated knowledge.
- (2) The company's acquisition strategy appears to have developed in two main phases. In the earlier phase, up to 1996, L'Oréal may have followed a polarized search strategy. In this period, it extended the depth of its knowledge portfolio by mainly

Target	Year of acquisition	Targets' patents		Acquired knowledge		
		# Cited patents	# Tech. classes	Similar	Complementary	Unrelated
BIO THERM	1970	2	9	6	1	2
SANOFI/ SYNTHELABO	1973	23	75	32	36	7
HELENA RUBINSTEIN	1984	2	7	7	0	0
MENNEN	1988	19	21	17	3	1
ROCHE POSAY	1988	4	22	22	0	0
DELALANDE	1991	2	20	16	4	0
MAYBELLINE	1996	18	23	22	1	0
SOFT SHEEN	1998	6	2	2	0	0
CARSON PRODUCT	1998	5	7	7	0	0
UEMURA	2000	2	5	5	0	0
SKINCEUTICAL	2005	1	6	6	0	0
The BODY SHOP	2006	3	5	5	0	0
YSL BEAUTE	2008	1	11	11	0	0
COLORIGHT	2014	3	13	12	0	1
TOTAL		91	137	94	43	11

Note(s): The sum of technological classes covered by the patents of the acquired firms (at the seven-digit level) is larger than 137, since a patent can refer to different technologies and the same technology might be included in different patents. Moreover, the same acquired technologies, which are unrelated in a given acquisition, might be classified as similar or related in successive acquisitions when they are effectively used to expand the breadth of L'Oréal's technological portfolio. This explains why the sum of similar, complementary and unrelated technologies is not equal to the total

Table 1.
Characteristics of the
acquired knowledge

tapping into similar knowledge but also exploring unrelated knowledge. In the second period, the search strategy focused solely on similar knowledge, except for its takeover of Coloright. The company's takeover of Coloright represents the only exception. In the first phase, L'Oréal acquired important large and diverse targets, such as Sanofi, Mennen and Maybelline, which enabled it to access differentiated knowledge bases, some of which were related and some unrelated to its existing knowledge, in the search for breakthrough innovations. In the second phase, the acquisition strategy appears to be oriented toward the acquisition of more specialized targets. This mirrors a clear-cut research process, focused on improving existing technologies rather than discovering new technological trajectories.

4.3 The characteristics of developed knowledge

To connect the acquired knowledge to the company's technological trajectory, we had to identify the nature of the developed knowledge (second step in [Figure 1](#)). The developed knowledge is embodied in 466 citing patents of the acquiring firm. L'Oréal's citing patents covered 170 technological classes at the seven-digit level and 48 classes at the four-digit level. As explained in the methodology session, the characteristics of the developed knowledge can inform us whether L'Oréal's innovation trajectory was one of specialization or diversification. By studying the developed knowledge, we can gain insights into the recombination capabilities of the company, which leverages knowledge acquired by the targets and recombines this with its accumulated preexisting knowledge to develop an innovation strategy based on the creation of new technologies.

The data in [Table 2](#) reveal the following important findings.

- (1) L'Oréal's exploitation and recombination processes were primarily oriented toward increasing the specialization of the company's technological trajectory. Most of L'Oréal's patents that cite acquired knowledge from targets relate to technological classes already associated with its patent portfolio, indicating a path-dependent technological trajectory.
- (2) We can observe two main phases. In the first phase, before 1998, acquired knowledge only occasionally contributed to the process of diversification. The findings show that only in about 5% of the cases was acquired knowledge effectively used to develop complementary (4.15%) and unrelated (1.28%) technological trajectories. In the second phase, after 1998, the trajectory is largely one of specialization.

4.4 Comparing acquired and developed knowledge

The similar distribution of data in [Tables 1 and 2](#) suggests a potential correlation between the activities of exploration and assimilation and those of exploitation and recombination. A cross-tabulation analysis enables us to assess how different forms of acquired knowledge affected the development of technological specialization or diversification (third step in [Figure 1](#)).

The analysis reveals that L'Oréal mainly used the external knowledge it acquired from technological acquisitions to intensify the specialization of its own knowledge base. [Table 3](#) shows that the knowledge recombination process involved mainly acquired knowledge that was similar to the company's existing knowledge and was used to develop knowledge that was also similar (82.13% of cases). Column conditional percentages (the first value in brackets) disclose that different types of developed knowledge mainly rely on similar acquired knowledge (similar acquired knowledge affects the 82.7% of similar, 73.21% of complementary and 69.56% of unrelated developed knowledge). Row conditional percentages further stress that different types of acquired knowledge mainly affect a

recombination process, which increased the specialization of L'Oréal's patent portfolio. After the acquisition, Biotherm continued to operate independently, and in 1976, it was granted a patent (family ID US4187291) that referred to the technological classes A61P-003 (drugs for disorders of the metabolism) and A61P-029 (non-central analgesic, antipyretic or anti-inflammatory agents, such as antirheumatic agents and non-steroidal anti-inflammatory drugs), which were new to the L'Oréal knowledge domain. Interestingly, L'Oréal only used that knowledge effectively in 1990, when it was granted a patent (family ID 3921276) citing Biotherm's invention. L'Oréal's patent exploited Biotherm's unrelated knowledge on the cosmetic composition of a skin treatment with an anti-inflammatory or anti-edematous agent to aid slimming and prevent cellulite. This innovation constituted an incremental step in L'Oréal's technological portfolio rather than a new direction. In summary, even though the takeover led to the acquisition of unrelated knowledge, this knowledge was exploited to increase the specialization rather than the diversification of the company's technological portfolio.

- (2) The second example concerns the exploitation of knowledge acquired from Mennen in 1988. As a result of this takeover, L'Oréal recombined some unrelated knowledge from Mennen concerning a container with a roller element to dispense liquid (Mennen's patent US3095598 of 1960, referring to the technology class B43M-011) with its existing knowledge domain in another incremental step on its innovation path. This knowledge was used by L'Oréal to devise a new container/applicator comprising a reservoir for the product and an applicator (L'Oréal's patent 24913 in 2000), a technology that is useful for the application of "liquid powders" and that, therefore, relates to the company's traditional fields of makeup and skincare.
- (3) The third case considered is the takeover of Sanofi-Synthelabo by L'Oréal in 1998. In this case, the unrelated knowledge acquired through the acquisition was used to enhance L'Oréal's traditional technological patent portfolio, which was largely based on technologies related to beauty treatments. L'Oréal used an original Sanofi-Synthelabo patent filed in 1998 (family ID US6767533), which referred to the technological class C12N-001 (concerning the process of preparing compounds or compositions using microorganisms or enzymes), for the preparation of skin treatments. The patent specifically described a composition containing a peripheral benzodiazepine receptor ligand for topical use to treat cutaneous stress. L'Oréal's citing patent (family ID 14346750), which was registered in 2004, applied this new technology to create a medicament (or dietary agent) for oral administration, which contained blueberry extract, antioxidants and micronutrients to benefit the skin. This opened up a technological new field, nutritive cosmetics and several breakthrough innovations in the beauty sector, related to pills to improve skin and hair. However, these radical innovations were part of a consolidated specialization pattern.
- (4) More recently, in 2014, L'Oréal exploited unrelated knowledge with its takeover of Coloright. We specifically refer to patent 44664471, which is for a dispenser for a composition to treat keratinous fibers (registered in the technological class B01B-001, concerning boiling apparatuses for physical or chemical purposes). L'Oréal used this technology to develop a system for dispensing makeup and hair coloring appliance (see L'Oréal's patents 73234887 and 73093016 of 2014), which was linked to its existing technological core.
- (5) With the technological acquisition of Synthelabo in 1973, L'Oréal was able to access a large amount of external knowledge. Although most of this knowledge was similar to

L'Oréal's existing knowledge, some of Synthelabo's patents included some unrelated knowledge, such as a patent registered in 1975 (family ID 165629) for a new technology (A61P-025 referring to drugs for disorders of the nervous system) within the class A61P (specific therapeutic activity of chemical compounds or medicinal preparations). An analysis of the two L'Oréal patents filed in 1989 (family IDs 12977479 and 62266232) in which Synthelabo's patent was cited indicates that L'Oréal mainly used this new technology within its core specialization to develop thickening agents for its products in the cosmetic field, particular for lipsticks, nail varnishes and creams. However, these thickening agents could also be used in other unrelated fields, such as liquid carbonaceous fuels (C10L-001). This enabled L'Oréal to protect its inventions in many technological fields.

- (6) Another example is a Mennen patent (family ID 59971699) cited by L'Oréal in 1997. The invention was a cosmetic composition containing the thickening agent siloxane polymer. In 2004, L'Oréal filed a patent (family ID 968564) in which this component was used in compositions containing keratin and keratinous materials. Again, this strengthened L'Oréal's core knowledge base.

5. Discussion

This article comprises a historical analysis of L'Oréal's innovation strategy in relation to its significant technological acquisitions. The first finding concerns the extent to which this leading global firm, during the last four decades, based its innovation activity on a model of closed innovation. In fact, of its intensive knowledge production, covering (more than) 14,000 EU patents registered by L'Oréal (Orbit database, 1928–2015), only a small portion is from the recombination of external knowledge deriving from takeovers. Only 14 of L'Oréal's 52 acquisitions were related to technology. Thus, external acquisition of knowledge appears to have played a marginal role (only 91 patents of L'Oréal's patents cited targets that the company had acquired) in the company's innovation strategy, with developed knowledge derived from the recombination process accounting for less than 4% of its cumulative inventing activity. The case of L'Oréal presents a challenge to the imperative of open innovation and shows the effectiveness of the old internal model of innovation. The evidence we collected enabled us to trace L'Oréal's technological trajectories, which indicate an internal linear model of knowledge accumulation studded by a small sequence of technological acquisitions of companies that generally owned knowledge that was similar to L'Oréal's existing knowledge.

In particular, our findings confirm that the absorption of similar and complementary knowledge is conducive to an innovation trajectory that strengthens the firm's technological specialization. The acquisition of similar knowledge is less costly for an organization and better supports the transformation of acquired knowledge into exploitable knowledge (Deng, 2010). Firms more easily recognize and absorb external knowledge close to their existing knowledge base (Cohen and Levinthal, 1990), because they can easily spot its potential. Consequently, acquisition strategies are more often directed toward firms operating in close knowledge domains, where the result of knowledge recombination is more predictable, making the acquisition less risky. However, the closeness between the acquirer's and the target's knowledge bases and the technological overlap limits the innovative output (Nooteboom *et al.*, 2007). Similarly, technological proximity reduces the acquirer's opportunities for learning (Hitt *et al.*, 1996), resulting in an incremental rather than a radical innovation process. Thus, it has been claimed that the development of radical innovations might depend more on access to knowledge from different scientific domains and knowledge sources, on the condition that the distance is not

too large (Colombo and Rabbiosi, 2014; Cassiman and Veugelers, 2006; Sears and Hoetker, 2014). This aligns with recent studies on regional innovation policies, which have found technological relatedness to be a critical driver of technological development and progress (Boschma, 2017; Apa *et al.* 2018; Balland *et al.*, 2019). Makri *et al.* (2010) argued that related knowledge can include not only similar knowledge but also complementary knowledge, both of which can contribute to a specialization path (Ganzaroli *et al.*, 2016). Therefore, Proposition 1 is derived.

Proposition 1. Technological acquisitions enable companies to increase their technological specialization through a recombination process that exploits similar or complementary knowledge from the target.

When the technological distance is significant, the invention process may be more complex and costly (Nooteboom *et al.*, 2007). Nevertheless, several studies have highlighted that technological unrelatedness can trigger more radical forms of invention (Phene *et al.*, 2006; Frenken *et al.*, 2007; Castaldi *et al.*, 2015). In such cases, external knowledge acquisition can increase a firm's ability to profit from path-breaking (Nagle and Teodoridis, 2020). This finds theoretical justification in the Schumpeter's idea (1911) that radical path-breaking innovations result from novel combinations of knowledge. However, unrelated knowledge combinations remain unexplored as sources for new path development and structural change (Grillitsch *et al.*, 2018; Miller *et al.*, 2007). Often, the process of creating radical breakthrough technologies through acquisition requires novel competences and high coordination abilities, the lack of which can hinder innovation (Grigoriou and Rothaermel, 2017).

Research has shown that non-equity venturing alliances are more likely to be useful for explorative learning than joint ventures or acquisitions (Schildt *et al.*, 2005). Interdivisional knowledge among diverse firms has a stronger impact on the quality of innovation than knowledge that exists within the boundaries of a single firm. This supports the hypothesis that the most diverse types of knowledge trigger the most radical forms of innovation (Miller *et al.*, 2007).

The acquisition of unrelated knowledge is usually costlier and riskier because of the technological distance between the acquirer's and the target's knowledge domains. Low levels of absorptive capacity can further inhibit a firm's ability to transfer and integrate new unrelated knowledge. Conversely, firms with significant experience of M&As and high levels of absorptive capacity can overcome technological distance and more efficiently support the knowledge recombination process, which, nevertheless, leads to sustain pre-existing technological trajectories, obeying to a specialization path. Despite the potential for radical innovation from the acquisition of companies owning unrelated knowledge, the case illustrates that even when the process of exploration of distant knowledge domains is available, the company prefers to use that knowledge to reinforce the technological specialization, creating products and technologies that conformed to its preexisting technological patterns. Hence, we propose the following proposition:

Proposition 2. Even if technological acquisitions enable companies to adopt a technological diversification trajectory through a recombination process that exploits complementary or unrelated knowledge from the target, the acquirer tends to use the acquired knowledge for reinforcing its specialization.

Paradoxically, the case informs that in case of development of unrelated knowledge, this was due to the exploitation of the collaboration with acquired companies specialized in related knowledge domains. This is the most interesting result of the study, which asks for further

testing by scholars willing to deepen the “dark side” of open innovation, which, as our case illustrates, is not necessarily conducive to radical innovation.

Proposition 3. Radical innovations can derive from the close knowledge recombination, and not necessarily coming from the exploration of distant knowledge through acquisitions.

Overall, our analysis shows that L’Oréal’s innovation strategy was strongly path dependent. L’Oréal did not use the open innovation approach to explore new knowledge domains. Rather, it engaged in repeated acquisitions to develop its existing technological trajectory through the realization of incremental innovations that have strengthened its technological specialization. This trajectory aligns with [Hargadon’s \(2003\)](#) argument that innovators rarely come up with completely novel ideas; instead, they recombine old ideas into new ones, adapting them from one context to another. This is supported by the fact that in some cases, L’Oréal used similar knowledge acquired from the target to develop unrelated knowledge, which suggests that a high level of specialization is required for innovation in more distant domains. Since its first patent, for a hair dye formula containing a blend of harmless chemical compounds, which was filed on the 24th March 1908 by the company’s founder, the French chemist Eugène Schueller, L’Oréal linked the company’s growth with the development of the global “market of beauty.” Its strong innovation strategy enabled the company to become the undisputed “queen” of the beauty industry.

Our empirical evidence shows that in large organizations, invention is still the result of a long accumulation process, predominantly based on the recombination of existing knowledge owned by the organization for new uses and applications. As [Schoenmakers and Duysters \(2010\)](#) emphasized, recombining existing knowledge can lead to very important innovations and sometimes to new knowledge related to an entirely new domain. An emblematic case is that of hair dyeing shampoo, which combines competences in shampoo production and hair dye production.

To sum up our evidence and open a discussion on the effects of technological acquisitions on the innovation trajectories of firms, we propose a taxonomy of knowledge recombination through acquisitions, shown in [Figure 3](#).

Four innovation trajectories can be identified: (1) pure specialization, (2) recombinant specialization, (3) related diversification and (4) pure diversification. The first trajectory pertains to companies seeking to exploit their core competences and reinforce their competitive advantage as leaders in the market through the acquisition of companies with similar knowledge. The second is typical of companies that are engaged in innovative

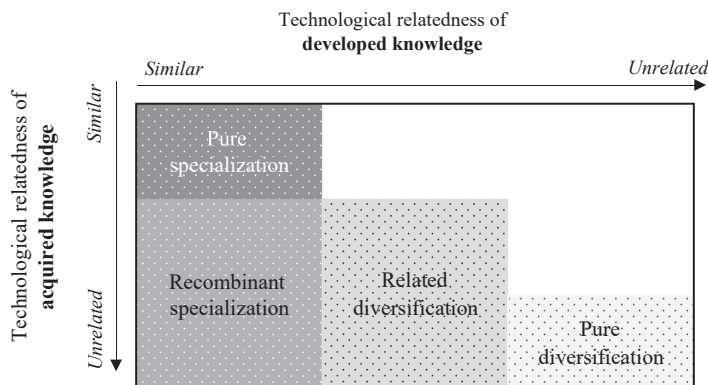


Figure 3.
A proposed taxonomy of knowledge recombination through technological acquisitions

collaborations with partners and suppliers and that decide to vertically integrate members of their network to internalize complementary knowledge, thereby strengthening their core competences. The third concerns companies that search for complementary or unrelated knowledge to explore new trajectories in conjunction with a related diversification pattern. The last trajectory relates to companies that search far from their own domain of knowledge for unrelated knowledge and acquire companies that can enable them to explore new trajectories and develop technologies not considered in their past innovation strategies.

6. Conclusions

6.1 Contribution

This paper explores the impact of technological acquisitions on the knowledge recombination process involved in the innovation activity of L'Oréal, a leading firm in the beauty industry. We explored the extent to which the focal firm assimilated different types of knowledge throughout technological acquisitions; then, we investigated the extent to which the acquired knowledge contributed to the specialization or diversification of the company's technological trajectory. The most interesting evidence that emerged from our empirical analysis is presented below.

The most important result is that the role of an acquired external firm's knowledge in an acquisition is not particularly relevant in quantitative terms: only about 3% of L'Oréal patents have cited a patent of an acquired company. This reveals how the process of invention and innovation at L'Oréal is prevalently based on a closed innovation model (Balconi *et al.*, 2010), which is built on the ability to create and accumulate knowledge internally. While external knowledge sourcing plays a role in the company's innovation strategy, the classical process of closed innovation based on internal knowledge generation is more important (Grigoriou and Rothaermel, 2017; Manzini *et al.*, 2017; Knott and Vieregger, 2020). Classifying the company's acquired knowledge in terms of similar, complementary, and unrelated knowledge, shows that the flows of knowledge coming from outside are mainly composed of similar and complementary knowledge. The acquisition of unrelated knowledge is a rare phenomenon in L'Oréal's history and has not led to a flow of radical innovations. Quantitatively, similar knowledge appears to be more important than complementary knowledge, although both have played a role, contributing to extending the depth more than the breadth of L'Oréal's patent portfolio.

6.2 Theoretical implications

We contribute to innovation management literature by offering evidence of a paradoxical use of external knowledge from technological acquisitions, being it close or far from the consolidated technological trajectory of the company. We observed, in fact, a persistent trend towards the strengthening of pre-existent technological specialization, providing evidence of a clear path-dependent innovation model, which is, nevertheless, successful in the beauty industry. Moreover, our findings suggest caution in claiming the primacy of the "new" open innovation model over the "old" closed innovation model. Not all successful firms base their innovation strategy on an open innovation model, and when they decide to combine closed and open innovation models, they might go for a marginal adoption of the latter. Indeed, in these cases knowledge recombination through acquisitions lead to sustain a path-dependent innovation process (Nerkar, 2003) rather than an exploration and innovation trajectory.

Consequently, we recommend caution when examining the innovation strategies of successful firms, which might base their competitive advantage on the ability to reinforce core competences, with limited recourse to external sourcing. It appears that a greater reflection is required on the relationship between the resource-based view (and the dynamic

capabilities perspective), on the one hand, and the M&A and collaboration perspective, on the other (Bogers *et al.*, 2019). Further research might test the validity of our arguments in different companies and fields of specialization. The cases of Apple and Tesla seem to represent similar approaches to innovation and may be fruitful to investigate. We have proposed a taxonomy of knowledge recombination through acquisitions, which might guide future researchers in studying the possible output of an innovation strategy through acquisitions. Our results might find support in complementary empirical evidence arising from analyses of other firms in the beauty industry or in other industries.

6.3 Managerial implications

Our research also sheds light on the management of acquisitions, and on their role in supporting the growth of an innovative company. Managers should be able to use technological acquisitions as a tool to sustain the core competences of a firm through the absorption of related knowledge from a pool of selected partners. A broad sourcing strategy might not be the most remunerative. According to Laursen and Salter (2006), when the sources of knowledge for an innovation process exceed a certain level, coordination and knowledge recombination requires excessive effort.

Therefore, when considering an open innovation strategy, companies should consider the extent of their reliance on external knowledge sources, and compare this with a strategy of leveraging internal R&D alongside an open innovation management.

6.4 Limitations and further research

We acknowledge that our research has certain limitations, mainly connected to our choice to study a single case, and to limit our analysis to few different types of knowledge. Nevertheless, we believe that evidence from a single case study can provide more fine-grained insights into the knowledge recombination processes compared to a more general study. This has also enabled us to isolate the innovation strategies at the firm level, obtaining some results that suggest an alternative approach to the open innovation model. Further research on different companies, or sectors, might enable us to apply our analytical framework to other contexts, testing the validity of our taxonomy.

Notes

1. All the information used in this research and concerning L'Oréal case study is publicly available.
2. At either the four- or seven-digit IPC level.

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