



Crossing industrial boundaries at the pharma-nutrition interface in probiotics: A life cycle perspective



Sabine Bornkessel^{a,*}, Stefanie Bröring^b, S.W.F. (Onno) Omta^c

^a University of Applied Sciences, Oldenburger Landstr. 62, 49090 Osnabrück, Germany

^b University of Bonn, Meckenheimer Allee 174, 53115 Bonn, Germany

^c Wageningen University, P.O. Box 8130, 6700 EW, Wageningen, The Netherlands

ARTICLE INFO

Article history:

Received 20 October 2015

Received in revised form 21 October 2015

Accepted 21 October 2015

Available online 1 December 2015

Keywords:

Converging industries

Cross-industry innovation

Life cycle concept

Functional ingredient

Probiotics

ABSTRACT

The aim of this paper is to advance the research on innovation at the pharma-nutrition interface by analysing the three steps of science, technology and market convergence in the area of probiotics using a life cycle perspective. Results from a bibliometric analysis drawing upon 8245 scientific publications, 2082 patents and 1357 news reports focussing on product launch announcements from 1990 up to 2009 indicate that the proposed curve shapes of the life cycles in the theory based framework can be transferred to the case of probiotics. There is a time shift considering the life cycles showing the same activities of the industrial sectors at different moments of time. The food sector dominates the field of probiotics by driving science, technology and market convergence showing earlier activities in scientific publications, patents as well as product launches, while presenting a higher clockspeed between the different life cycle phases. While the food sector dominates product launches for food products containing probiotics, the pharmaceutical sector dominates the product launches of the supplement market. In addition, a clear trend towards industry convergence can be identified by the growing number of cross-industry activities.

© 2015 Elsevier B.V. All rights reserved.

1. Introduction

For almost 40 years, the idea of converging industries has fascinated researchers and practitioners alike. First studies can be observed in the late 1970s with the initial identification of convergence in the area of the computing and telecommunication systems [1]. Subsequently, with the growing interest in this research field numerous studies exist which focus on the overlapping segments triggering the emergence of a new industry field of information and communication technology (ICT) [e.g. 2–5]. Another but less well understood example of convergence is the nutraceuticals and functional food sector which emerges at the interface between the food and the pharmaceutical industry [6]. This industry segment comprises products delivering nutritional as well as health value. The converging segments of food and pharma are characterised by cross-industry activities [7] resulting in rapid market changes.

These rapid market changes in converging industries can be analysed by means of life cycle concepts [e.g. 8,9] as in general life

cycles are defined as “a progression through a series of differing stages of development” [10]. Considering the distinct concepts of life cycles, these focus on various objects like products, technologies, organisations or industries [8]. Although there are some attempts to relate specific concepts like the patent life cycle [11] to converging industries [12,13], the literature on applying life cycle concepts to measure convergence processes is rather scarce in general and, yet, has not seen a wide application on the setting of pharma-nutrition convergence. Furthermore, the literature regarding the evaluation of converging industries addresses mainly the front end of the process including science and technology convergence. These studies focus on the anticipation of convergence processes convergence [see for instance 14]. Hence, literature regarding the assessment of market convergence is rather limited, particularly in the emerging area at the borderline of foods and drugs.

Related to this particular case, a growing number of different functional ingredients has become available on the food market especially within the last decade [15]. Accordingly, the food ingredient category of *probiotics* presents a rather young group beside the more classical functional ingredients like vitamins and minerals. Food products containing probiotics are of a high relevance for the rapidly changing food market and the related

* Corresponding author.

E-mail addresses: s.bornkessel@hs-osnabrueck.de (S. Bornkessel), s.broering@ilr.uni-bonn.de (S. Bröring), onno.omta@wur.nl (S.W.F. (Onno) Omta).

innovations [16]. From a market perspective, dairy products enriched with probiotics are one of the most successful functional foods on the market, especially looking at the rise of the new category of daily-dose drinks in small bottles [17]. Probiotics are defined as “live microorganisms, as they are consumed in adequate numbers confer[ring] a health benefit on the host” [18]. Probiotics belong to a group of functional ingredients that may improve gut health and boost the immune system [19].

In this context, the overall aim of the paper is to analyse cross-industry activities in convergence at the interface of the food and pharmaceutical sector using the example of probiotics. In doing so, the first three steps of science, technology and market convergence are analysed from a life cycle perspective—especially including the evaluation of market convergence as the consecutive step following science and technology convergence. Based on bibliometric data sets including scientific publications, patents as well as news reports, life cycle indicators are applied to the process of industry convergence. As the existent literature on the application of the life cycle concept to convergence processes encompassing cross-industry activities is rather scarce, we follow an exploratory approach leading to a research framework to assess science, technology as well as market convergence.

2. The life cycle concept in convergence processes

2.1. Cross-industry activities in convergence processes

Industry convergence has been presented in the extant literature by using various definitions. These definitions share the common idea, which is summarised by the Organisation for Economic Co-operation and Development (OECD) as follows “the blurring of technical and regulatory boundaries between sectors of the economy” [20]. This implies that formerly distinct industrial areas start to produce similar products in an emerging field of new approaches like for example, the telecom industry and camera technology sector developing the new segment of camera phones [21] or the segment of nutraceuticals on the interface of the pharmaceutical and food sector leading to borderline products like probiotic yoghurts [22].

Moreover, dimensions of industry convergence are discussed as a process rather than a steady state [e.g.,12,14,21,22]. One approach is the description of the consecutive steps: science, technology, market and industry as an idealised time series of events leading to a complete convergence of two hitherto distinct industrial sectors. The initial step implies that distinct scientific disciplines begin to cite each other in interaction with first collaborations of scientific disciplines. The decreasing distance between applied sciences and technology development is defined as the second step. The subsequently new product-market combinations indicate market convergence. The final step of industry convergence incorporates fusion of firms or industry segments [14,21]. Thereby, with an increasing level of diversification during convergence processes companies perform best when they are more integrated in different knowledge resources [23] which could be resembled by cross-industry activities of companies from distinct industrial backgrounds.

As convergence processes are based on the activity of different industrial sectors, cross-industry activities occur during this merging process [7]. Cross-industry innovation is based on knowledge, technologies, and partners with a high cognitive distance which remains a current research field on innovation management [24], as the resulting radical innovations are of a high relevance for companies [25]. The need for the different competences of the different industrial sectors might lead to competence gaps of the involved firms [26]. Furthermore, the stretch of resources to serve the adjacent industry, resp. emerging

inter-industry segment might result in competence gaps [26] since innovation barriers are industry-specific [27]. Companies’ strategic actions to close the arisen competence gaps encompass the internalisation of external assets for instance through the acquisition of companies or strategic alliances [28,29]. Thus, the competence base of hitherto distinct industry sectors starts to become alike.

The research setting of this study of probiotics belongs to the functional food sector, as a new inter-industry segment between the food and pharmaceutical sector. The research and development investments of the European food industry is much lower than in other sectors [30] as for example in the pharmaceutical sector. The pharmaceutical sector is characterised as a research-intensive sector [31]. This leads to strong competences in research and development for the pharmaceutical sector whereas the food sector is more consumer market-oriented [22]. In other words, the core competences of one sector will appear as competence gaps of the other sector while the research and market areas of these two sectors converge. Although external collaborations along the value chain seems to be underdeveloped in the food sector [32], collaborations in the emerging area of functional foods will become increasingly important due to the growing market interest.

The subsequent theoretical perspective to analyse cross-industry activities in convergence processes is based on the life cycle concept, which originated in biology and is adapted in marketing research [9,33]. The steps are commonly defined as introduction, growth, maturity and decline [8,9]. One possibility to categorise the different approaches is the framework delivered by Höft [for a detailed description see 8]. This categorisation is based on the different objects of life cycles: products, technologies, organisations and industries. Thereby, the technology life cycle respectively the industry life cycle are both concepts, which aggregate the underlying life cycles of products respectively organisations on a higher abstraction level [8,34]. Furthermore, specialised concepts focussing on one certain area of life cycle concepts are described in literature. For instance, the patent life cycle introduced by Ernst based on the s-curve concepts of technologies [11]. As a further example, the product generation life cycle extends the product life cycle perspective incorporating the sum of the product life cycles of the associated products which are connected to one product generation [35,36].

In literature, technology life cycles are often combined with an analysis of patent data leading to a patent life cycle [11,37]. The patent life cycle can be divided into the three phases of *emergence* showing a slight increase in the amount of patent applications, followed by a *consolidation* phase leading to a high increase in patent applications during the *market penetration* of a technology [11]. In derogation from the traditional life cycle concept, the patent life cycle considers a consolidation phase between the emergence (introduction) and market penetration (growth). This consolidation phase describes the reorientation of research efforts based on first market experiences of the new technology [11].

Patent analyses are used for the depiction of technology life cycles [37] as well as for the description of ongoing processes in the context of converging industries, especially to scrutinise technology convergence [see for instance,38–40]. Therefore, the usage of patent data as a measurement tool for technology life cycles, which in turn are used to describe converging industries, presents a current research field [41]. Especially for industrial sectors arisen at the interface of pharma and nutrition like the medical nutrition sector, the consideration of patent data is of importance due to the protection of intellectual property [42]. In addition, (industry) life cycle concepts hardly consider the dynamics of relationships between actors from different industries [43]. However, these

Download English Version:

<https://daneshyari.com/en/article/2564406>

Download Persian Version:

<https://daneshyari.com/article/2564406>

[Daneshyari.com](https://daneshyari.com)