

# Business Ecosystems in Healthcare Industry: A Framework of Analysis

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## Abstract

*The current research aims to discover the main differences between the proposed linear model of business ecosystems structures in comparison and the classical model. The research approach resides on the proposed business ecosystem linear model of analysis. Thus, in this paper the research methodology is based on literature review in order to identify the main components of the proposed framework. Also, there was conducted an exploratory research and based on case study approach there was highlighted the main differences between the proposed and classical frameworks by gathering evidences from the companies that represent the major stakeholders in the north-east region of Romania.*

*The main result was to provide a new framework of business ecosystem analysis based on the evidence from the health care sector. Also, to highlight the relevance of the linear business ecosystem model development in comparison to the classical one within the current state of the art. Thus, to propose an integrative framework applied in health care sector as the main collaborative instrument whose main objective is to provide relevant insights on business ecosystems performance. From this point of view, the proposed framework of analysis could provide an important mechanism applied in different industries in order to ensure business sustainable growth and performance measurement. This paper demonstrates the relevance and applicability of the proposed customized business ecosystem framework by gathering the evidences from health care sector.*

**Keywords:** Business ecosystems, health care, performance metrics

## INTRODUCTION

Business ecosystems are a relatively new concept, but increasingly integrated, explored and researched in both business and academia. In recent years the Ecosystem approach has demonstrated both its importance and its applicability in the multitude of industries present in the business environment. Today we can see a global trend of integrating the health industry into the business environment. This integration is mainly due to the evolution and development of the private environment, where medicine can be regarded as a real business and patients as customers. Development generally arises from the desire to provide the patient/client with what the public health system offers. Thus we can observe an evolution from rapid consultations to 510 minutes and “on conveyor” in state hospitals, to real full experiences focusing on the patient, longer duration, in which the patient is listened to, examined correctly and completely and has the possibility of complete and comprehensive investigations and treatments to raise the quality of life, regardless of the pathologies he may have. In this context, a multitude of customer options have emerged, ranging from private medical offices to private hospitals. At the same time, the much-lost concept of interdisciplinary collaboration has emerged, facilitated in private hospitals, because the good of the client is put first.

The aim of this paper is to explore the applicability of different business ecosystem models within the health industry. The health industry is a growing industry, especially in the business segment through the private sector (private hospitals, private clinics, provision of services through national health programs carried out with the help of multinational corporations). The business ecosystem is a model that can help us identify the structure and different cooperation and competitiveness relationships within the health industry, thus contributing to a harmonious trend of industrial development.

Proposed initially as a mechanism to explore and understand markets’ dynamics (Moore, 1993), business ecosystem concept evolved as an integrative and complex framework. Interesting is the fact that business ecosystems development requires an integrative approach which transcends not only industry borders but also eliminates the limitation among private and public sectors (Autio, 2022). From this point of view, business ecosystem’s main objective seems to be closely linked to the delivering the co-created products (Jacobides, et. Al, 2018; Jacobides, Lianos, 2021). Thus, from the structural point of view, a modular approach is preferred.

Especially interesting for business ecosystems theory remains the structural organization of an entire community of actors (Adner, 2017, Aarikka-Stenrose, Ritala, 2017), as such collaborative structure requires not only to define orchestration processes, but also to understand what actors are engaging into this type of collaborative structure. From this point of view, a business ecosystem was defined as a community comprised of suppliers, potential clients, distributors, standardization bodies (Moore, 1993; Makinen, Dedehayir,), governmental agencies (Galateanu (Avram), Avasilcai, 2013). However, the fact that in a business ecosystem could be engaged various actors the most valuable for its development was to define what roles those actors adopted. Thus, in the scientific literature emerged the first classification proposed by Iansiti and Levien, namely: keystones, dominators, niche players and hub landlords (Iansiti, Levien, 2004a). This classification was followed further by Den Hartigh who reshaped the roles and proposed new ones, such as: the shaper, the adapter and the opportunist (Den Hartigh, Tol, Visscher, 2006). Both theories suggested that each engaged actor from business ecosystem adopts a specific role in the main processes within the structure in accordance with the business ecosystem life cycle stage.

The health industry is an aggregation and integration of sectors of the economic system that provide goods and services for curative, preventive, rehabilitation and palliative treatments. It is one of the largest industries in the world, with the highest growth rate currently consuming more than 10 % of GDP in developed countries. The interest for Healthcare Industry and its development increased especially last years. The pandemic situation emergence triggered a series of industrial changes, an accelerated digital transformation process and the development of new emergent business ecosystems.

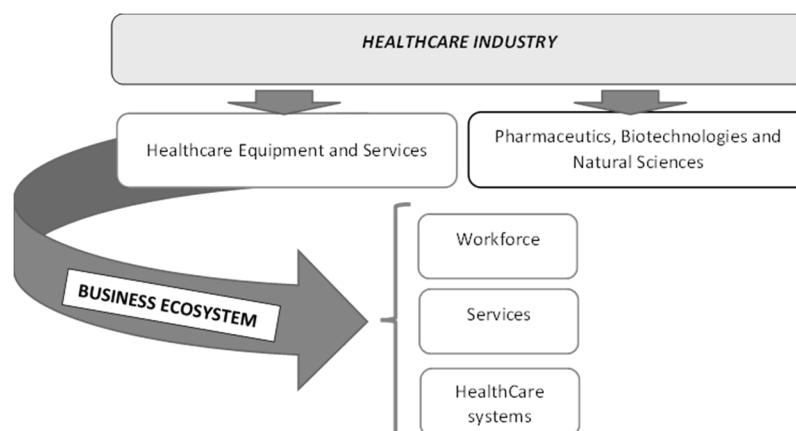
According to the UN International Standard Classification, the Healthcare industry is concentrated on three main sectors such as: hospital activities, dental and medical activities and other healthcare services (United Nation Statistics Division, 2022). Another classification was provided by Global Industry Classification Standard, according to which the healthcare industry is defined by: healthcare equipment and services, and pharmaceuticals, biotechnologies and natural sciences (MSCI, 2022). This type of classification is especially relevant in defining the healthcare business ecosystems as it gave the opportunity in identification of ecosystems engaged actors. Although up until now business ecosystems were presented from the actors’ point of view, within the current research a customized approach was taken by bringing in front three main components, namely (Hernandez, et.al, 2009):

- Workforce – the existence of specialized employees such as medical one, auxiliar medical employees and non-medical personnel (administrative workforce, specialized in medical issues, non-governmental agencies – Red Cross, Doctors without Frontiers, etc.)
- Services – the interface offered within the doctor-client’s relations. Usually, in the healthcare domain it is about the services offered by primary care physician.
- Systems – can be seen as an important infrastructure which could ensure the clients’ access for medical services.

## METHODS, RESULTS AND DISCUSSIONS

In researching business ecosystem concept the anchor point is to understand the concept of collective effort and how it is quantified in different contexts. Up until now, the qualitative approach is preferred, especially from the explorative point of view, as its main interest is to understand and to provide an in-depth examination of business ecosystem concept (Yin, 2011).

**Figure 1: The Healthcare Industry Business Ecosystem Framework**



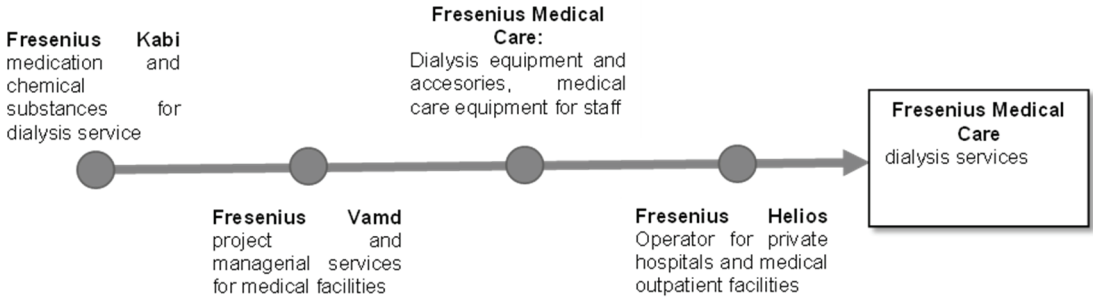
Thus, the adopted research methodology was based on the exploration of the business ecosystem formation phenomenon within Healthcare Industry. From this point of view, first undertaken step was

to explore the structure of the analyzed industry in order to discover its constructive architecture based on Healthcare Industry metrics. Based on the identified structure of analyzed industry there were highlighted two main components: pharmaceuticals, biotechnology and natural sciences, and healthcare services and equipment. However, within the proposed framework the second component was used as a unit of analysis. Next step in developing the analysis framework was to highlight and customize research criteria. Thus, based on literature review, there were proposed three main criteria of analysis such as: healthcare workforce, provided services and healthcare systems, applied on healthcare services and equipment component as it shown in Figure 1. Consequently, the research strategy was based on the following stages:

- *Exploration of healthcare industry especially within the private sector* – at this stage there were identified the main components within the healthcare industry used in the analysis framework development;
- *Assessment of existing business ecosystem models* – there were proposed the units of analysis with respect to the initial theory of business ecosystems. Thus, based on literature review there were defined customized metrics based on actors’ roles, ecosystems lifecycle and performance metrics;
- *Provide illustration of framework analysis implementation* based on case study approach on two companies from the healthcare industry.

Founded in 1912, Fresenius represents one of the global leaders in healthcare services providers with presence on over 100 countries (Fresenius, 2022a). Its successful development is based on the attention provided for the quality of the provided healthcare services, innovation and efficiency of the medical act (Fresenius, 2022a). According to historical milestones, the company expanded its own ecosystem not only through mergers and acquisitions, but also by creating its own divisions (Fresenius, 2022b), presented in figure 2. This type of linear growth ensured the coverage of all essential healthcare and social wellbeing services and extended the ecosystem as it follows: treatment services (Fresenius Medical Care), creating own supply division (Fresenius Kabi), development and management of own healthcare facilities (Fresenius Vamed) and division responsible for the whole hospital network (Fresenius Helios) (Fresenius, 2022a).

**Figure 2: Fresenius Business Ecosystem Structure**



By analyzing Fresenius ecosystem development and life cycle it seems rather as a linear integration process. According to the secondary data, Fresenius ecosystem was developed synergically and in a constant manner. Once the company entered on the market (the birth stage), it shaped its own role further. Basically, the growth stage comprises the timeline when the company became a manufacturer and equipment supply of healthcare services – the division Fresenius Medical Care. In the growth stage

the company ensured the diversification of its own offer and activities. By becoming the global leader as a supplier, Fresenius entered in the maturity stage of development. It ensures its domination by becoming not only globally recognized supplier but also the manufacturer of healthcare services. This was the moment when Fresenius established long term collaboration with InterWell Health in order to ensure best nephrologists services (Fresenius Medical Care, 2022) and other meaningful partnerships especially in the domain of kidney treatment processes and replacement – Unicyte, Humacyte, eGenesis (Kossman, 2021) and it marked its transition from niche player to the keystone for other competitive ecosystems. The renewal of Fresenius ecosystem can be described by continuous effort to create new divisions. Also, during pandemic times, at this stage there were implemented digital platforms not only as the interface in relation medical staff-patient, but also digital warehouses of data (Stuard, Amato, 2021). Thus, by establishing divisions as Fresenius Helios and Vamed, the company gained new perspectives and opportunities to consolidate its position in Germany and Spain. Consequently, by following life cycle stages, there can be seen that each actor from Fresenius ecosystem adopted its role as a part of strategic and sustainable growth goal, presented in Table 1.

**Table 1. The adopted roles of Fresenius and Diaverum business ecosystem**

<b>FRESENIUS business ecosystem</b>		<b>DIAVERUM business ecosystem</b>
<b>Actors' roles</b>		
<b>Keystone players</b>	Fresenius Medical Care	Diaverum
<b>Niche players</b>	Fresenius Medical Care Fresenius Kabi Fresenius Helios Fresenius Vamed	Nipro Japan Fresenius Medical Care Fresenius Kabi Bbraun
<b>Dominators</b>	Fresenius Medical Care	Fresenius Medical Care
<b>Hub landlords</b>	Fresenius Medical Care	Diaverum

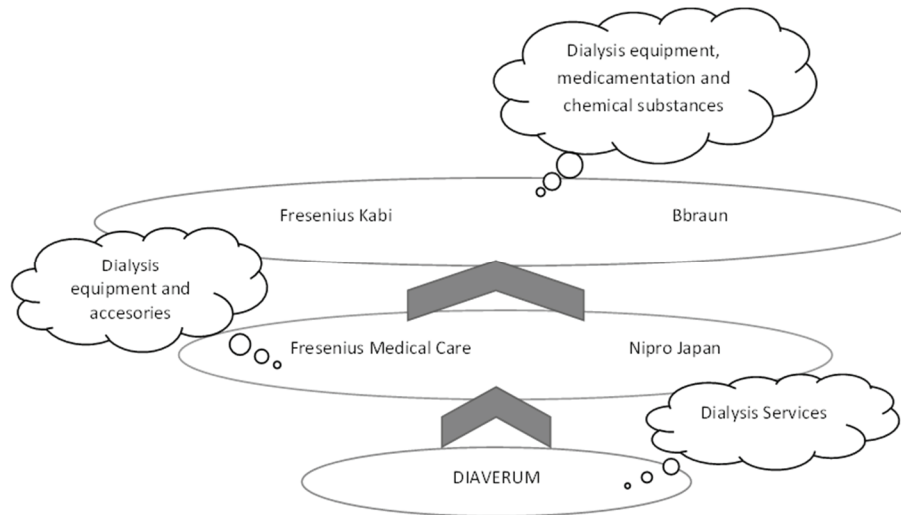
On the other side, the Diaverum’s business ecosystem model is rather based on classical model, initially proposed by Moore in 1993. Founded in Sweden in 1991, up until 2007 company concentrated its efforts on sustaining its own ecosystem at national level. However, at this moment it is globally present in over 24 countries, with over 12 thousand employees (Diaverum, 2022a). In addition, Diaverum’s core objective is to provide qualitative life-changing services (Diaverum, 2022a) and renal health services (Alharbi, A et al, 2020). Digitalization plays an essential role for the company, as it developed own healthcare platforms and application based on artificial intelligence (Diaverum, 2022b). Interesting is the fact that Diaverum’s business ecosystem structure depends on the development of collaboration with different partners and competitors such as: Nipro Japan and Fresenius Medical Care (dialysis equipment and accessories), Fresenius Kabi and Bbraun (medical equipment, medicamentation and chemical substances), as it is shown in Figure 3.

Established in 2007, as result of acquisition of Bidgepoint, represents the anchor point in the development of Diaverum Ecosystem, as it marked the birth stage. However, since 2007 up until 2022, the Diaverum ecosystem expanded so that it is represented by 155 medical facilities in 14 countries (Diaverum, 2022a). According to the official statement, nowadays it comprises 469 medical facilities providing dialysis services with over 41 thousand of patients (Diaverum, 2022a).

A change of paradigm on the development of Diaverum ecosystem can be seen at the maturity stage. In order to stay competitive within the healthcare industry, the company addressed to international suppliers such as Baxter, Nipro and Bbraun on from the dialysis equipment and accesories point of view (Diaverum, 2022d). Thus, in order to sustain its business ecosystem, Diaverum in the renewal stage

started to incorporate ambulatory monitoring offices, as example the ambulatory network from South Arabia recognized and accresited by Joint Commission International (Diaverum, 2022a). This approach was preferred in order to attract patients to the Diaverum clinics and to get them to know the Diaverum’s staff, medical facilities and services offered by each clinic. Also, as a part of renewal ecosystem strategy the company engaged into long-term partnership with Spanish Confederation of Business Organization (Diaverum, 2022e) In comparision with the previous case, the Diaverum ecosystem is highly anchored to the main goal, that is to provide dialysis services. Form this point of view, the actors who are engaging into this ecosystem were mostly external partners, whose roles are presented in the Table 1.

**Figure 3. Diaverum Business Ecosystem Structure**



The comparative study was conducted following the following elements: life cycle stages, ecosystem actors and ecosystem health. In order to illustrate the main differences, there was realized an extensive analysis presented in the Table 3.

**Tabel 3. Comparative analysis based on the main criteria: business ecosystem life cycle and performance metrics**

Description	FRESENIUS	DIAPERUM
<b>Business Ecosystem Life Cycle Stages</b>		
<b>Birth stage</b>	Once the company was founded	
<b>Growth stage</b>	Activity diversity by establishing 4 new divisions	Geographical expansion, new markets penetration
<b>Maturity stage</b>	Global leader in medical equipment and services	Recognition in top 3 on dialysis services
<b>Renewal Stage</b>	Diversification of the products, became major European operator of the network of private medical facilities	Extends its activity by establishing new monitoring points
<b>Business Ecosystems Metrics</b>		
<b>Productivity</b>		
<b>Dialysis services at large scale</b>	Dialysis services at middle scale	
<b>Medical equipment manufacturing, pharmaceuticals products and hospitals’ network</b>	Dialysis services	
<b>Medication for oncological and dialysis treatments</b>	Network of new monitoring medical point	

<b>Resilience</b>		
<b>Survival Rate</b>	High level of adaptation to the crisis moments within the healthcare industry	
<b>Ecosystem structure adaptability</b>	Restructuring of the entire group by adding new divisions	Adaptability of the organizational structure based on new supply actor's emergence
<b>Predictability</b>	Unpredictable growth rate and continuous innovation	Predictable growth rate based on the main goal
<b>Obsolesce</b>	Low level	High Level
<b>Learning from experience</b>	Self-sustaining business ecosystem	Business ecosystem based on competitors' actions

## DISCUSSIONS AND CONCLUSION

Today, the health industry has gone through a continuous transformation, increasingly relying on the private sector and companies. The applicability of the business ecosystem in this industry is identified using two companies offering dialysis services. Worldwide, this chronic treatment is provided by multiple companies, the main ones being FRESINIUS, BBRAUN and Diaverum. This work focused on two of these companies, Fresenius and Diaverum. The individual analysis of the two business ecosystems identified two different models that can be applied: a linear integration of the ecosystem for Fresenius and the classic model proposed by Moore in 1993 for Diaverum.

The analysis of the Fresenius ecosystem reveals a firm that has created a self-sustaining ecosystem. The company develops four major subdivisions: Fresenius Kabi, Fresenius Medical Care, Fresenius Helios and Fresenius Vamd, who become actors in their own ecosystem. The analysis of the Diaverum ecosystem shows us a firm dependent on its main competitors in the market for their dialysis services as actors. We see that Fresenius' subdivisions also become actors within this ecosystem, fulfilling the roles of nickel player and dominator.

The comparative analysis of the two ecosystems shows us greater productivity for the model with linear integration, greater ecosystem persistence, with continuous development and innovation of the ecosystem structure. The classic model shows us an ecosystem with very high predictability, with an evolution and structure based on the actions of its competitors fulfilling various roles as actors in the ecosystem. The comparative analysis of ecosystem results shows that the linear integration of the ecosystem leads to better results than Moore's classic model. For the companies analysed: Fresenius Medical Care comprises about 10 times more clinics than Diaverum and provides treatment for about 10 times more patients than Diaverum.

Integrating the business ecosystem structure in the healthcare industry can help the growth and the development of the industry.

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