RESEARCH PAPER

Two routes to market for pharmaceutical and health innovation in India: Incubators and e-pharmacy

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ABSTRACT
Public incubators are one of the main channels through which new drugs, diagnostics and medical devices move from the laboratory towards patients, yet there is little evidence on whether they help such ventures innovate and reach the market, particularly in emerging economies. This study examines how incubation support relates to innovation and market adoption among Indian health and life-science ventures, and whether e-pharmacy firms, which deliver medicines to patients, follow the same route. A five-dimension framework of incubation support was examined against public secondary data: outcomes of the BioNEST scheme, an incubator-level cross-section of 65 BioNEST incubators, records of 140 startups that received incubator-routed SEED or LEAP equity, and a comparison of five leading e-pharmacy firms. Outcome ratios, concentration indices, bootstrap intervals, non-parametric tests and negative binomial regression were applied. BioNEST's 3,157 incubatees had filed more than 1,300 intellectual property applications and commercialized more than 800 products. Between 57% and 63% of equity-supported startups raised follow-on funding, amounting to 11 to 13 times the public equity deployed. Incubation space was unrelated to the number of ventures supported ($\rho = 0.04$), outcomes were concentrated in a few incubators, and incubators in metropolitan life-science hubs had 2.6 to 3.7 times as many agency-funded tenants once outliers were removed. None of the e-pharmacy firms showed an incubation link. Incubation appears to help product-based pharmaceutical and health ventures through knowledge, networks and validation rather than space, while e-pharmacy grows outside the incubation system and depends more on regulatory clarity.

Keywords: Pharmaceutical innovation; Business incubation; BioNEST; E-pharmacy; Drug regulation; India

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1. INTRODUCTION

India's startup base has grown faster than the evidence on what helps young firms succeed. The Department for Promotion of Industry and Internal Trade recognized 471 startups in 2016 (Swarajya, 2022), and the count had passed 2.23 lakh by 31 March 2026 (Inc42, 2026). Public money has followed this growth into incubators through the Atal Innovation Mission, the NIDHI programme, TIDE 2.0, the Startup India Seed Fund Scheme and BIRAC's BioNEST scheme. Health is a priority area: under the BioNEST and E-YUVA schemes, 94 bio-incubators had been set up across 25 States and Union Territories by July 2025 (BioVoice News, 2025), of which 74 appear in the BioNEST incubator table analyzed here.

For pharmaceutical science the question matters because a promising molecule, formulation or delivery device creates value only after it clears validation, regulatory approval and distribution. Incubators and e-pharmacies sit at two different points on that path. Incubators support the development of new drugs, diagnostics and devices, whereas e-pharmacies change how approved medicines reach patients. The e-pharmacy market was estimated at USD 344.78 million in FY2021, with expected growth of about 21% a year to FY2027 (ResearchAndMarkets.com, 2021).

Both routes operate under unsettled rules. India has no dedicated e-pharmacy law; online sale of medicines falls under the Drugs and Cosmetics Act, 1940 and the Drugs and Cosmetics Rules, 1945, and draft e-pharmacy rules notified on 28 August 2018 have not been finalised (LSHTM, 2026). A health-tech venture therefore carries three liabilities at once: the liability of newness, a technical liability because clinical performance and data security must be proven, and a regulatory liability that shapes the trust of customers, investors and partners. Desk space and generic mentoring may ease the first but are unlikely to resolve the other two.

Four gaps motivate the study. Most incubation research measures survival, jobs or funds raised, and few studies separate innovation from market adoption. Evidence comes mainly from ICT and manufacturing tenants rather than regulated health ventures. Findings from Europe are mixed (Colombo and Delmastro, 2002; Schwartz, 2013; Lukeš et al., 2019) and may not transfer to emerging markets. Incubation is also often treated as a single treatment, although its service dimensions may matter differently (Bergek and Norrman, 2008; Eveleens et al., 2017). The

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study therefore asks: (i) whether incubation support is associated with the innovation output of Indian health and life-science ventures; (ii) whether it is associated with market adoption, measured by commercialization and follow-on funding; (iii) which support dimensions matter, and whether physical infrastructure is one of them; (iv) how evenly outcomes are spread across incubators; and (v) whether e-pharmacy firms follow the same route as other health ventures.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Incubation and its dimensions

A business incubator offers young firms shared space, services, monitoring and networks to improve their chances of survival and growth (Hackett and Dilts, 2004). Bruneel et al. (2012) trace three generations of incubators, moving from infrastructure to coaching and then to networks that open access to technology, capital and legitimacy, and Hansen et al. (2000) regard networks as the distinctive strength of the modern incubator. Bergek and Norrman (2008) list selection, infrastructure, business support, mediation and graduation as the building blocks of an incubator model. Because business assistance is co-produced by managers and founders (Rice, 2002), and founders do not always recognize what they lack (van Weele et al., 2017), support should be measured as received and used rather than merely offered. Table 1 sets out four established dimensions and a fifth, regulatory and clinical validation support, proposed here for health ventures that need help with drug and device rules, clinical pilots and data protection.

Table 1. Dimensions of incubation support

Dimension	What the incubator provides	Representative sources
Infrastructure support	Workspace, laboratories, IT, shared administrative services	Bergek and Norrman (2008); Bruneel et al. (2012)
Business support and mentoring	Coaching, training, business-model and strategy advice	Rice (2002); Peters et al. (2004)
Networking support	Links to customers, suppliers, experts, universities and other tenants	Hansen et al. (2000); Scillitoe and Chakrabarti (2010)
Access to finance	Seed grants, investor introductions, pitch preparation	Amezcua et al. (2013); Cohen et al. (2019)
Regulatory and clinical validation support (proposed)	Licensing and compliance guidance, hospital and clinician access for pilots, data-privacy and quality-standard advice	Proposed in this study, building on Zimmerman and Zeitz (2002) and Blind (2012)

2.2 Evidence on incubation outcomes

Empirical results are mixed. Incubated Italian firms grew faster and adopted new technologies more readily than their peers (Colombo and Delmastro, 2002), and university ties were linked to lower failure and faster graduation (Rothaermel and Thursby, 2005). A large Italian sample showed higher short-run sales but no clear effect on jobs (Lukeš et al., 2019), while a German control-group study found no survival advantage (Schwartz, 2013). The benefit of sponsorship depends on the founding environment (Amezcua et al., 2013), and inconsistent results partly reflect differences in incubator types and outcome measures (Eveleens et al., 2017). Recent syntheses are more positive. A meta-analysis of 39 studies covering 55,219 firms finds that incubation improves innovation and growth, with weaker effects on survival, profitability and employment, and that effects depend on the type of support and ownership (Murillo-Rojas et al., 2026). A second meta-analysis of 22 studies reports a positive effect moderated by specialization, public sponsorship and regional context (Seitz et al., 2026b), and accelerator evidence shows a similar pattern alongside clear selection bias (Seitz et al., 2026a). Incubator attributes also act as a signal to venture capitalists (Manconi et al., 2022). In India, public incubators lack a common monitoring framework (Surana et al., 2020) and systematic performance measurement (Gupta and Sunder, 2025), while 74.9% of 2,165 BIRAC-supported projects relate to human healthcare (Differding, 2023).

2.3 Innovation, adoption and legitimacy in health markets

Innovation performance refers to new or significantly improved products, services and processes (Wang and Ahmed, 2004). Incubators can raise it by lowering the cost of experimentation, transferring knowledge from mentors and peers, and opening access to external technology, although the gain depends on a venture's absorptive capacity (Cohen and Levinthal, 1990; Scillitoe and Chakrabarti, 2010). Market adoption, the extent to which users take up an offering, depends on relative advantage, compatibility and trialability (Rogers, 2003) and on perceived usefulness and social influence (Davis, 1989; Venkatesh et al., 2003). In health markets trust is decisive, so legitimacy acts as a resource that unlocks other resources (Zimmerman and Zeitz, 2002), and incubator affiliation can serve as a certification signal (Aldrich and Fiol, 1994; Suchman, 1995). Licensing, policy, data privacy and security recur as barriers in health-tech research (Chakraborty et al., 2021; Inampudi et al., 2024; Weimar et al., 2025).

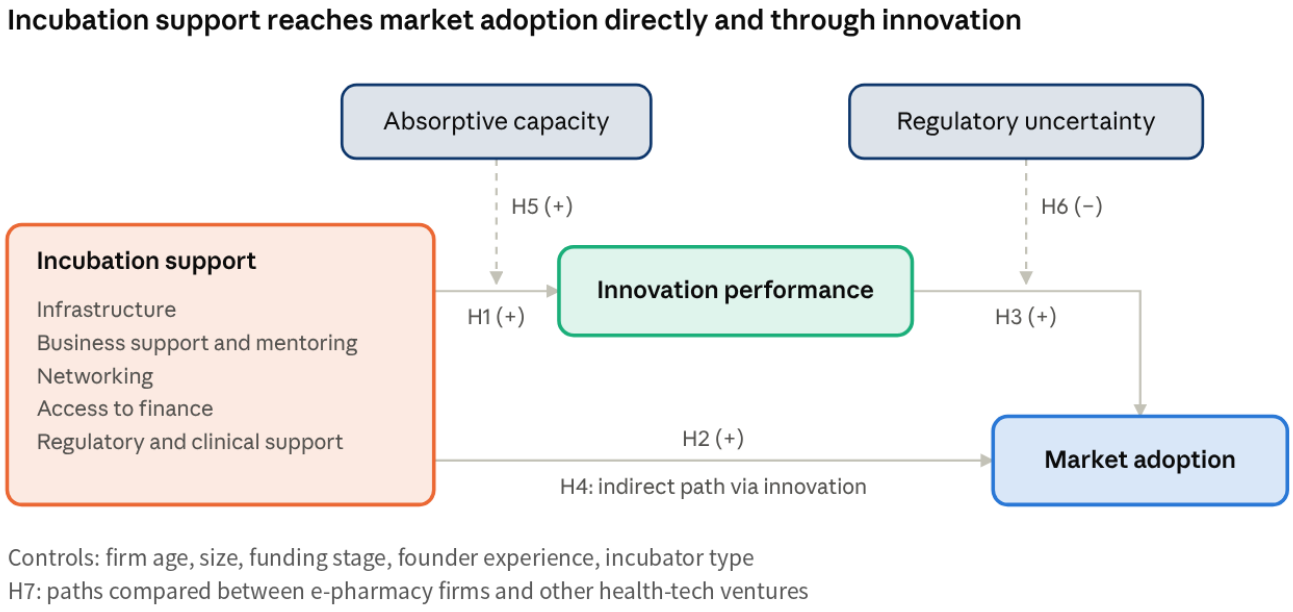
2.4 E-pharmacy and regulation

Indian e-pharmacies run inventory-led, marketplace and omnichannel models. They compete with about 8.5 lakh offline pharmacies, account for only 2–3% of medicine sales and face strong opposition from pharmacist associations (LSHTM, 2026). Clear rules can encourage innovation by reducing uncertainty, whereas unclear rules dampen it (Blind, 2012). E-pharmacy in low- and middle-income countries has been described as a case of technology moving ahead of regulation (Miller et al., 2021), and Indian evidence calls for dedicated rules and accreditation (Apte et al., 2024). Research has not yet examined how these firms are built and financed, or whether incubators play any part.

2.5 Framework and hypotheses

The framework (**Figure 1**) draws on three theories. The resource-based view holds that advantage rests on valuable and hard-to-imitate resources (Barney, 1991), which new ventures lack (Stinchcombe, 1965); incubation is one channel through which they acquire them. Dynamic-capability theory adds that resources create value only when a firm can integrate and reconfigure them (Teece et al., 1997). Legitimacy theory explains why affiliation and validation matter for adoption in regulated markets (Suchman, 1995). Incubation support is expected to affect market adoption directly and through innovation, with absorptive capacity moderating the first stage and regulatory uncertainty the second. Seven hypotheses follow: incubation support is positively associated with innovation performance (H1) and market adoption (H2); innovation performance is positively associated with market adoption (H3); innovation mediates the incubation–adoption link (H4); absorptive capacity strengthens the incubation–innovation link (H5); regulatory uncertainty weakens the innovation–adoption link (H6); and these relationships differ between e-pharmacy firms and other health ventures (H7). Because public data are aggregated, H1 to H3 are examined here as propositions for consistency with the evidence and H7 qualitatively, while H4 to H6 require firm-level data and are left for testing with the instrument in Supplementary Appendix S1.

Figure 1



3. MATERIALS AND METHODS

3.1 Design and data

The study uses a descriptive and exploratory design based entirely on public secondary data; no primary survey was conducted and no human participants were involved. It combines four strands (Table 2).

Table 2. Data sources

Strand	Unit and coverage	Source
A. Programme outcomes	BioNEST scheme totals: incubators, incubatees, space, funds, products, IPs, employment	BIRAC (2026), headline figures
B. Incubator cross-section	74 incubators listed, 65 with incubatee data: incubatees not funded and funded by BIRAC, incubation space	BIRAC (2026), incubator-wise table
C. Incubator-routed equity	SEED Fund: 16 partners, 112 startups; LEAP Fund: 6 partners, 47 startups; follow-on funding, valuation, products; partner-wise tables	BIRAC (2023a, 2023b), last updated February 2023
D. E-pharmacy cases	Five leading firms: founding, capital route, outcome	Company releases and trade-press reports (Table 11)

3.2 Working sample and data treatment

The BioNEST page reports two incubatee totals. The headline total of 3,157 combines 1,741 resident and 1,416 non-resident incubatees. The incubator-wise table sums to 3,026, made up of 2,148 incubatees not funded by BIRAC and 878 funded by BIRAC; its per-incubator column labelled 'Total Funded Incubatees' equals not-funded plus funded incubatees in every row and is treated as the total. BIRAC does not explain the gap of 131, and no attempt is made to allocate it. Programme ratios use the headline total because IP, product and employment figures are reported at the same aggregate level, while incubator-level analyses use the table. Of the 74 incubators in the table, nine report no incubatee figures, so the working sample is 74 − 9 = 65; all 65 also report space. Product and IP counts are reported as minimums (800+ and 1,300+), all counts are self-reported, and SEED and LEAP figures date from February 2023.

3.3 Measures and coding

Infrastructure support is proxied by incubation space; access to finance by BIRAC-funded incubatees and incubator-routed equity; innovation by IP filings and products developed; and market adoption by products commercialized and follow-on funding from external investors. Follow-on funding reflects investor acceptance rather than patient uptake, so adoption is interpreted as commercial and investor traction. Host type was coded from incubator names into university (22), technical institute (17), public research institute (13) and standalone park or foundation (13). Hub location equals 1 for incubators in Bengaluru, Hyderabad, Pune, Mumbai, Delhi-NCR or Chennai (30) and 0 otherwise (35). Startups were classified by sub-sector from firm names and public descriptions. The full coding is reported in Supplementary Table S1.

3.4 Statistical analysis

Derived ratios are shown with their formulas in each table. Spearman's ρ was used because distributions are highly skewed. Concentration was measured with the Gini coefficient, $G = 2\Sigma(i \cdot x_i) \div (n\Sigma x_i) - (n + 1) \div n$ with values sorted in ascending order, and the Herfindahl–Hirschman index, $HHI = \Sigma s_i^2$, whose inverse gives the effective number of equal-sized incubators. Bootstrap 95% intervals used 5,000 resamples with a fixed random seed. Host types were compared with the Kruskal–Wallis test and hub with non-hub incubators with the Mann–Whitney U test. The number of BIRAC-funded incubatees was modelled by negative binomial regression after a Poisson model was rejected for overdispersion (Pearson $\chi^2/df = 61.2$), with log space, log non-funded incubatees, hub location and host type as predictors and results reported as incidence rate ratios (IRR). Analyses were run in Python with SciPy and stats models.

4. RESULTS AND DISCUSSION

4.1 Programme-level outcomes

BioNEST incubatees have commercialized at least one product for every four ventures and filed at least two IPs for every five (Table 3).

Table 3. BioNEST scheme outcomes (cumulative)

Indicator	Reported value	Derived ratio (formula)
Incubators supported	74	–
Funds committed	₹447.4 crore	₹14.2 lakh per incubatee (₹44,737 lakh ÷ 3,157)
Incubation space	11,02,430 sq ft	–
Incubatees supported	3,157 (1,741 resident; 1,416 non-resident)	55.1% resident (1,741 ÷ 3,157)
IPs filed	1,300+	≥0.41 per incubatee (1,300 ÷ 3,157)
Products and technologies commercialized	800+	≥0.25 per incubatee (800 ÷ 3,157)
Employment generated	3,500	1.11 jobs per incubatee (3,500 ÷ 3,157)

Source: Headline figures, BIRAC (2026) ₹1 crore = ₹100 lakh.

Public outlay works out to at most about ₹56 lakh per commercialized product (₹44,737 lakh ÷ 800), and IP filings exceed commercialized products by about 1.6 times (1,300 ÷ 800), so a sizeable share of incubated innovation has not yet reached the market. Using the table total of 3,026 instead of 3,157 changes the ratios only slightly (₹14.8 lakh, 0.43 IPs, 0.26 products and 1.16 jobs per incubatee). The output is consistent with earlier evidence that incubated firms innovate actively (Colombo and Delmastro, 2002), but without a comparison group the data cannot show how much would have happened without incubation (Schwartz, 2013).

4.2 Incubator-level cross-section

Activity is unevenly spread and bears no relation to incubator size (Tables 4 and 5). Space does not predict how many ventures an incubator supports or how many win agency funding, and the result holds when the six non-reporting incubators that list space are coded as having no incubatees. A Pearson correlation on log-transformed space and incubatees gives the same answer ($r = 0.09$, $p = 0.470$). In the median incubator only about one tenant in eight holds BIRAC funding.

Table 4. Distribution of incubatees across BioNEST incubators (n = 65)

Statistic	Value	Formula
Total incubatees	3,026	Sum over 65 incubators
Mean / median per incubator	46.6 / 34	3,026 ÷ 65; middle value
Standard deviation; range	44.8; 1 to 291	Sample SD
Share of five / ten largest incubators	25.5% / 41.1%	Their incubatees ÷ 3,026
BIRAC-funded incubatees	878 (29.0%)	878 ÷ 3,026
Funded share excluding KIIT-TBI	21.8%	(878 − 282) ÷ (3,026 − 291)
Median funded share per incubator	11.8%	Median of funded ÷ total
Incubators with no funded incubatee	11	Count
Median space per incubatee	354 sq ft	Median of space ÷ total

Source: Computed from the incubator-wise table in BIRAC (2026).

Table 5. Spearman rank correlations at incubator level

Pair	ρ (p), n = 65	95% bootstrap CI	ρ (p), n = 71[a]
Space and total incubatees	0.04 (0.757)	−0.23 to 0.31	0.02 (0.849)
Space and BIRAC-funded incubatees	0.03 (0.832)	–	0.01 (0.945)
Total and BIRAC-funded incubatees	0.60 (< 0.001)	0.39 to 0.75	0.67 (< 0.001)

Note. [a]Six non-reporting incubators that list space coded as having zero incubatees. p-values are two-tailed. *Source:* Computed from BIRAC (2026).

4.3 Incubator-routed equity and follow-on funding

About six in ten startups that received incubator-routed equity raised follow-on funding from external investors, amounting to 11 to 13 times the public equity deployed (Table 6). Because 19 startups received both SEED and LEAP equity, the two columns should be read separately.

Table 6. SEED and LEAP Fund outcomes

Indicator (formula)	SEED Fund	LEAP Fund
Partner incubators; startups supported	16; 112	6; 47
Public equity deployed	₹30 crore	₹30 crore
Raised follow-on funding (raised ÷ supported)	71 of 112 (63.4%)	27 of 47 (57.4%)
Follow-on funding raised	₹398 crore	₹339 crore
Leverage (follow-on ÷ public equity)	13.3 times	11.3 times
Follow-on per startup that raised	₹398 crore ÷ 71 = ₹5.6 crore	₹339 crore ÷ 27 = ₹12.6 crore
Products commercialized (per startup)	118 (1.05)	46 (0.98)
Average valuation (combined ÷ startups valued)	₹2,498 crore ÷ 89 = ₹28.1 crore	₹1,668 crore ÷ 33 = ₹50.5 crore

Source: Impact panels, BIRAC (2023a, 2023b).

Outcomes differ sharply by incubator (Table 7, **Figure 2**). Three SEED partners account for 70.8% of follow-on funding and two report none. Pooled follow-on funding is ₹356 lakh per startup, while the unweighted partner mean is ₹306 lakh and the median only ₹138 lakh. The number of startups a partner supported correlates with the follow-on funding it raised ($\rho = 0.72$, $p = 0.002$, 95% CI 0.33 to 0.90). In the LEAP Fund, startups at IKP Knowledge Park and C-CAMP raised ₹233.5 crore, or 68.9% of the total (BIRAC, 2023a). Follow-on capital of 11 to 13 times public equity is compatible with incubator backing acting as a certification signal (Zimmerman and Zeitz, 2002; Manconi et al., 2022), although the selection of strong ventures could produce the same pattern.

Figure 2

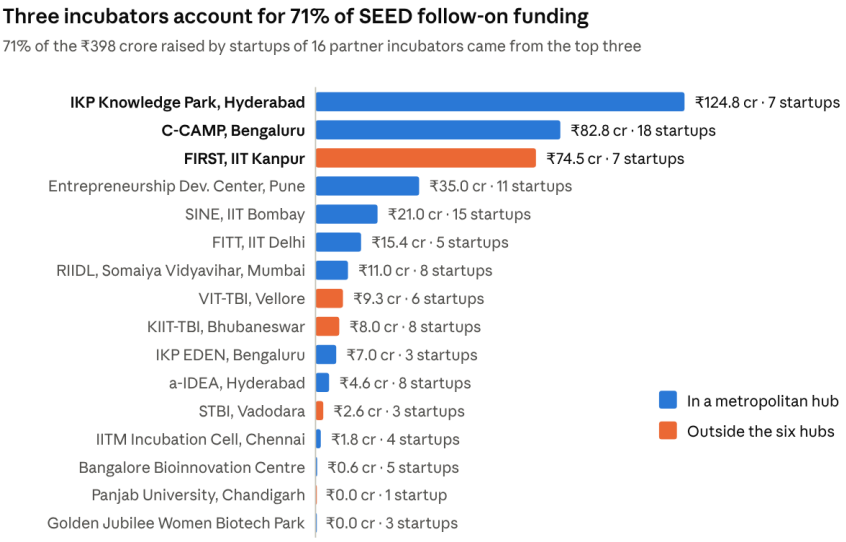


Table 7. Follow-on funding by SEED Fund partner incubator

Partner incubator	Startups supported	Follow-on funding (₹ lakh)	Per startup (₹ lakh)
IKP Knowledge Park, Hyderabad	7	12,480	1,783
C-CAMP, Bengaluru	18	8,280	460
FIRST, IIT Kanpur	7	7,455	1,065
Entrepreneurship Development Centre, Pune	11	3,504	319
SINE, IIT Bombay	15	2,098	140
FITT, IIT Delhi	5	1,540	308

Partner incubator	Startups supported	Follow-on funding (₹ lakh)	Per startup (₹ lakh)
RIIDL, Somaiya Vidyavihar, Mumbai	8	1,097	137
VIT-TBI, Vellore	6	927	155
KIIT-TBI, Bhubaneswar	8	803	100
IKP EDEN, Bengaluru	3	700	233
a-IDEA, Hyderabad	8	458	57
STBI, Vadodara	3	261	87
IITM Incubation Cell, Chennai	4	177	44
Bangalore Bio innovation Centre	5	55	11
Panjab University, Chandigarh	1	0	0
Golden Jubilee Biotech Park for Women, Chennai	3	0	0
Total	**112**	**39,835**	**356**

Source: Partner-wise table, BIRAC (2023b). Per startup = follow-on funding ÷ startups supported.

4.4 Concentration, group differences and regression

Agency funding is far more concentrated than incubation itself (Table 8, **Figure 3**). Incubatees are spread as if across 34 equal-sized incubators, but funded incubatees as if across fewer than eight. SEED-supported startups are spread fairly evenly across partners (Gini 0.33), whereas their follow-on funding is twice as unequal (Gini 0.67), so inequality arises after allocation, in what startups at different incubators go on to raise.

Figure 3

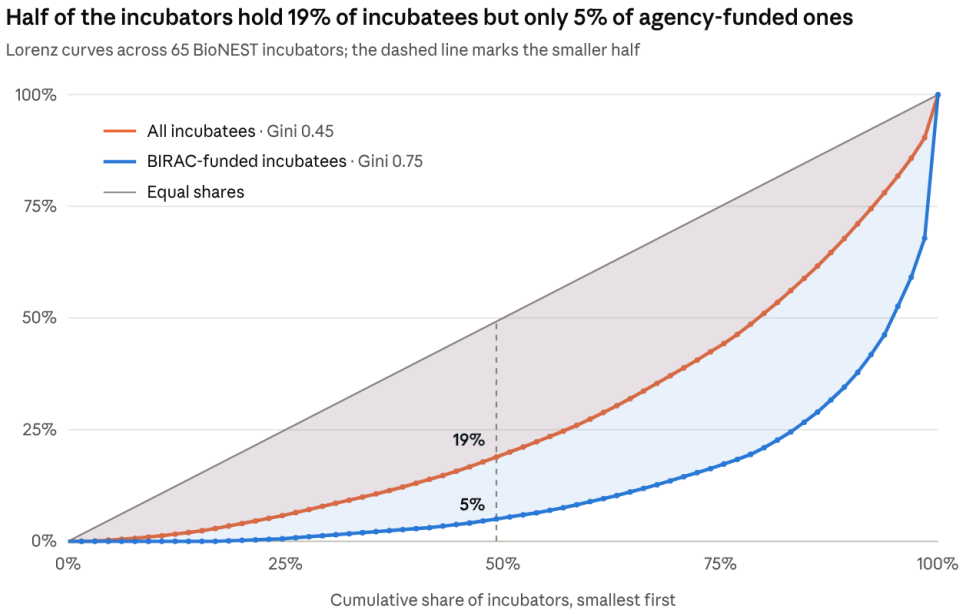


Table 8. Concentration across incubators

Distribution	n	Gini	95% bootstrap CI	HHI	Effective number
Total incubatees	65	0.45	0.37 to 0.52	0.029	34.0
BIRAC-funded incubatees	65	0.75	0.60 to 0.82	0.128	7.8
SEED startups supported	16	0.33	0.20 to 0.41	0.087	11.5
SEED follow-on funding	16	0.67	0.49 to 0.75	0.191	5.2
LEAP follow-on funding	6	0.48	–	0.304	3.3

Note. No interval is reported for the LEAP Fund because six observations are too few. *Source:* Computed from BIRAC (2023a, 2023b, 2026).

Host type makes no significant difference to any outcome, but location does (Table 9). Hub and non-hub incubators support similar numbers of ventures, yet roughly twice the share of hub tenants hold agency funding. Recoding the nine borderline host types marked in Supplementary Table S1 leaves the host-type tests non-significant (p = 0.50 to 0.99), and the hub difference in funded share holds whether the incubator with an unconfirmed location is excluded (p = 0.002) or coded as a hub (p = 0.003).

Table 9. Group comparisons at incubator level (n = 65)

Comparison	Outcome	Group medians	Statistic	p
Host type	Total incubatees	University 35.5; research 34; standalone 30; technical 26	H = 1.04	0.793
Host type	Funded incubatees	Research 6; standalone 6; technical 4; university 4	H = 0.68	0.878
Host type	Funded share	Standalone 20.0%; research 17.6%; technical 11.8%; university 9.6%	H = 2.85	0.416
Hub vs non-hub	Total incubatees	33.5 vs 34	U = 534	0.911
Hub vs non-hub	Funded incubatees	6 vs 2	U = 690	0.029
Hub vs non-hub	Funded share	18.3% vs 8.7%	U = 764.5	0.002

Note. Kruskal–Wallis H test for host type; Mann–Whitney U test for hub location. *Source:* Computed from BIRAC (2026).

The regression confirms the role of location (Table 10). The hub effect strengthens as outliers are removed, so that a hub incubator has 2.6 to 3.7 times as many funded incubatees as a comparable non-hub incubator. The space effect is fragile: it is significant in Models 1 and 2 but disappears, and reverses sign, once the two largest campuses are dropped. A model of total incubatees was not significant (likelihood-ratio p = 0.574), and explanatory power is low throughout, so the regression is exploratory.

Table 10. Negative binomial regression of BIRAC-funded incubatees (IRR, p in brackets)

Predictor	Model 1 (n = 65)	Model 2 (n = 64)	Model 3 (n = 62)
Log incubation space	2.09 (0.011)	1.50 (0.046)	0.69 (0.275)
Log non-funded incubatees	1.09 (0.693)	1.16 (0.293)	1.42 (0.028)
Hub location	2.26 (0.105)	2.60 (0.006)	3.69 (< 0.001)
Research institute (ref. university)	0.53 (0.241)	1.51 (0.354)	1.69 (0.219)
Standalone (ref. university)	0.67 (0.535)	2.16 (0.115)	1.35 (0.516)
Technical institute (ref. university)	0.61 (0.399)	1.49 (0.346)	0.96 (0.918)
Dispersion (α)	2.02	1.35	1.17
Likelihood-ratio test, p	0.086	0.011	0.001
McFadden pseudo-R^2	0.025	0.041	0.056
AIC	448.1	408.8	379.4

Note. Model 2 excludes KIIT-TBI (282 of 291 incubatees funded). Model 3 also excludes IIT Kanpur (150,000 sq ft) and the Bio-resources Development Centre, Shillong (196,020 sq ft), whose floor areas are 15 to 20 times the median of 10,000 sq ft. *Source:* Computed from BIRAC (2026).

Three conclusions follow. First, facilities are not the differentiator: space is unrelated to throughput, supporting the view that later-generation incubators add value through services and networks (Hansen et al., 2000; Bruneel et al., 2012) and questioning square feet created as a headline performance measure. Second, outcomes are concentrated, echoing evidence that incubation is not a uniform treatment (Amezcua et al., 2013; Eveleens et al., 2017); the same instrument yields ₹17.8 crore per startup at one partner and nothing at another. Third, location matters, as the networked-incubator thesis predicts and as meta-analytic evidence on regional context suggests (Seitz et al., 2026b). Hub location may stand for investor networks and deal flow, but also for proximity to the funding agency, and the present data cannot separate these explanations.

4.5 E-pharmacy firms: a different route

None of the five leading e-pharmacy firms reports an incubator affiliation, and none appears among the 112 SEED or 47 LEAP startups (Table 11). All grew on venture, family or corporate capital, and three of the five were

acquired by larger groups, which suggests that scale, logistics and capital drive competition in this segment. Their innovation lies in business models and supply chains rather than laboratory products, so bio-incubator infrastructure and IP support have little to offer them. What these firms lack is regulatory clarity, which no incubator can supply; the consolidation of the sector is compatible with H6, though it does not test it, and mirrors the pattern described for other low- and middle-income markets (Miller et al., 2021).

Table 11. Capital route and outcome of leading Indian e-pharmacy firms

Firm	Founded	Capital route	Outcome	Source
Netmeds (Vitalic Health)	Incorporated 2015	Promoter family (Dadha), in pharma retail since 1914	Reliance Retail Ventures bought about 60% of Vitalic and 100% of its subsidiaries for about ₹620 crore, August 2020	Reliance Industries Limited (2020)
Tata 1mg	Incorporated 2015	Founder-led with outside investors	Tata Digital announced acquisition of a majority stake, June 2021	Tata Digital (2021)
Medlife	Founded 2014	Founder family trust, private investors and debt	Acquisition by API Holdings (PharmEasy) approved by the Competition Commission of India, September 2020	Inc42 (2020a, 2020b)
PharmEasy (API Holdings)	Founded 2015	Venture capital incl. Temasek, Bessemer, Naspers, TPG Growth	Filed for ₹6,250 crore IPO, November 2021; 2024 investor mark-down implied value about 92% below $5.6 billion peak	Inc42 (2021); TechCrunch (2024)
Truemeds	Founded 2019	Venture capital: Accel, Peak XV, West Bridge, Info Edge Ventures	Raised $85 million Series C, 2025	Entrepreneur India (2025)

4.6 Sub-sectors and the drug and device pipeline

Health ventures make up at least half of the 140 distinct equity-supported firms and 69% of the 101 that could be classified (Table 12), in line with Differing (2023). Within health, device and diagnostics firms outnumber digital-health and AI firms about five to one, and no e-pharmacy or pharmacy-enablement firm appears. For drug and device ventures the distance between a patent and a product on the shelf is long: a therapeutic or medical device must pass preclinical and clinical validation and obtain approval from the Central Drugs Standard Control Organization before sale. The gap between IP filings and commercialized products therefore points to clinical validation, regulatory approval and access to buyers as the missing steps (Rogers, 2003), which are exactly the areas covered by the proposed fifth support dimension.

Table 12. Sub-sector of SEED and LEAP Fund startups

Sub-sector	SEED (n = 112)	LEAP (n = 47)	Distinct firms (n = 140)
Health and medical, total	55 (49.1%)	29 (61.7%)	70 (50.0%)
Medical devices and diagnostics	31	14	37
Therapeutics, biopharma, research tools	8	6	10
Digital health and AI	5	2	7
Health, type not identified	11	7	16
Agriculture, food, aquaculture, veterinary	19 (17.0%)	2 (4.3%)	19 (13.6%)
Environment, water, other technology	9 (8.0%)	5 (10.6%)	12 (8.6%)
Not classifiable from available information	29 (25.9%)	11 (23.4%)	39 (27.9%)

Note. 159 list entries (112 + 47) less 19 firms on both lists gives 140 distinct firms. *Source:* Startup lists, BIRAC (2023a, 2023b); sub-sectors coded from firm names and public descriptions.

Taken together, the evidence is consistent with H1 and H2 for product-based health and life-science ventures, only partly consistent with H3 because innovation does not convert fully into adoption, and consistent with a segment difference (H7). Incubation appears to work for ventures that build products, and not to reach those that build distribution.

5. IMPLICATIONS

For theory, the study adds regulatory and clinical validation support as a distinct dimension of incubation, separates innovation from market adoption and shows a measurable gap between them, and identifies a boundary condition: platforms that compete on scale and capital, such as e-pharmacies, grow outside the incubation system. The

skewed outcomes also favour contingency views of incubation over uniform ones.

For incubator managers, investor networks, validation partnerships and mentoring matter more than floor space. Standing agreements with hospitals, diagnostic chains and pharmacy networks would allow pilots to run quickly, and in-house or shared expertise on drug, device and data-protection law would shorten the path to approval. Incubators hosted by pharmaceutical institutions, such as the NIPER incubators in the BioNEST network, are well placed to link formulation and drug-delivery research with clinical-pilot partners and regulatory guidance. Founders should choose incubators for sector fit, hospital connections and regulatory support rather than subsidized rent, and should use affiliation deliberately as a credibility signal.

For policy, BioNEST and similar schemes should be assessed on tenant outcomes such as products commercialized and follow-on capital rather than space created. The concentration of outcomes calls for structured peer learning and a review of partners that report no follow-on funding, and publishing firm-level, dated outcome data would make impact evaluation with comparison groups possible. Regulatory facilitation cells for digital health within incubators would lower compliance costs, but incubation policy will not reach e-pharmacy; finalizing the pending e-pharmacy rules is the relevant lever for that segment.

6. LIMITATIONS AND FUTURE RESEARCH

There is no comparison group of non-incubated ventures, so the results show association rather than causation, and incubators and equity schemes select promising ventures. The data are aggregated and self-reported, so conclusions about individual firms carry a risk of ecological inference, and H4 to H6 could not be assessed. Cumulative counts are not adjusted for incubator age, which may partly explain the hub effect. Market adoption is proxied by commercialization and investor funding rather than patient uptake, sub-sector coding rests on firm names, and the e-pharmacy analysis covers five large firms, so smaller incubated e-pharmacy ventures may exist outside the sample. Future work should survey incubated and matched non-incubated ventures with the instrument in Supplementary Appendix S1, add incubator age to the regression, study high-performing incubators in depth, examine patient and clinician adoption, and build a census of smaller e-pharmacy and pharmacy-enablement startups.

7. CONCLUSION

The evidence points to two routes to market. Product-based health and life-science ventures show substantial innovation (at least 1,300 IP filings) and commercial traction (at least 800 products commercialized), and 57% to 63% of equity-backed startups raised follow-on capital. Leading e-pharmacy firms show no incubation route; they were built on venture and corporate capital, and their growth is constrained by regulation rather than by a shortage of incubators. Across incubators, outcomes are largely unrelated to space and concentrate in a few well-connected institutions. In a regulated pharmaceutical market, an incubator's value appears to lie less in the facilities it offers than in the knowledge, networks and legitimacy it passes on, and above all in helping drug and device innovations through validation and approval.

REFERENCES

A. Official government and agency sources (the main data)

- Biotechnology Industry Research Assistance Council. (2026). *BioNEST: Bioincubators nurturing entrepreneurship for scaling technologies* from https://birac.nic.in/bionest.php
  Used for: Table 5 (scheme totals), Tables 6, 7, 11, 12 and 13 (incubator-wise data) and Table A2.
- Biotechnology Industry Research Assistance Council. (2023a). *LEAP Fund* [Web page; impact data last updated February 2023] from https://birac.nic.in/leapFundNew.php
  Used for: Table 8 (LEAP column), the LEAP partner figures (₹233.5 crore, 68.9%) and Table 14.
- Biotechnology Industry Research Assistance Council. (2023b). *SEED Fund* [Web page; impact data last updated February 2023] from https://www.birac.nic.in/seedFundNew.php
  Used for: Table 8 (SEED column), Table 9 and Table 14.
- BioVoice News. (2025). *India has set up 94 biotech incubators across 25 states*. https://biovoicenews.com/india-has-set-up-94-biotech-incubators-across-25-states-invested-rs-489-crore-in-last-13-years-minister/
  Used for: the count of 94 bio-incubators under BioNEST and E-YUVA (Section 1.1).
- Inc42. (2026). *Centre recognises record 55,200 startups in FY26*. https://inc42.com/buzz/centre-recognises-record-55200-startups-in-fy26/
  Used for: 2.23 lakh DPIIT-recognised startups as of 31 March 2026 (Section 1.1).
- Swarajya. (2022, July 23). *Number of recognised startups increased from 471 in 2016 to 72,993 in 2022: Govt*. https://swarajyamag.com/amp/story/business/number-of-recognised-startups-increased-from-471-in-2016-to-72993-in-2022-govt
  Used for: 471 startups recognised in 2016 (Section 1.1).

B. Policy and market reports

- London School of Hygiene and Tropical Medicine. (2026). *E-pharmacy in India: Regulation, practice and performance* [Policy brief]. https://www.lshtm.ac.uk/media/102426
  Used for: the regulatory status of e-pharmacy, the 8.5

lakh offline pharmacies, and the 2–3% market share (Sections 1.2 and 2.6).

- ResearchAndMarkets.com. (2021, November 23). *India e-pharmacy market report 2021: Market stood at $344.78 million in 2021 and is expected to witness robust growth of 21.28% to 2027* [Press release]. GlobeNewswire. https://www.globenewswire.com/fr/news-release/2021/11/23/2339554/28124/en/India-e-Pharmacy-Market-Report-2021-Market-Stood-at-344-78-Million-in-2021-and-is-Expected-to-Witness-Robust-Growth-of-21-28-to-2027.html
  Used for: the e-pharmacy market size (Section 1.1).

C. Company releases (Table 10)

- Reliance Industries Limited. (2020, August 18). *Media release on the acquisition of a majority stake in Netmeds by Reliance Retail Ventures*. https://www.ril.com/sites/default/files/2023-01/Media-Release-18082020.pdf
- Tata Digital. (2021, June 10). *Tata Digital to acquire majority stake in India's leading online healthcare marketplace 1MG* [Press release]. https://www.tatadigital.in/resources/pressreleases/tata-digital-to-acquire-majority-stake-in-india-s-leading-online-healthcare-marketplace-1mg

D. Trade press (Table 10)

- Inc42. (2020a). *Exclusive: Online pharmacy Medlife raises INR 173 Cr*. https://inc42.com/buzz/exclusive-online-pharmacy-medlife-raises-inr-173-cr/
- Inc42. (2020b, September 23). *CCI approves PharmEasy's merger with rival Medlife*. https://inc42.com/buzz/cci-approves-pharmeasys-merger-with-rival-medlife
- Inc42. (2021, November 10). *Epharmacy giant PharmEasy files DRHP for INR 6,250 Cr IPO*. https://inc42.com/buzz/epharmacy-giant-pharmeasy-files-drhp-for-inr-6250-cr-ipo
- TechCrunch. (2024, September 3). *PharmEasy still 92% below its peak $5.6B valuation, investor estimates*. https://techcrunch.com/2024/09/03/pharmeasy-still-92-below-its-peak-5-6-billion-valuation-investor-estimates/
- Entrepreneur India. (2025, August 11). *Truemeds secures USD 85 Mn Series C funding to expand affordable healthcare access*. https://india.entrepreneur.com/news-and-trends/truemeds-secures-usd-85-mn-series-c-funding-to-expand/495717

Apte, A., Bright, H.R., Kadam, S., Sundarsanam, T.D., Chandy, S.J., 2024. Facilitators, barriers, and potential impacts of implementation of e-pharmacy in India and its potential impact on cost, quality, and access to medicines: Scoping review. Online Journal of Public Health Informatics 16, e51080. https://doi.org/10.2196/51080

BIRAC (Biotechnology Industry Research Assistance Council), 2023a. LEAP Fund. https://birac.nic.in/leapFundNew.php.

BIRAC (Biotechnology Industry Research Assistance Council), 2023b. SEED Fund. https://www.birac.nic.in/seedFundNew.php.

BIRAC (Biotechnology Industry Research Assistance Council), 2026. BioNEST: Bioincubators nurturing entrepreneurship for scaling technologies. https://birac.nic.in/bionest.php.

BioVoice News, 2025. India has set up 94 biotech incubators across 25 states. https://biovoicenews.com/india-has-set-up-94-biotech-incubators-across-25-states-invested-rs-489-crore-in-last-13-years-minister/.

Chakraborty, I., Ilavarasan, P.V., Edirippulige, S., 2021. Health-tech startups in healthcare service delivery: A scoping review. Social Science & Medicine 278, 113949. https://doi.org/10.1016/j.socscimed.2021.113949

Cohen, S., Fehder, D.C., Hochberg, Y.V., Murray, F., 2019. The design of startup accelerators. Research Policy 48(7), 1781–1797.

Differding, E., 2023. Biotechnology in India: An analysis of 'Biotechnology Industry Research Assistance Council' (BIRAC)-supported projects. ChemBioChem 24(21), e202300302. https://doi.org/10.1002/cbic.202300302

Entrepreneur India, 2025. Truemeds secures USD 85 Mn Series C funding to expand affordable healthcare access. https://india.entrepreneur.com/news-and-trends/truemeds-secures-usd-85-mn-series-c-funding-to-expand/495717.

Eveleens, C.P., van Rijnsoever, F.J., Niesten, E.M.M.I., 2017. How network-based incubation helps start-up performance: A systematic review against the background of management theories. Journal of Technology Transfer 42(3), 676–713.

Gupta, S., Sunder, D.L., 2025. Tall tales or success stories? A scrutiny of the business incubation policy and landscape in India. Journal of Public Affairs 25(1). https://doi.org/10.1002/pa.70014

Hackett, S.M., Dilts, D.M., 2004. A systematic review of business incubation research. Journal of Technology Transfer 29(1), 55–82. https://doi.org/10.1023/B:JOTT.0000011181.11952.0f

Inampudi, S., Rajkumar, E., Gopi, A., Mol, K.S.V., Sruthi, K.S., 2024. Barriers to implementation of digital transformation in the Indian health sector: A systematic review. Humanities and Social Sciences Communications 11(1), 1–10. https://doi.org/10.1057/s41599-024-03081-7

Inc42, 2020a. Exclusive: Online pharmacy Medlife raises INR 173 Cr. https://inc42.com/buzz/exclusive-online-pharmacy-medlife-raises-inr-173-cr/.

Inc42, 2020b. CCI approves PharmEasy's merger with rival Medlife. https://inc42.com/buzz/cci-approves-pharmeasys-merger-with-rival-medlife.

Inc42, 2021. Epharmacy giant PharmEasy files DRHP for INR 6,250 Cr IPO. https://inc42.com/buzz/epharmacy-giant-pharmeasy-files-drhp-for-inr-6250-cr-ipo.

Inc42, 2026. Centre recognises record 55,200 startups in FY26.https://inc42.com/buzz/centre-recognises-record-55200-startups-in-fy26/.

Lukeš, M., Longo, M.C., Zouhar, J., 2019. Do business incubators really enhance entrepreneurial growth? Evidence from a large sample of innovative Italian start-ups. Technovation 82–83, 25–34.

Manconi, M., Bellomo, S., Nosella, A., Agostini, L., 2022. Attributes of business incubators: A conjoint analysis of venture capitalist's decision making. Journal of Risk and Financial Management 15(5), 213. https://doi.org/10.3390/jrfm15050213

Murillo-Rojas, J.-V., Brinckmann, J., van Essen, M., 2026. Hatching and fledging? A meta-analysis of the performance effects of business incubators. Strategic Entrepreneurship Journal. https://doi.org/10.1002/sej.70032

Peters, L., Rice, M., Sundararajan, M., 2004. The role of incubators in the entrepreneurial process. Journal of Technology Transfer 29(1), 83–91. https://doi.org/10.1023/B:JOTT.0000011182.82350.df

Reliance Industries Limited, 2020. Media release on the acquisition of a majority stake in Netmeds by Reliance Retail Ventures, 18 August 2020. https://www.ril.com/sites/default/files/2023-01/Media-Release-18082020.pdf.

Rice, M.P., 2002. Co-production of business assistance in business incubators: An exploratory study. Journal of Business Venturing 17(2), 163–187. https://doi.org/10.1016/S0883-9026(00)00055-0

Rogers, E.M., 2003. Diffusion of Innovations, fifth ed. Free Press, New York.

Rothaermel, F.T., Thursby, M., 2005. Incubator firm failure or graduation? The role of university linkages. Research Policy 34(7), 1076–1090. https://doi.org/10.1016/j.respol.2005.05.012

Schwartz, M., 2013. A control group study of incubators' impact to promote firm survival. Journal of Technology Transfer 38(3), 302–331.

Seitz, N., Buratti, M., Lehmann, E.E., Kurrle, J., 2026a. A meta-analysis towards the effectiveness of startup accelerators. Journal of Technology Transfer 51(1), 373–413. https://doi.org/10.1007/s10961-025-10218-6

Seitz, N., Buratti, M., Lehmann, E.E., Eberle, N., 2026b. Do startup incubators enhance new venture performance? Evidence from a meta-analysis. Review of Managerial Science. https://doi.org/10.1007/s11846-026-01017-w

Stinchcombe, A.L., 1965. Social structure and organizations, in: March, J.G. (Ed.), Handbook of Organizations. Rand McNally, Chicago, pp. 142–193.

Suchman, M.C., 1995. Managing legitimacy: Strategic and institutional approaches. Academy of Management Review 20(3), 571–610. https://doi.org/10.5465/amr.1995.9508080331

Surana, K., Singh, A., Sagar, A.D., 2020. Strengthening science, technology, and innovation-based incubators to help achieve Sustainable Development Goals: Lessons from India. Technological Forecasting and Social Change 157, 120057. https://doi.org/10.1016/j.techfore.2020.120057

Swarajya, 2022. Number of recognised startups increased from 471 in 2016 to 72,993 in 2022: Govt. https://swarajyamag.com/amp/story/business/number-of-recognised-startups-increased-from-471-in-2016-to-72993-in-2022-govt.

Tata Digital, 2021. Tata Digital to acquire majority stake in India's leading online healthcare marketplace 1MG. Press release, 10 June 2021. https://www.tatadigital.in/resources/pressreleases/tata-digital-to-acquire-majority-stake-in-india-s-leading-online-healthcare-marketplace-1mg.

TechCrunch, 2024. PharmEasy still 92% below its peak $5.6B valuation, investor estimates. https://techcrunch.com/2024/09/03/pharmeasy-still-92-below-its-peak-5-6-billion-valuation-investor-estimates/.

Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. Strategic Management Journal 18(7), 509–533.

van Weele, M., van Rijnsoever, F.J., Nauta, F., 2017. You can't always get what you want: How entrepreneur's perceived resource needs affect the incubator's assertiveness. Technovation 59, 18–33.

Wang, C.L., Ahmed, P.K., 2004. The development and validation of the organisational innovativeness construct using confirmatory factor analysis. European Journal of Innovation Management 7(4), 303–313. https://doi.org/10.1108/14601060410565056

Weimar, S.N., Martjan, R.S., Terzidis, O., 2025. Conceptualizing the landscape of digital health entrepreneurship: A systematic review and research agenda. Management Review Quarterly 75(2), 1619–1667. https://doi.org/10.1007/s11301-024-00417-0