Healthcare Entrepreneurship and Management

A Comprehensive Guide for Biomedical Engineers and Entrepreneurs

Arnab Chanda and Shubham Gupta

Routledge
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A PRODUCTIVITY PRESS BOOK

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Post pandemic, the world is not the same place. There has been an increasing focus on healthcare and well-being, which has created a once-in-a-lifetime opportunity for healthcare innovations and startups. From adoption of a range of medical apps and telemedicine technologies to heightened public interest in smart wearables and medical devices, the demand for efficient healthcare delivery has been skyrocketing.

This book aims to serve as a first-of-its-kind guide for skill development in conception to commercialisation of healthcare products and services. It covers the gamut from the study of healthcare challenges, such as understanding customer requirements, market needs, and competition, to the various steps of the healthcare product development process, such as defining value propositions and specifications, the creation of minimum viable product (MVP) to prototyping, and manufacturing. The authors also discuss key commercialisation and management strategies, including the development of a robust business plan, fund raising, intellectual property, creating barriers to entry, and launching healthcare startups. Medical product pricing, positioning, sales and distribution, and customer acquisition are also presented with real-life examples.

This book serves as a key reference not only for biomedical engineers who are looking to launch their products or services in the market but also for budding entrepreneurs willing to explore opportunities in the healthcare domain. For example, engineers and managers working on the development of medical devices require knowledge of ethical guidelines, regulations, and approvals to effectively launch their products in the medtech industry. On the other hand, entrepreneurs looking to benefit from the booming healthcare industry will find this book helpful in understanding the fundamentals of medical product development and commercialisation to launch their ideas successfully.

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First published 2025
by Routledge
605 Third Avenue, New York, NY 10158

and by Routledge
4 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

Routledge is an imprint of the Taylor & Francis Group, an informa business

ISBN: 978-1-032-75709-4 (hbk)
ISBN: 978-1-032-75708-7 (pbk)
ISBN: 978-1-003-47530-9 (ebk)

DOI: 10.4324/9781003475309

Typeset in Garamond
by Deanta Global Publishing Services, Chennai, India

Contents

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INTRODUCTION 1

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Chapter 1

Introduction to Current Healthcare Problems and Unmet Needs

1.1 Introduction

The lives of patients are significantly impacted by hospitals, community health clinics, and healthcare systems [1]. US healthcare providers and entrepreneurs can support patients in satisfying their unmet fundamental requirements while also educating them on the connections between health and unmet needs, or social determinants of health (SDOH). Although Medicaid-insured patients are disproportionately affected by unmet basic requirements, over 45% of consumers with all coverage categories report having at least one unmet basic need. It's possible that patients with increased incomes are nonetheless experiencing unmet requirements. Ninety percent of the $3.8 trillion that the United States spends annually on healthcare goes toward treating persons with mental health and chronic illnesses [2]; 60% of adult Americans have one chronic illness [3], and 40% have two or more [1].

Almost 25% of families in several low- and middle-income nations avoided medical attention when it was necessary during the COVID-19 pandemic due to financial constraints, movement restrictions, or fear of getting the virus [4]. Estimates indicate that nearly half of adult Europeans (aged 18–29 years old) experienced lack of fulfilment of needs pertaining to mental healthcare throughout the COVID-19 pandemic, even in high-income environments [5,6]. Unmet needs are those for which a person has a need

DOI: 10.4324/9781003475309-2

for healthcare but is unable or unwilling to obtain high-quality treatment [7]. Poor health outcomes, excessive spending, and a decline in both individual and societal productivity could result from this [8]. Unmet need is not taken into account in the present measures of the health system in providing services. The 76th World Health Assembly, 2023, recently started to examine the value and viability of adding unmet healthcare needs as a metric to track universal health coverage (UHC) both domestically and internationally [4].

Unmet healthcare need is exacerbated by unfulfilled fundamental needs, which also result in poor results, needless and unnecessary utilisation, and clinical exacerbations [9]. Contrasted with individuals whose fundamental needs are satisfied, those grappling with unmet basic requirements are considerably more inclined to express subpar physical well-being, mental health challenges, and a pronounced increase in healthcare usage—surpassing 2.5 times for physical well-being, fivefold for mental health, and doubling for healthcare utilisation [1]. Moreover, individuals facing unmet basic needs typically encounter restricted access to healthcare and express lower satisfaction with the care they do receive [10]. Even among those employed, those with one or more unmet basic needs face a 2.4-fold heightened risk of absenteeism, missing six or more days of work in the preceding year, and forgoing necessary medical treatment [1].

Closing the gaps in unmet requirements could boost economic output while also immediately improving patient and community care. Healthcare providers and entrepreneurs should think about taking certain steps, such as gathering patient data, to determine which unmet basic needs remedies are most likely to be successful [1]. In addition to this, a few systematic approaches for uncovering medical needs could be followed, such as firstly defining the need, understanding need statement and prioritising needs, defining need specification, and then following an algorithmic approach (Figure 1.1).

In order to attain optimal health outcomes, timely utilisation of personal health services is referred to as "access to health care" [12]. Individuals may face both non-financial and financial obstacles that limit their ability to

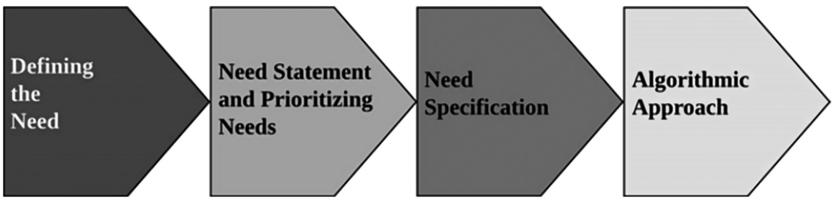

Figure 1.1 A methodical technique to identify medical requirements [11].

obtain the necessary medical treatment. Poorer health outcomes may arise from delayed or non-received care. The proportion of individuals across all age groups who postponed or refrained from receiving necessary medical care because of expense declined from 11.4% in 2009 to 7.2% in 2016, and subsequently rose to 8.3% in 2018. In 2023, 8.5% of people postponed or did not receive necessary medical care because of cost [12]. From 8.4% in 2009 to 5.2% in 2015, the percentage of people of all ages who did not receive necessary prescription drugs owing to cost in the previous 12 months declined, and it remained relatively stable until 2018 (5.3%) [12]. In addition to this, 5.6% of people in 2019 reported that they had not received necessary prescription medication in the previous 12 months owing to the cost [12]. Conversely, the proportion of individuals two years of age and older who did not receive necessary dental care within the previous year owing to expense declined from 13.3% in 2009 to 8.9% in 2016, and then rose to 9.9% in 2018. In 2019, 14.7% of people aged over two did not receive necessary dental care within the previous year due to financial constraints [12].

In 2022, specifically for EU (European Union) citizens, 4.1% of people aged 16 years or above reported that they had unfulfilled needs for a medical examination or treatment [13]; this percentage varied from 0.2% in Cyprus to 12.5% in Denmark, 12.6% in Estonia, and 13.1% in Greece. 2.2% of EU citizens reported having unmet needs, with the percentage varying from 0.1% in Cyprus to 9.0% in Greece and 9.1% in Estonia. These respondents cited factors such as cost, distance from place of residence, or waiting lists that affected the organisation and operation of healthcare services (Figure 1.2) [13]. In the 2023 survey, 46% of adults globally said that the largest issue confronting their nation's healthcare system was either a lack of treatment or lengthy wait times (Figure 1.3) [14]. An additional 46% of adults stated that the largest problem was a staffing shortage (Figure 1.3). This statistic displays the proportion of respondents worldwide who said that, as of 2023, a few specific concerns were the main challenges facing their nation's healthcare system [14].

1.2 Creating an Action Plan

Despite the initiation of efforts by healthcare entrepreneurs and providers to acknowledge unmet basic needs through screening, closed-loop referrals, resource managers, and community relationships, the transition from small-scale initiatives serving a specific patient subset to comprehensive programmes is met with formidable challenges. These obstacles encompass constrained resources, a

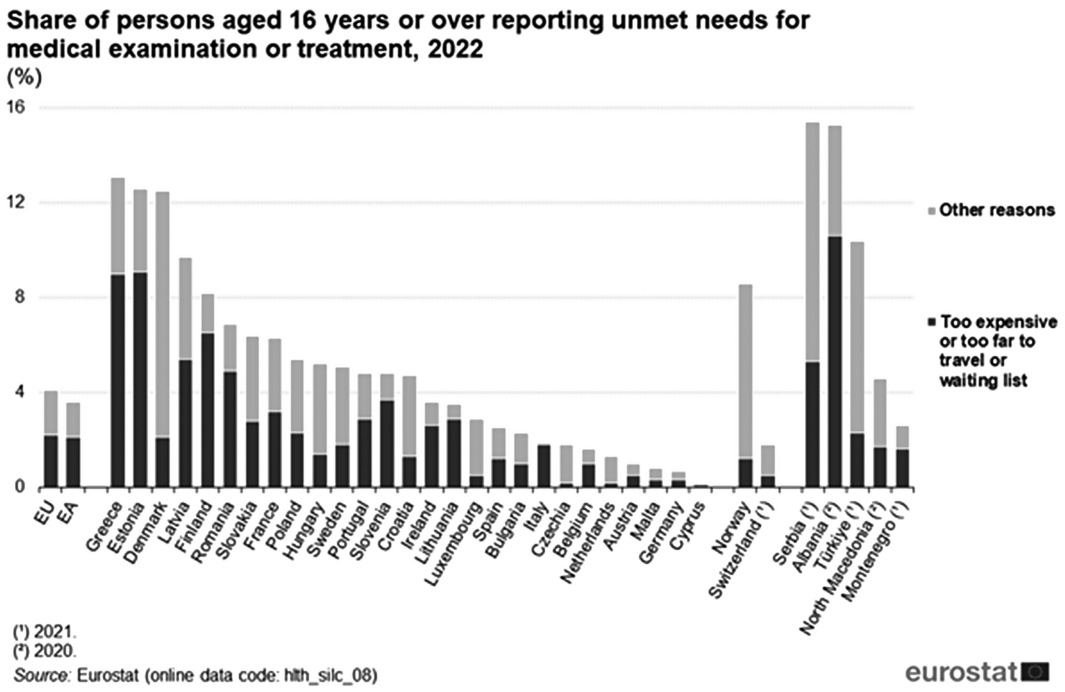

Figure 1.2 Share of persons aged 16 years or over reporting unmet needs for medical examination or treatment [13].

lack of data pinpointing who would benefit from the interventions, insufficient coordination to identify needs and implement scaled solutions across various sites in the hospital, medical departments, and programmes, along with uncertainties regarding the economic return on investment.

No healthcare practitioner or entrepreneur can solve every social issue, and they shouldn't feel compelled to. But healthcare, especially value-based care initiatives, may give priority to initiatives that would improve patient outcomes the most, fit in with existing or planned partnerships and capabilities, and be financially viable [15]. The steps below can be used by healthcare entrepreneurs or providers to create an efficient programme [1].

Considering unmet needs as strategic priorities: Determining how addressing patients' unmet basic needs can contribute to the realisation of the system's strategic objectives is crucial. Unattended basic requirements among patients exert a substantial influence on their engagement, experience, and overall health, emphasising the interconnectedness between addressing these needs and the attainment of broader organisational goals [16]. Additionally, they have a close relationship with institutional strategic targets like value-based care, quality improvement, patient experience, and

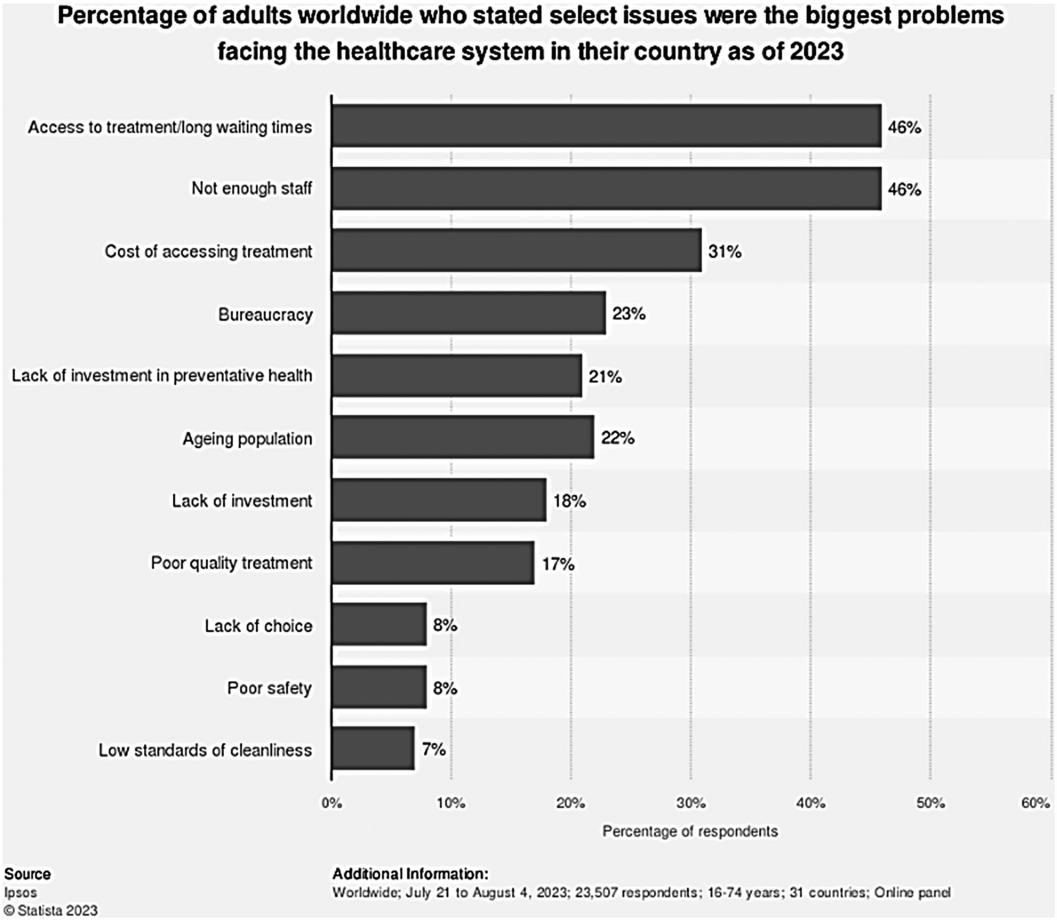

Figure 1.3 Percentage of adults who reported selected issues in the healthcare system [14].

the overall cost of care. Entrepreneurs in the healthcare industry or providers should begin by determining which unmet needs are most directly related to current strategic priorities and capabilities, then concentrating on those (for example, by communicating the link with other leaders across the organisation to gain traction and dedicate funding).

Unaddressed basic needs can be interconnected with various strategic priorities, and multiple avenues to address SDOH exist. Informed by insights into the impact of unmet basic needs on clinical outcomes, the prevalence of these needs in communities, existing organisational capabilities, and the potential for forming partnerships with community-based organisations or other healthcare entities, healthcare entrepreneurs or providers can strategically prioritise their initiatives and determine where to commence interventions.

Even though there are many external opportunities to address unmet basic requirements, healthcare providers or entrepreneurs can make significant changes within their own institutions. Potential points of unintentional friction can be found by taking a holistic view of the patient experience. The experiences of patients and their families are greatly influenced by a number of factors, including parking fees, hospital shuttle services, on-site food options, the quality and promptness of translation services, and the availability of childcare when needed.

Building a strong organisational structure: Appointing an executive leader dedicated to SDOH is pivotal. This individual would spearhead the establishment of a cross-team structure and a comprehensive system-wide approach to effectively identify and address unmet basic needs through a unified system. Integral to this framework are specialised staff members in population health and community health. Engaging in a collaborative team effort to provide input and implement solutions, participation from clinical department leaders, nursing staff, and leaders in patient experience, quality, and safety, as well as data and analytics, is imperative. This coordinated approach ensures a multifaceted perspective and effective implementation of solutions across the healthcare system.

Establishing alignment of incentives concerning unmet basic needs is crucial for a cohesive approach. It is advisable to articulate a reporting structure that encourages cross-team communication and coordination, accompanied by the identification of performance metrics linked to the success of these initiatives. For instance, the fulfilment of a social risk assessment could serve as a process metric for primary-care physicians operating within value-based-care contracts. Additionally, to comprehend patient perspectives consistently, cultivating robust relationships with patients and community members proves invaluable for programme development. Healthcare entrepreneurs or provider systems might consider establishing family and patient advisory councils and committees, ensuring active engagement with leaders throughout the hospital system.

Collection of data: Establishing priorities for data collection to enable particular activities. Healthcare providers or entrepreneurs should make sure that data-gathering initiatives help improve comprehension of the unmet basic demands and the programmes that now address those needs. For instance, a healthcare professional or entrepreneur offering a programme for non-emergency medical transportation could be aware of the individuals in need, their residences, and any other needs that the programme might be able to address (for example, grocery or prescription collection). In an ideal

world, programme feedback, engagement, and correlation with health outcome measurements (e.g., improved control over a chronic health condition, stress reduction, decreased depression, or reduced anxiety) would all be routinely assessed and might guide future programme iterations.

Creating screening procedures that connect with a variety of patients at pivotal times is essential. Annual preventative checkups are increasingly often combined with checks for unmet basic needs. Nevertheless, there may be additional high-value times when this kind of screening takes place, like right before hospital discharge or during an ER visit. Furthermore, in order to avoid perceived stigma, some patients could prefer to self-screen and locate resources; others would prefer to do so on an as-needed basis rather than waiting for a visit from a healthcare professional or entrepreneur.

Businesses in the healthcare industry that offer vendor platforms with technology that enables self-screening and extensive resource libraries can help patients. They might also work with patients or direct them to local services. Basic requirements screening and billing procedures need to be straightforward and effective because frontline healthcare professionals and businesses are required to execute an increasing number of tasks and screenings during patient visits. Provider systems or healthcare entrepreneurs may be able to achieve this by including these screening technologies with patient appointments.

1.3 Creating a Support Infrastructure and Investigating Outcomes

Having solid ties with neighbourhood-based organisations may be advantageous for healthcare providers or enterprises. To improve the patient experience, they can try "warm handoffs" between social service and medical healthcare providers or entrepreneurs. It might be possible to automate this procedure by investing in social services referral infrastructure and technology. Through the establishment of referral networks facilitating communication between healthcare providers and social service providers, healthcare providers can verify whether patients have received the necessary services. This lays the groundwork for enhanced care coordination, allowing for a more comprehensive and integrated approach to addressing patients' needs.

In order to detect unmet basic requirements and connect patients to services, many hospitals are forming teams of coordinators and providing training to permanent staff, such as community health workers and patient

navigators. Social workers are under less stress because of this referral system. Additionally, providers may wish to assist patients in understanding the benefits that are included in the healthcare plan. Furthermore, players broaden their range of offerings to include additional benefits, such as providing medically tailored meals for patients with specific health conditions.

The provider may decide on measures depending on possible outcomes. These objectives should ideally be connected to broad strategic key performance indicators (KPIs). For example, by working to standardise screening for unmet basic requirements and referrals, providers might monitor the proportion of screened patients and show if referrals resulted in a decrease in unmet basic needs. The provider may link these measurements to a broad KPI pertaining to other screenings. Following the establishment of metrics and realistic goals, the provider could adopt an agile or quality improvement approach to improvement by conducting iterative measurements and adjustments based on input from staff, patients, families, and community members.

1.4 Forming and Prioritising a Need Statement

Making a need statement—a succinct description of the invention's purpose—is the first step in inventing anything new. Clear definitions of the problem, population, and outcome are necessary for a need statement to be effective. Consider the following three need statements [11].

1. A strategy to avoid problems after sternotomy.
2. A strategy to stop sternotomy wire-related infections.
3. A non-sternotomy method of revascularising the coronaries.

While sternotomy staples might have been contemplated as a potential solution for the initial need statement, it is acknowledged that the statement lacks specificity, rendering it a suboptimal example of a clear and focused statement. Now, for the second need statement, the quest for a method to reduce infections offers additional insights in addition to the specificity into understanding the primary reasons for complications. In contrast, the third need statement expands our perspective by exploring methods for minimally invasive revascularisation of coronary arteries following sternotomy. The formulation of this third need statement, for instance, could have been a catalyst for the creation of percutaneous procedures such as stenting.

Addressing challenges in cancer therapy requires a nuanced consideration of various aspects. Several formulations of the need statement could be explored [11]:

1. Developing an Effective Cure for Cancer: Crafting methodologies aimed at discovering a definitive cure for cancer, considering diverse modalities and approaches.
2. Minimising Chemotherapy Side Effects while Preserving Anti-Tumour Efficacy: Innovating strategies to mitigate the adverse effects of chemotherapy, ensuring a balance that preserves the anti-tumour efficacy of the treatment.
3. Non-Invasive Ablation of Stage IA Non-Small Cell Lung Cancer (NSCLC) Tumours: Devising techniques for the non-invasive ablation of stage IA NSCLC tumours, eliminating the need for thoracotomy and advancing patient-friendly treatment options.

Each need statement above addresses a distinct aspect of cancer therapy, reflecting the multifaceted nature of the challenge and the diverse approaches required to enhance outcomes in cancer treatment.

The initial requirement merely outlines a broad objective without providing additional information or guidelines to guide the invention process [11]. Alternatively, develop a need statement along the lines of need statement 2, where the objective is to cure cancer with chemotherapy while reducing toxicity. A need statement with a well-defined objective, like the one described, could have been instrumental in inspiring the creation of the transarterial chemoembolisation (TACE) treatment, which currently stands as the gold standard for treating hepatocellular carcinoma. Additionally, the meticulously crafted third need statement holds the potential to drive the development of an invention for bronchoscopic ablation of stage IA NSCLC tumours. Such an innovation could substantially minimise the morbidity and mortality traditionally associated with conventional chest-opening treatments, providing a notably less intrusive alternative.

In order to enhance the invention's chances of success, it is crucial to prioritise creating well-crafted need statements, as inventions take time, resources, and funding. The size of the market, the gap in technology, and reimbursement are the three main factors that determine how to rank a need statement. For instance, a sizeable patient base with a more severe ailment will have a sizeable market, which might greatly enhance the quality of life for patients.

Launching an invention would be challenging if the patient group was small and the severity of the sickness was low. This would limit the possibility of reaching and significantly impacting those people. The technology gap is the next need statement to be taken into account. If there are many emerging technologies, the gap in technical advancement can be extremely tiny; conversely, if there is a shortage of newly produced technology, the gap can be very significant. The opportunity costs associated with releasing a new invention onto the market are represented by the extent of the technology gap. For instance, it will be harder to succeed in marketplaces where new technologies are widely available yet have little to no influence. Thirdly, the ability to recover the expenses incurred in creating and producing an innovation is essential to its success.

For the need specification, comprehensive data are needed once a specific requirement statement has been discovered. The need specifications cover every aspect needed for an invention to be commercialised, such as: 1) medical characteristics; 2) stakeholders; 3) legal requirements; 4) reimbursement; 5) possible acquirers; and 6) marketing [11]. The components of an innovation that is going to be sold are depicted in Figure 1.4. An inventor must evaluate the procedure's level of invasiveness and the clinical endpoints that need to be reached in terms of medical qualities. If a large-scale clinical trial is necessary to demonstrate the safety and efficacy, the

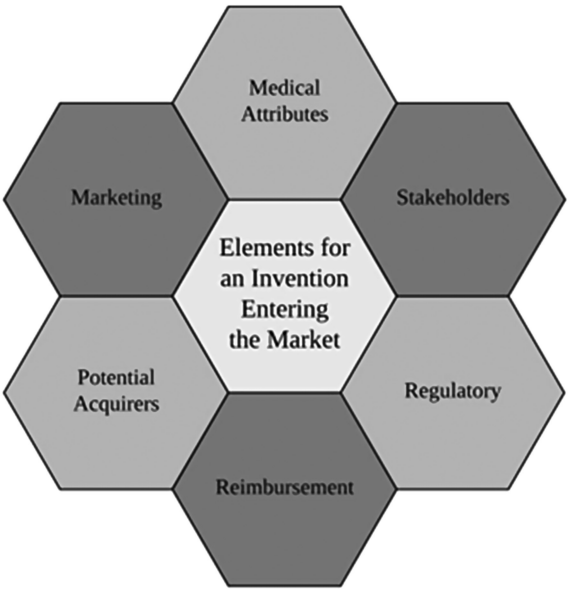

Figure 1.4 Elements for an invention entering the market [11].

accompanying costs and feasibility must be taken into account. Applicability and usability can be determined with the assistance of significant stakeholders, such as the doctors who will carry out the treatments. Regulatory agencies may also provide information about the size of a trial that is required to assess safety and efficacy and if a device needs premarket approval.

Finally, how well a product enters the market will depend on leads to possible acquirers and marketing tactics [11]. Venture capital companies and investors will need specific reimbursement pathways and market research. Members of the target audience are more likely to accept the device's implementation as a viable, workable solution if all requirements in the need specification are satisfied.

An inventor can concentrate on creating the novel device once the need statement and need specification have been met. For this stage, an algorithmic technique can be applied. To begin with, examine previous and present treatments to determine the reasons for each treatment's success and failure [11]. Secondly, turn a sickness to your advantage. Urinary retention mechanisms, for instance, can be mimicked in a urinary incontinence treatment device. Finally, consider how analogous processes arise in the natural world. Using these techniques will probably help inventors come up with a few ideas for new products that meet the given demand. Once these innovations are underway, compile the various requirements specifications for each invention and verify the intellectual property (IP) positions of the top ideas.

References

1. Patients struggle with social determinants of health: medical providers can help | McKinsey n.d. https://www.mckinsey.com/industries/healthcare/our-insights/patients-struggle-with-unmet-basic-needs-medical-providers-can-help (accessed January 15, 2024).
2. Health and economic costs of chronic diseases | CDC n.d. https://www.cdc.gov/chronicdisease/about/costs/index.htm (accessed January 15, 2024).
3. Chronic diseases in America | CDC n.d. https://www.cdc.gov/chronicdisease/resources/infographic/chronic-diseases.htm (accessed January 15, 2024).
4. Rosenberg M, Kowal P, Rahman MM, Okamoto S, Barber SL, Tangcharoensathien V. Better data on unmet healthcare need can strengthen global monitoring of universal health coverage. *BMJ* 2023;382:e075476. https://doi.org/10.1136/BMJ-2023-075476.
5. Kim JY, Kim DI, Park HY, Pak Y, Tran PNH, Thai TT, et al. Unmet healthcare needs and associated factors in rural and suburban Vietnam: a cross-sectional study. *Int J Environ Res Public Heal* 2020;17:6320. https://doi.org/10.3390/IJERPH17176320.

6. Yadav R, Yadav J, Shekhar C. Unmet need for treatment-seeking from public health facilities in India: An analysis of sociodemographic, regional and disease-wise variations. *PLoS Glob Public Heal* 2022;2:e0000148. https://doi.org/10.1371/JOURNAL.PGPH.0000148.
7. Academy of Medical Sciences. Unmet need in healthcare. n.d.
8. Health at a glance: Europe 2022 2022. https://doi.org/10.1787/507433B0-EN.
9. Chen J, Hou F. Unmet needs for health care. *Stat Canada* 2002;13:82–5.
10. Rahman MM, Rosenberg M, Flores G, Parsell N, Akter S, Alam MA, et al. A systematic review and meta-analysis of unmet needs for healthcare and long-term care among older people. *Health Econ Rev* 2022;12:1–10. https://doi.org/10.1186/S13561-022-00398-4/FIGURES/3.
11. Dao D, Brenner J. Identifying unmet needs: problems that need solutions. *Acad Entrep Med Heal Sci* 2019. https://doi.org/10.21428/B2E239DC.171B57D1.
12. Unmet need for health care - health, United States n.d. https://www.cdc.gov/nchs/hus/topics/unmet-need.htm (accessed January 15, 2024).
13. Unmet health care needs statistics - statistics explained n.d. https://ec.europa.eu/eurostat/statistics-explained/Unmet_health_care_needs_statistics (accessed January 15, 2024).
14. Leading problems in healthcare systems worldwide 2023 | Statista n.d. https://www.statista.com/statistics/917153/leading-problems-healthcare-systems-worldwide (accessed January 15, 2024).
15. The six biggest challenges of the hospital at home care model n.d. https://us.nttdata.com/en/blog/2023/december/the-six-biggest-challenges-of-the-hospital-at-home-care-model (accessed January 15, 2024).
16. Kowal P, Corso B, Anindya K, Andrade FCD, Giang TL, Guitierrez MTC, et al. Prevalence of unmet health care need in older adults in 83 countries: measuring progressing towards universal health coverage in the context of global population ageing. *Popul Health Metr* 2023;21:1–16. https://doi.org/10.1186/S12963-023-00308-8/FIGURES/6.

Chapter 2

Healthcare Startup Ecosystems around the Globe

2.1 Introduction

Industries may be disrupted and reshaped by the enormous forces created by ecosystems [1]. In the healthcare sector, they have the ability to boost customer satisfaction and affordability, involve both formal and informal caregivers, boost provider productivity, and offer a personalised and integrated experience. A single business model and a virtual data infrastructure connect the actors in a value chain, which include suppliers, customers, platforms, and service providers. Improved and more efficient experiences for stakeholders and customers are the outcome of the seamless collection, handling, and sharing of data that support this relationship. The term "ecosystem" refers to this networked and effective structure that is purposefully created to handle significant problems or inefficiencies in the system.

Usually, avoiding and successfully treating chronic illnesses are the main priorities. But when these objectives change, as we have seen, productivity in the healthcare sector falls behind other service sectors [2]. New technologies offer real-time metric-based care, lower costs among collaborated stakeholders, and the required treatment that is provided near to or at home [3]. Stakeholders must now shift to an ecosystem model of care, which is made feasible by five significant industrial forces driving technological innovation:

DOI: 10.4324/9781003475309-3

- Persistent inefficiencies in the industry contribute to challenges related to affordability, outcomes, and quality, resulting in a subpar consumer experience. These inefficiencies, existing over an extended period, create an opportune environment for innovation to yield substantial returns.
- Notable investments have been made in healthcare technology; from 2014 to 2018, over 580 US deals valued at greater or equal to $10 million each made a total of over $83 billion in overall earning value. Three main areas that received disproportionate attention from these investments were: innovative care models, data and analytics, and patient engagement.
- Tech behemoths are fiercely vying for supremacy in the cloud technology, investing substantial sums in research and development to enhance their platforms. The objective is to deliver user-friendly services catering to a broad customer spectrum and diverse applications, including areas like predictive analytics, in a bid to propel innovation. This intense competition amounts to a trillion-dollar battle, emphasising the strategic significance of capturing market share and sustaining consumer engagement. Furthermore, strategic partnerships, whether formed among pharmacy providers, health systems, or collaborations with technology firms, signify a growing trend towards increased integration. This movement also highlights a mounting emphasis on patient privacy concerns. Both traditional healthcare incumbents and emerging players can seize this innovation as a substantial opportunity to expand their market presence, all the while enhancing the cost-effectiveness and quality of healthcare delivery.
- In order to increase their data and analytics capabilities, payers, providers, healthcare services, and technology companies made strategic acquisitions totalling almost $40 billion in the healthcare sector between 2014 and 2018. This signalled the start of an important trend in which industry leaders invested heavily to develop their ecosystems as a whole.

In 2021, health tech fundraising broke previous records, totalling $29.1 billion over 729 deals, with an average confirmed deal of $39.9 million (as depicted in Figure 2.1) [4]. An investor has highlighted the current period as one of the most exciting times for health tech investments, and the market prognosis points to a continuous growth trajectory in the following years. In 2021, R&D catalyst ($5.8 billion), on-demand healthcare ($4.5 billion), and illness therapy ($4.5 billion) were the three main investment topics.

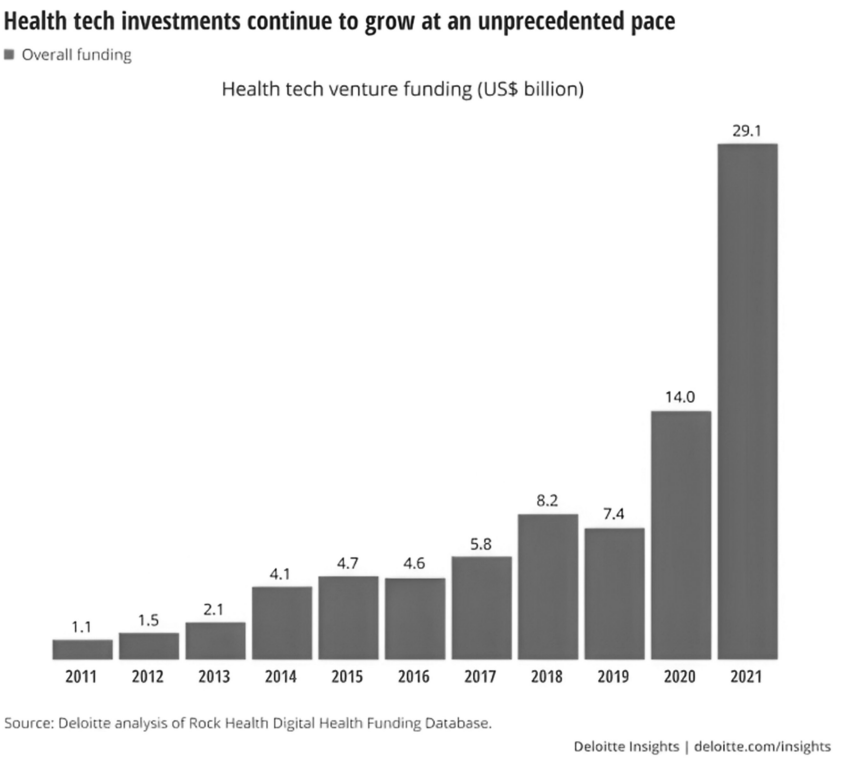

Figure 2.1 Chart showing the growth of healthcare domain investments [4].

However, some health finance databases discovered that, in addition to infrastructure and skill pools, modifications in organisational models and a greater emphasis on deliver-to-consumer and even business-to-business may have the greatest impact on the sector in the long run. Investments in platform businesses have already begun to come from venture capitalists, healthcare organisations, and private equity firms. For example, VEDA, an AI-based data management platform that leverages intelligent working to speed up administrative procedures in healthcare, has received $45 million.

Four of the nine healthcare businesses that filed for public offering in 2021 identify as platforms. However, not every company claiming to be a platform will succeed. The markets will value them differently depending on whether they are genuine platforms or not. Numerous healthcare companies have demonstrated that they should expand or diversify in response to opportunities (such as growing their market share) or risks (e.g., changing reimbursement models). However, due to limitations with resources, skill, and organisational structure, mergers and acquisitions might not always be the optimal course of action. Recent technological developments have made it possible for healthcare organisations to accomplish comparable goals

(expansion and diversity) via a more recent channel: platform-enabled ecosystems. This has opened the door for the transformation of conventional business models. Conveners of ecosystems establish a platform that combines the products and services offered by ecosystem participants [5]. These business models have rewired value chains in sectors like retail, entertainment, and hospitality by giving customers a better, digitalised experience and making suppliers more accessible, which draws more and more users to the platform (Figure 2.2).

To gauge the extent to which healthcare organisations are embracing and utilising this innovative business model for enhancing care quality, cost reduction, and personalising the healthcare consumer experience, the Deloitte Center for Health Solutions undertook an analysis of health tech investment trends. Additionally, they conducted ten interviews with a varied group of leaders representing healthcare organisations, health tech innovators, and investors. The discussions encompassed an exploration of ongoing initiatives dedicated to constructing platforms that bring together ecosystems,

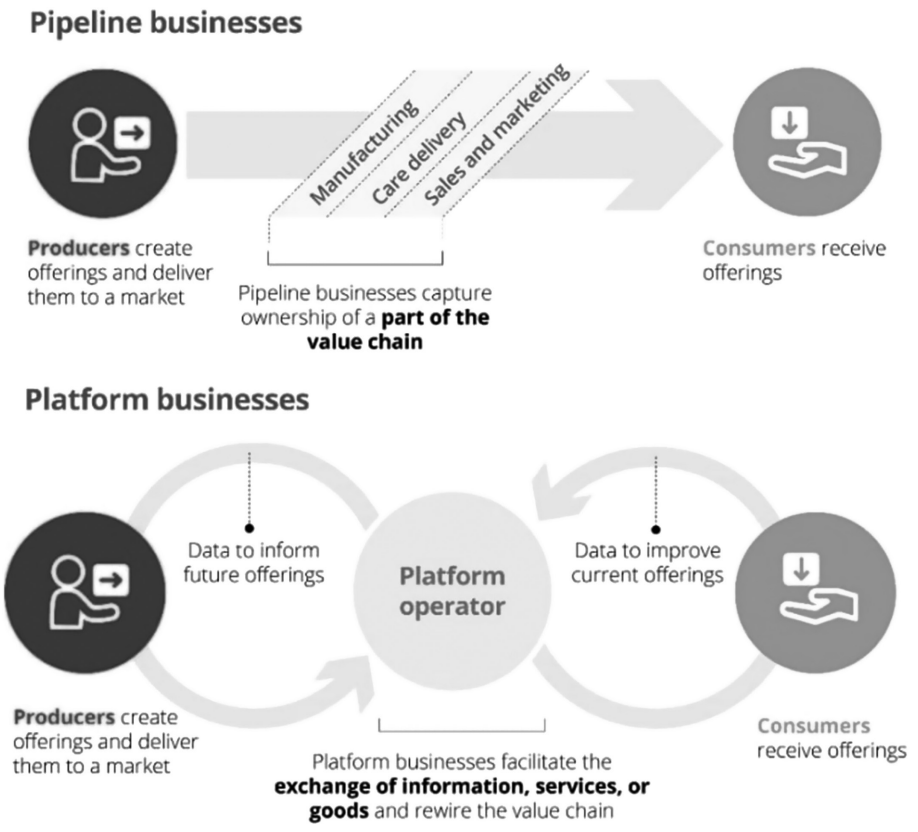

Figure 2.2 Differences between pipeline business and platform business [4].

the initial value derived from these efforts, and insights gained from these experiences.

2.2 Principles for Enabling Effective Ecosystems

Interviewees' responses to the idea of platform-enabled ecosystems in healthcare varied widely. Some were dubious about the idea of platforming healthcare, or even certain subsegments of it, and about ecosystems as a potential future economic model [6]. Rather, they favoured concentrating on developing technological remedies to tackle specific issues in the treatment process or establishing an edge pipeline enterprise as a substitute source of income. Some were still figuring out how to create an ecosystem, but they were interested in doing so. One of the respondents talked about creating community health-focused localised ecosystems, but encountered two obstacles: developing the technical foundation and persuading clinical and administrative leadership. Many of the interviewees, nevertheless, were enthusiastic about the idea. The following lists five guidelines that can support a productive, long-lasting platform-based ecosystem (Figure 2.3).

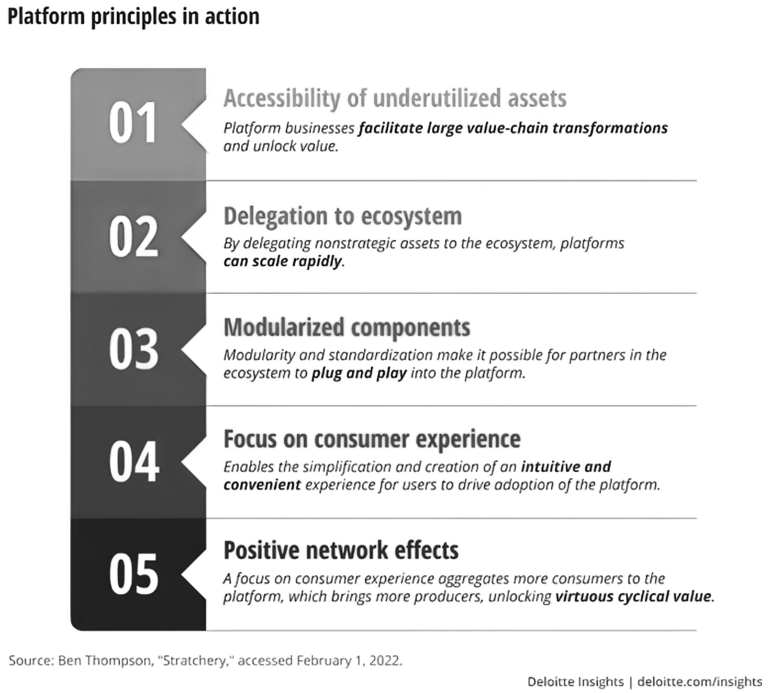

Figure 2.3 Principles for enabling effective ecosystems [4].

Availability of Untapped Resources: It is commonly accepted that the healthcare sector has valuable assets that are frequently not given enough attention. These assets include clinical knowledge, availability of healthcare providers, as well as diverse data sources like fragmented clinical and claims data and factors that influence health drivers (known as social determinants of health). Those interviewed highlighted the significant impact of creating platforms that enable ecosystems, allowing organisations to access and maximise the inherent value of these assets that have been underutilised [7]. For example, telemedicine platforms have successfully adopted underutilised provider availability, enabling clinicians to communicate with patients at any time and from any location, especially in a safer setting during the pandemic. The idea that data are underutilised assets was also covered in detail, with real-world examples of businesses realising this potential and creating a marketplace to connect data suppliers and buyers.

Empowering the Ecosystem through Delegation: There is a myriad of advantages in uniting participants through this innovative business model. For instance, the expanding influence of accountable care organisations is directly tied to the root causes of health, impacting the risk profile of hospitals. While hospitals may not directly address needs like housing, groceries, or job training, strategic partnerships with community-based organisations, facilitated by technology, streamline patient connections with these vital services. Furthermore, health plans are increasingly outsourcing disease management to virtual-first providers, eliminating the need for the health plan to independently construct such solutions, thereby facilitating rapid scalability for improved outcomes. In this dynamic landscape, organisations are leaning towards collaborative relationships with suppliers facilitated by networked platforms rather than pursuing outright ownership, offering a more efficient avenue for realising their strategic objectives.

Component Modularity: Platform-centric businesses may construct interoperable, standardised platforms that facilitate the integration of additional capabilities or specialised solutions, ultimately simplifying and refining the user experience. These modular components may be developed internally or by external partners. According to many interviewees, the adoption of modular platforms can eliminate redundancies, such as the development of multiple diabetes management apps. The concept of allowing partners or third parties to seamlessly integrate and utilise the platform for enhancing existing offerings and solutions, often described as "plug and play," was a common theme in the discussions. As an illustration,

HealthVerity's platform, focused on identity, privacy, governance, and exchange, empowers partners to amalgamate diverse datasets securely, enhancing record-matching accuracy. This platform was strategically designed to accommodate various datasets, standardise intricate processes, and capitalise on the network effect, thereby expanding its user base through both data suppliers and buyers.

Prioritise the Patient Journey: The responders stressed the significant achievement of enhancing and simplifying the consumer experience in platform-based ecosystems. One participant highlighted, "Ultimately, the goal is to enhance consumer convenience." Platforms not only create a digital interface for care delivery but also optimise the omnichannel care experience for patients. A recent study showed that a majority of health system digital executives view digital capabilities as crucial for transforming their interactions with consumers.

Synergistic Impact of Networks: Distinguishing themselves from pipeline businesses, platform businesses rely on virtuous network effects for competitive advantage. These platforms foster growth by incentivising ecosystem partners to join and address existing gaps. Prominent consumer technology firms often leverage demand-side strong network effects, where an expanding user base enhances the value they deliver, leading to improved offerings that are either superior or more cost-effective. Access to more user behaviour data enables businesses to refine their products or services, creating a cycle where an enhanced offering attracts additional consumers and partners [8]. Additionally, producers within the platform can collaborate; for instance, on a care-management platform, virtual-first diabetes companies can engage with virtual-first behavioural health companies.

2.3 Factors to Contemplate in Platform-Enabled Ecosystems

Healthcare entities seeking to strategically position themselves for the Future of Health™ and address ongoing influences such as COVID-19, value-based care, data liquidity, consumer expectations, digital transformation, and virtual health, should explore the concept of assembling a platform or becoming part of an ecosystem. In formulating their approach to leveraging platforms and ecosystems, organisations should take into account the following essential considerations:

- Recognise opportunities to expand the value chain (e.g., enhance outcomes, improve customer experience, and lower costs) without resorting to mergers and acquisitions (M&A): With the increasing responsibilities placed on healthcare organisations, leaders should assess areas where collaboration within an ecosystem and utilising a platform might prove advantageous. Entrusting certain aspects to partners can serve as a cost-effective alternative to extensive vertical integration, often yielding results that are equally, if not more, successful.
- Spot opportunities to transform threats into advantages: In the face of business threats, introducing a platform can effectively neutralise those challenges. For instance, many health systems are assuming additional risk and actively seeking avenues to tackle the fundamental determinants of health. Through establishing an ecosystem in collaboration with a network of community-based organisations, health systems can more effectively address the underlying factors influencing their patients' health.
- Establish alliances within the ecosystem: Identifying suitable partners is a crucial aspect of building an ecosystem. Each entity brings unique skills and offerings, necessitating alignment with the overarching goals and purpose of the ecosystem. Additionally, each participant must determine their preferred roles within the ecosystem. Will they act as a convener, taking charge of platform creation, operation, and interaction orchestration? Alternatively, would a participant role, involving the provision of goods and services on the platform, be a more suitable fit?

In the past, pipeline business models have been the norm for life sciences and healthcare organisations. These businesses competed on the basis of price, quality, and market share, with M&A serving as the main growth path. However, it is becoming unfeasible for a single healthcare organisation to provide the full range of care, from clinical services to addressing fundamental health drivers, spanning well-being to long-term care, given the expanding breadth of healthcare products and services [9]. Using a platform business model allows for similar results with lower capital expenditures, leverages the sharing of goods, services, or information among ecosystem participants, and competes on the basis of customer experience and network effects.