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Christina Marquez

cqmarquez@up.edu.ph

Laguna Medical Center https://orcid.org/0009-0008-3588-1385

Leo Mendel D. Rosario

University of the Philippines Open University https://orcid.org/0000-0002-7524-6449

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Narrative Inquiry on the Innovation Journeys of Biomedical and Health Technology Startup Founders in the Philippines

Authors: Christina Quiñones-Marquez M.D. [1] and Leo Mendel D. Rosario PhD[2]

[1] Medical Specialist II, Laguna Medical Center, Sta Cruz, Laguna, Philippines
Master of Research Development and Management, University of the Philippines Open University (UPOU)
cqmaquez@up.edu.ph; ORCID Number: 0009-0008-3588-1385

[2] Assistant Professor, Faculty of Management and Development Studies (FMDS)
Founder and Program Coordinator, Adaptive Research-Innovation Systems and Environments (ARISE) Research Group, University of the Philippines Open University (UPOU)
leomendel.rosario@upou.edu.ph, ORCID Number: 0000-000207524-6449

Abstract

Purpose: Research on biomedical and health technology startups in the Philippines has documented regulatory, financial, and market barriers, but little is known about how founders themselves experience, interpret, and manage the journey from ideation to commercialization. This study examines how biomedical and health technology startup founders narrate that journey in the Philippines, a resource-constrained, lower-middle-income country.

Methodology: Guided by a constructivist-interpretivist paradigm, the study used narrative inquiry with eight purposively selected founders representing medical devices, pharmaceuticals, diagnostics, and digital health. The study conducted semi-structured narrative interviews, re-storied them into individual narrative profiles, member-checked them, manually coded them, and compared them through cross-narrative synthesis, retaining negative cases.

Findings: The journeys were organized around five non-linear narrative thresholds: arrival or entry; building and validation under constraint; regulatory qualification; procurement and adoption; and relational reconfiguration with the systemic environment as well as, resilience and identity reconstruction. Entry was relational and often serendipitous. A problem-led orientation and commitment to identifiable beneficiaries sustained the founders. Founders validated functioning technologies through improvisation and resource combination. Regulatory qualification varied by product and venture. Founders sought clear product categorization, proportionate requirements, and predictable timelines rather than deregulation. The sharpest divergence occurred after validation, when procurement and institutional adoption enabled movement or produced delays, redirection, withdrawal, or re-entry. Financing and adoption were

mutually constraining. Resilience and narrative identity formed an adaptive architecture. Resilience was characterized as individualized, team-distributed, or organizational, while identity was reconstructed in sequential, layered accumulation or continuity deepening modes.

Implications: The study qualifies effectuation, resilience, narrative identity, and diffusion of innovations for resource-constrained biomedical settings. For policy, it points to aligning development funding with public procurement, proportionate regulatory pathways, pre-revenue financing, simplified administrative processes, and entrepreneurial capability building.

Originality/Value: This is among the first founder-centered narrative studies of biomedical and health technology commercialization in the Philippines. It shows that the decisive challenge is not invention itself but moving viable technologies into institutional adoption and sustained public benefit.

Keywords: biomedical startups; health technology; innovation journey; narrative inquiry; effectuation; entrepreneurial resilience; narrative identity; technology adoption; Philippines; low-and-middle-income-countries.

JEL codes: L26, O31, O32, I11, I18, O53.

1. Introduction

Health systems in low-and-middle-income countries (LMICs) face persistent challenges such as shortages of health workers and rising costs of care (Jiu et al., 2022; Kulkov et al., 2023; Meara et al., 2015). Biomedical and health technologies, ranging from laboratory tests and implants to digital health platforms, are widely seen as a route to cost-effective and locally adapted solutions (Howitt et al., 2012). The United Nations Sustainable Development Goals link these concerns explicitly: Target 3.b calls for support for research and development of medicines and vaccines for diseases that primarily affect developing countries. SDG Target 9.5 calls for stronger scientific research and technological capability. Biomedical and health technology startups sit at this intersection, and their founders carry ideas from laboratories, clinics, and communities toward products that patients can use.

The Philippines illustrates both the promise and the difficulty of this work. The country has only 174 full-time researchers per million population, and gross expenditure on research and

development (R&D) is 0.324% of gross domestic product (GDP), far below the global average of 2.04% (National Economic and Development Authority [NEDA], 2023). Linkages among government, business, academe, and the research community remain fragmented (National Innovation Council, 2022). Biomedical and health technology startups make up only 5.2% of the country's technology startups (Teves et al., 2023). The Philippine Innovation Act of 2019 (Republic Act No. 11293; Republic of the Philippines, 2019) created a National Innovation Council to coordinate national innovation efforts. The Department of Science and Technology's Philippine Council for Health Research and Development (DOST-PCHRD) also runs programs intended to help ventures translate research into market-ready products. Even so, products must pass through conception, prototyping and preclinical testing, clinical validation, economic assessment, and regulatory appraisal before market access (Perez et al., 2024). Philippine startups receive less venture capital than peers in Singapore and Malaysia (Teves et al., 2023). Founders therefore often rely on bricolage, the creative recombination of whatever resources are at hand (Baker & Nelson, 2005; Senyard, 2015).

Existing studies describe this landscape at the level of structures: regulatory barriers, policy gaps, funding limits, and market access (Hu et al., 2022; Perez et al., 2024; Teves et al., 2023). Much less is known about how founders experientially navigate, construct meaning from, and manage the innovation journey. This matters for two reasons. First, founders hold tacit knowledge, adaptive strategies, and relational practices that formal innovation management frameworks rarely capture. Second, without founder-centered evidence, policymakers risk designing support mechanisms that are misaligned with the actual hurdles innovators face. Innovation management models remain built largely on high-income settings where resource constraints are less binding (Kulkov et al., 2023; Wang, 2023).

This study addresses that gap through narrative inquiry. Its central question is: *What are the narratives of biomedical and health technology startup founders in the Philippines as they navigate their innovation journey from laboratory research to market commercialization?* Three specific questions guided the inquiry:

- **RQ1:** What backgrounds, entry points, motivations, and formative experiences characterize biomedical and health technology startup founders who pursue innovation in the Philippines?

- **RQ2:** What technical, regulatory, financial, and market-related challenges do founders encounter, and what narrative patterns of adaptation, resilience, and identity reconstruction emerge from their experiences?
- **RQ3:** What systemic gaps, support mechanisms, and ecosystem improvements do founders identify as essential for advancing Philippine biomedical innovation?

The study makes three contributions. Empirically, it offers a founder-centered account of biomedical and health technology commercialization in a LMIC setting, organized through five inductively derived narrative thresholds. Analytically, it shows that the most consequential passage was not from idea to working technology but from validated technology to procurement and sustained adoption, and that financing ran beneath every threshold rather than occupying a single stage. Theoretically, it qualifies four frameworks (effectuation, resilience, narrative identity, and diffusion of innovations) for this setting. The paper proceeds with a review of the literature and sensitizing theories, a description of the methodology, the findings, a discussion of theoretical and policy implications, and the study's limitations.

2. Literature Review and Theoretical Framing

2.1 Biomedical commercialization in resource-constrained settings

The development of biomedical products follows long, stage-structured pathways with distinct technical, regulatory, and financial requirements at each step. Stage-Gate models, widely used by medical device firms, organize innovation into stages separated by formal review gates (Cooper, 2008; Pietzsch et al., 2009). Health technology variants add early health technology assessment, economic modeling, and regulatory strategy (Ijzerman & Steuten, 2011). Translation times differ sharply by technology. Regulated software may reach the market within a few years, low- to moderate-risk devices and in vitro diagnostics typically take three to seven years, and novel drugs or high-risk devices can take one to two decades (Hanney et al., 2015; Morris et al., 2011). Attrition is high, and the gap between promising research and fundable commercial development is often described as a "valley of death" (Miller, 2009; Parrish et al., 2019). Translation time shapes the founder's story: long journeys demand sustained commitment and resilience, while shorter ones emphasize agility in responding to users and regulators.

In the Philippines, government-funded biomedical engineering research has not always aligned with health priorities, and implementation and regulatory barriers have kept many ventures from commercialization (Perez et al., 2024). Medical device development must navigate ideation, regulation, and technology transfer with limited institutional support (De Leon & Tejero, 2022). Studies of health technology entrepreneurship identify critical success factors and value-creation challenges (Chakraborty et al., 2023; Kalinowska-Beszczyńska & Prędkiewicz, 2024; Kulkov et al., 2023), and process models from emerging markets describe how university research can reach commercialization (Kruachottikul et al., 2024). Yet most of this work describes structures and processes rather than how founders experience them. Narrative approaches in entrepreneurship research show that founders' stories are not neutral records but means through which they contextualize innovation, make sense of adversity, and enact strategic responses (Castelló et al., 2023; Garud et al., 2014; Powell & Baker, 2014). In the Philippine startup ecosystem, narrative research has begun to document the experiences of women leaders (Jarabe et al., 2025), but founder narratives in biomedical innovation remain largely undocumented.

Policy documents frame the same gap from the national side. The Philippine Development Plan 2023–2028 identifies inadequate human resources in science, technology, and innovation, insufficient R&D expenditure, and underused university-industry-government linkages as obstacles to growth (NEDA, 2023). The National Innovation Agenda 2032 lists health and well-being among ten priority areas and stresses translating scientific innovation into actual solutions (National Innovation Council, 2022). Regional comparison sharpens the contrast. Singapore's biomedical ecosystem combines sustained government investment, international partnerships, and strong private-sector engagement (Lee & Vatvitsas, 2021; Pangarkar & Vandenberg, 2022). Philippine founders, by contrast, work with thinner venture capital, a smaller technical workforce affected by emigration, and lengthy business and regulatory processes (Teves et al., 2023). Evidence on how founders move through such an environment is needed to complement the quantitative and structural assessments on which policy currently relies.

2.2 The innovation journey

Van de Ven et al. (1999) describe innovation as a non-linear journey through initiation, development, and implementation or termination. Initiation is often set in motion by a shock or a convergence of events; development is marked by setbacks, shifting criteria, and cycles of

divergent and convergent activity; and the journey may end in implementation or in termination, which itself generates knowledge (Oeij et al., 2019). Coyne and Van de Ven (2024) stress that the journey cannot be controlled but can be maneuvered, favoring an enablement-oriented rather than control-oriented stance. This framework is well suited to narrative inquiry because it foregrounds temporality, setbacks, and learning.

2.3 Effectuation and bricolage

Effectuation theory proposes that entrepreneurs under uncertainty often begin not with a predefined goal but with available means: who they are, what they know, and whom they know (Sarasvathy, 2001). Its principles include using what is at hand ("bird-in-hand"), deciding by affordable loss, building partnerships ("crazy quilt"), leveraging contingencies ("lemonade"), and treating the future as controllable through action ("pilot-in-the-plane") (Fisher, 2012; Sarasvathy, 2001). In biomedical settings, effectual founders may draw on clinical relationships and institutional access rather than formal market research (Dew et al., 2009; Read et al., 2009). Effectuation, together with bricolage (Baker & Nelson, 2005; Senyard, 2015) and the Filipino cultural value of *bayanihan* (collective community effort); may help with translation when institutional voids make planning difficult.

2.4 Diffusion of innovations

Rogers' (2003) diffusion of innovations theory explains adoption through the attributes of the innovation, the characteristics of adopters, communication channels, and the social system, and classifies adopters as innovators, early adopters, early majority, late majority, and laggards. In health care, diffusion is shaped strongly by organizational conditions rather than technical merit alone (Greenhalgh et al., 2004), and clinicians are often cautious about new technology (Putteeraj et al., 2022; Zhang et al., 2015). The theory offers a lens on the market-level dynamics founders must navigate to achieve sustained adoption.

2.5 Resilience and narrative identity

Richardson's (2002) metatheory of resilience frames resilience as a dynamic interaction between individuals and their environment. It describes three "waves" of protective factors: a coping process in which disruption is followed by reintegration (a return to "biopsychospiritual homeostasis"), and the internal motivational forces that activate resilience. Entrepreneurship

research has drawn on this to explain founders' persistence through setbacks (Conduah & Essiaw, 2022). Narrative identity theory holds that people construct an evolving sense of self by integrating reconstructed past, present roles, and imagined futures into a life story (McAdams, 2018; McAdams & McLean, 2013; Polkinghorne, 1996). Founders who have failed or faced adversity may reconstruct their identity through narrative (Castelló et al., 2023; Powell & Baker, 2014).

2.6 Sensitizing framework

These theories were used as sensitizing lenses rather than hypotheses. The study did not presume that founders follow any single innovation approach, whether design thinking (Brown, 2008), lean startup methods (Blank, 2013; Ries, 2011), or technology push (Rothwell, 1994). Instead, it treated founder characteristics (professional background, orientation, and networks), contextual conditions (policy, institutions, and culture), and the type of technology as inputs into a contingent journey, and asked how founders narrate and make sense of it.

3. Methodology

3.1 Research design

The study adopted a constructivist-interpretivist paradigm. In this design, meaning is constructed as people interpret experience within cultural and institutional contexts, and the researchers act as a co-constructor of knowledge rather than a neutral observer (Creswell & Poth, 2016; Lincoln & Guba, 1986). Narrative inquiry was chosen because it treats human experience as story, attending to how individuals establish, convey, and reinterpret their lives across time, place, and relationships (Clandinin & Connelly, 2000; Polkinghorne, 1996). Clandinin and Connelly's (2000) three-dimensional space of temporality, sociality, and place aligned with the multiple dimensions of the startup ecosystem. Alternative designs were considered and set aside: phenomenology emphasizes the essence of experience over chronology, grounded theory emphasizes conceptual abstraction over narrative wholeness, single-case designs focus on a bounded system, and ethnography requires prolonged immersion (Adams & van Manen, 2017; Charmaz, 2017; Hughes, 2019; Yin, 2018).

3.2 Participants

Participants were selected through purposive, criterion-based sampling

The citeria are as follows :

(a) was a founder, co-founder, or principal innovator-leader of a Philippine startup developing medical devices, diagnostics, therapeutics, or digital health technologies and took an active part in strategic, product, and commercialization decisions;

(b) led a venture that had achieved at least one success milestone: a product at Technology Readiness Level 9 in commercial production (Mankins, 1995); Philippine Food and Drug Administration (FDA) approval, licensing, or product registration; or active clinical or pilot use in at least two Philippine health facilities;

(c) had at least three years of active involvement in the venture, ensuring enough temporal depth for reflection (Mupas-Obedoza, 2022; Surangi, 2022).

Participants were identified through institutional listings and networks (government science agency and regulatory listings, technology business incubators, university-based biomedical research units, and professional medical networks). Twelve potential founders were identified, nine proceeded to interview, and eight met all criteria. One founder was excluded because the venture had shifted from health technology to education technology and was being developed outside the country. Narrative inquiry typically involves one to fifteen participants (Clandinin & Connelly, 2000; Creswell, 2014), and comparable narrative studies of founders have used five participants (Jarabe et al., 2025). Eight participants allowed both narrative depth and meaningful cross-narrative comparison.

Recruitment began only after ethics approval. Each referred founder received an introductory email outlining the study and the inclusion criteria. Founder who agreed then received a study invitation describing its purpose, procedures, confidentiality measures, participant rights, and potential benefits, followed by the approved informed consent form. Founders also agreed to review their transcript and narrative profile for member checking and to share publicly available documents, such as awards, citations, and media features, for triangulation.

3.3 Data collection

Data were collected through in-depth, semi-structured narrative interviews. All founders chose online interviews over in-person meetings. Interviews opened with a broad invitation, such as “Can you tell me the story of your startup, from the initial idea to where it is today?” or “What

were the key moments, turning points, and experiences that shaped your journey?". This allowed founders to tell their story in their own words and sequence (Jovchelovitch & Bauer, 2000). A list of follow-up prompts (Supplementary Material S2) was used only when needed to explore motivations, turning points, challenges, and aspirations. The interviewer also noted affect, intonation, and contextual cues.

Interviews were recorded and transcribed using the videoconferencing platform's built-in transcription feature; no third-party transcriber was involved. Because founders often spoke in a mix of English and Filipino ("Taglish"), the first author reviewed each transcript against the audio within 48 to 72 hours and corrected it manually. Verified transcripts were returned to participants for review, and follow-up interviews were offered; none were requested. Publicly available or participant-provided documents (company profiles, media features, awards, pitch materials, and regulatory and grant documents) were reviewed to anchor and triangulate narrated events. These documents are not reproduced to protect participant privacy and proprietary information. In this article, excerpts originally spoken in Filipino or Taglish are presented in the authors' English translation.

3.4 Data analysis

Narrative analysis was chosen over thematic analysis because it preserves narrative voice, chronological sequence, and the storied nature of each account, which thematic approaches may dissolve into collective patterns (Polkinghorne, 1996; Riessman, 2008). Structural and interpretive traditions establish that the ordering of a story is itself analyzable data (Labov & Waletzky, 1997; Riessman, 2008), and that narrative is a mode of constructing reality rather than a transparent record of it (Bruner, 1991). Turning-point narratives are sites of identity and meaning-making (McLean & Pratt, 2006. This is usually situated within an evolving life story (McAdams & McLean, 2013) in which narrators act as "historians of the self" who re-story their lives (Mishler, 2004).

Analysis combined Creswell's (2014) re-storying approach with cross-case synthesis (Eisenhardt & Graebner, 2007) in three stages, supported by ATLAS.ti for memo writing, coding, and data management. All coding was done manually; the software's automated coding features were not used.

1. **Individual narrative analysis.** Each recording and transcript was reviewed three times for immersion. Transcripts were then coded into narrative elements (248 open codes across all cases) and reconstructed into a chronological narrative profile for each founder, preserving voice and self-characterization. Profiles were returned to founders for member checking.
2. **Cross-narrative synthesis.** Profiles were compared side by side using code groups and relationship matrices to identify shared patterns, divergences, and structural properties. Open codes were grouped into categories addressing each research question.
3. **Interpretation and theoretical integration.** Findings were related to the sensitizing theories and to R&D management, ecosystem development, and policy.

The cross-narrative synthesis was organized through five **narrative thresholds**. A narrative threshold is defined here as a researcher-identified passage in the founders' narratives that involves the founder's self-understanding, the technology being built, or the institutional relationships that govern it. Thresholds are an analytic device, not universal stages; they correspond to the plot of the narratives in Polkinghorne's (1996) sense of configuring events into a temporal unity. They were derived inductively from recurring passages, transitions, and turning points across accounts. Within each threshold, the analysis examined the triggering condition, founder action and strategy, enabling and constraining relations, turning points and interruptions, and consequences for onward movement. Founders who stalled, skipped, or reversed a threshold were retained and analyzed as negative cases, which set boundary conditions for the synthesis (Emigh, 1997).

3.5 Trustworthiness

Trustworthiness was addressed through credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1986). Credibility was supported by member checking of both transcripts and narrative profiles, triangulation with documentary evidence, and peer debriefing with graduate-level research colleagues who reviewed methodological decisions and potential biases (Spall, 1998). Dependability was supported by an audit trail comprising the coded project files, analytic memos, profile versions, reflexive journal entries, and decision logs. Confirmability was supported by grounding claims in participant quotations and documents, and by reflexive journaling throughout all stages. The first author's background as a health practitioner with training in R&D management was acknowledged as a potential influence on interpretation. Transferability

was supported by thick description of the participants, the ecosystem context, and the sampling and collection procedures.

3.6 Ethical considerations

The study protocol was approved by a university research ethics committee operating under the Philippine Health Research Ethics Board guidelines, with the UPOU FMDS Research Ethics Committee and REC Protocol No. 2026-002-GS-FMDS. All participants gave written informed consent, including consent to the publication of de-identified findings and quotations. Participation was voluntary, and participants could decline questions or withdraw without penalty until final data aggregation. Founders are identified only by interpretive pseudonyms, and startup names and specific technologies have been masked or generalized. Recordings, transcripts, and coded files were encrypted, stored on a password-protected drive, and will be retained for three years in line with the Data Privacy Act of 2012 (Republic Act No. 10173; Republic of the Philippines, 2012) before secure deletion.

3.7 Use of artificial intelligence tools

AI-enabled tools were used in limited, disclosed ways. The videoconferencing platform's built-in transcription produced initial transcripts, all of which were manually verified against the audio; no identifiable participant data were uploaded to open generative AI platforms. ATLAS.ti was used only to organize manual coding. In preparing the original study report, ChatGPT (OpenAI) assisted with outlining and feedback on flow and clarity, Grammarly with grammar and spelling, and Canva with figure design suggestions; the figures were constructed manually. An AI assistant (Perplexity Computer) was used to help condense the original study report into this article. No AI tool was used for coding, analysis, interpretation, or conclusions, and the authors reviewed and take full responsibility for all content.

4. Findings

4.1 Participants

Table 1 summarizes the eight founders. They came from all three major island groups of the Philippines. Four led digital health ventures, two led biomedical device ventures, and one each led pharmaceutical and diagnostic ventures. Two founders were physicians with subspecialty training,

four had backgrounds in health-related or allied sciences (biomedical engineering, pharmacy, microbiology, and psychology), and two came from fields outside health (business management and law). Each pseudonym was drawn from a defining disposition, role, or recurring motif in the founder's own narrative and functions as an early interpretive label, consistent with narrative identity theory's premise that individuals author a coherent sense of self through their stories (McAdams, 2018).

Table 1. *Participant and venture characteristics*

Pseudonym	**Category**	**Location**	**Role**	**Gender**	**Professional background**	**Years with venture**
Builder	Biomedical device	Mindanao	Co-founder	Female	Physician, subspecialist	6
Steward	Biomedical device	Luzon	President/ Project leader	Male	Biomedical engineer	>10
Collaborator	Pharmaceutical	Visayas	Founder	Male	Pharmacy	10
Strategist	Digital health	Luzon	Co-founder	Male	Microbiology	5
Catalyst	Digital health	Luzon	Co-founder/ President	Male	Business management	6
Optimizer	Digital health	Visayas	Co-founder	Male	Psychology	5
Anchor	Digital health	Luzon	Co-founder	Male	Law	8
Trailblazer	Diagnostics	Luzon	Founder	Male	Physician, subspecialist	>10

4.2 Founder narratives in brief

The following condensed profiles preserve each founder's entry point, central challenge, and narrative turn. Full reconstructed profiles, including original-language excerpts, are provided in Supplementary Material S1.

4.2.1 The Builder: a clinician who builds what is missing. The Builder was a clinical subspecialist in a regional hospital, where she mentored trainees, led her institution's research and technology unit, and co-founded its biomedical venture. She entered innovation by accident. During residency, a senior colleague brought a consumer-grade 3D printer into the department, and the two began exploring its use for surgical planning and training, later joining a wider fabrication community. The pandemic became the turning point: "A lot of people say a lot of negative things about COVID, but COVID actually opened a much greater opportunity in our laboratory… COVID actually gave us the push that we needed." Her team developed protective setups and workflows that kept services running, and this work was later recognized by specialty societies and published. With hospital institutionalization, an interdisciplinary team of engineers, chemists, and physicists, and a government grant for a high-temperature printer, the unit produced patient-specific implants for indigent patients from remote areas without access to a specialist surgeon in the region. These implants replaced imports costing hundreds of thousands each.

Her motivation was equity of access for patients who arrive late and "just give up" because of cost and distance. Yet growth was constrained. The product was authorized only for compassionate use because no registrable category existed for fully customized devices, and the regional device framework exempts custom-made devices without offering a commercialization route (Association of Southeast Asian Nations, 2015). The hospital was both enabler and constraint: its public mandate limited commercialization, simple purchases required months of approvals, and trained contract staff often left. Early work was self-funded, and the unit is now seeking investors for a private spin-off. Her self-story moved from clinician to researcher, innovator, administrator, and ecosystem advocate, sustained by images of recovered patients and by her trainees: "We're still doing what we can… We're smarter now, wiser." She envisioned institutionalized, funded hospital-based innovation units in every region, and urged future innovators to "not give up and recognize that your ideas are valid."

4.2.2 The Steward: a pragmatic custodian of a legacy mission. The Steward was an engineer sent abroad for graduate training in bioengineering under an explicit agreement to return and lead R&D. He now serves as president of a device company founded decades earlier by a Filipino surgeon, called here "Dr. Legacy," who had built an international research career and substantial wealth abroad. Finding that the implants he needed for medical missions were unavailable at home, the founder first imported them and then invested in local development. He financed the company

largely out of conviction rather than commercial calculation. An attempt to manufacture locally for the United States market failed for lack of capital to compete with established firms, and the company refocused on the Philippines. It accumulated patents and registered products but, in the Steward's words, "We never captured the market."

He located the central difficulty in the market rather than in technology. Imported implants dominated decentralized public procurement, often awarded to the lowest bidder. Insurance coverage of implants was limited. The founder's discomfort with local marketing practices had kept the company development-focused. He also described long registration timelines and unregistered devices sold through online marketplaces. After the founder's death, the Steward paused R&D to rebuild commercial capability, framing this as sequencing rather than abandonment of the founder's passion: "You can't go against market forces single-handedly." His identity moved from an engineer with few opportunities, to a sponsored scholar, to a builder of implants, and finally to a steward: not the originator of the vision but the person responsible for making it survive. He inherited the founder's belief in giving people "a chance to prove their worth," and his message to future innovators was frank: "it is difficult," and developers must "consider the market" from the start.

4.2.3 The Collaborator: turning local resources into health solutions. A pharmacist exposed early to his family's manufacturing enterprise, the Collaborator chose product development over medical school and later founded his own research-driven spin-off to create space for innovation. He found too little local technical capacity for what he envisioned, and the hardest early task was hiring people willing to "gamble their future" on a startup. Partnership with his alma mater, where two newly relocated research scientists became partners and mentors, was the turning point. Together they won an international development grant that funded the company's first medical-grade commercial product, followed by further products supported by the national science agency.

He wanted products that were "differentiated or set apart" through scientific evidence, and he wanted to end a "raw material mentality" in which local discoveries are monetized abroad. His strongest critique concerned regulatory proportionality: "Sometimes regulatory comes way ahead [of] innovation," with small local firms expected to meet standards and timelines modeled on multinationals, "a very big leap" in technical skill and technological capacity. He responded by investing in regulatory learning, attending the same trainings as regulators "so that whatever they

throw at us, we have an answer." He advocated "best-fit" technology, in which a portion of an academic discovery becomes a sellable product that is then improved as funding comes in, rather than "a long shot" that no one consumes. He described the journey as burdensome and lonely, and believed that risk was what kept an innovative company moving. His identity shifted from pharmacist to spin-off founder, research partner, translational innovator, and advocate for Filipino-made medicines. His message was to "partner with an institution that can help your startup grow" and to share technology once standards are met rather than waiting for perfection.

***4.2.4 The Strategist: a resilient builder of health systems*.** The Strategist, a microbiologist, had been a government researcher working on vaccine development. Long patient queues at public facilities, some forming before dawn, moved him to act. After his team placed second in a startup competition, he co-founded a digital health venture. Using their own savings, he and his co-founder launched during the pandemic, creating digital tools for rural health units. For nearly three years, they pitched to public primary care units with almost no uptake: "We understood for almost 3 years we're broke; we didn't have anything, we only had an idea." An international development innovation award kept the venture alive. A pivot to private-sector clients, which he called the team's "last hurrah," finally produced revenue, and partnerships with international and national agencies followed, extending the platform across several regions.

He traced his motivation to being "a son of an OFW" (overseas Filipino worker) and described his life mission as making work abroad "an option, not a requirement for Filipinos to have a decent life." His hardships included self-financing, odd jobs, family pressure to quit, and having no business background. He also faced punitive taxation of pre-revenue firms and fragmented business registration, a context he called "ultra-hard mode." He argued that "the ones who should be paying more should be the ones in the top… not the people who are still starting." He sustained himself with two nightly rituals: telling himself he could "give up tomorrow," and rereading Theodore Roosevelt's "Man in the Arena." His identity moved from bench researcher to improvising founder, grassroots negotiator, and system-changing advocate, and he called the venture "a journey to the self. It made me a better person… a better son… a better partner in business." His advice was blunt: "Look for paying customers first."

4.2.5 The Catalyst: a civic entrepreneur in primary care. An experienced entrepreneur with a business administration background, the Catalyst co-founded a social enterprise with fellow

members of a socio-civic organization during the pandemic. Their target was the "days-long journey" of patients who leave a health center with a laboratory request, queue at a public hospital, wait for results, and return before receiving a diagnosis and prescription. From the start, the venture was framed as "a social enterprise; we're more focused on the service rather than the profits." An outsourced platform failed after six months: "We gave up [on it]… let's start from scratch. Let's develop it ourselves, so that it is really based on the needs of Filipinos." The newly built platform grew from a pilot province to a nationwide operation. It was sustained by partnerships with national health insurance, local government, health maintenance organizations, and private entities. At the time of the interview, the company was developing AI-based diagnostic support.

His main challenge was regulatory volatility, particularly frequently changing insurance policies for preventive care that required rapid operational adjustments. He also had to finance and train a fast-growing workforce, which led to a dedicated training department. Asked whether he had ever considered quitting, he answered, "it never occurred," crediting the camaraderie of long-time friends. His resilience was routinized and team-based; he could not isolate a single crisis because problems were solved collectively and continuously. Compared with his earlier businesses, his identity deepened rather than changed. He was more passionate now "because we are really helping people directly." He saw Filipinos as "very enterprising" but lacking support, acknowledged that his group's ability to self-fund was good fortune, and urged founders to build "a very competent and big team" spanning medical, investment, and technology roles.

4.2.6 The Optimizer: an agile improver of patient experience. Trained in psychology and working outside health care, the Optimizer joined a friend's venture as an account manager and later became a co-founder. A single clinic's request for a digital workflow system during the pandemic led the team to ask, "Why not create a system for every clinic?" His motivation came from his own experience as a patient waiting in successive queues for consultation, insurer approval, and diagnostics, asking, "Can there be a better way of doing this?" Development took about four years before launch. Features were released in phases ("for this month, it's just three features… next month another three"), first in a single reference clinic and then in a bounded rollout in the venture's home city.

His main challenges were technical, including growing data volumes, privacy requirements, and interfaces with multiple insurers, and the long wait for any return on investment.

He also described the pressure to deliver before a product was perfect "because of the need of the market." What sustained him was the vision: "even if it's hard or challenging finances-wise, people-wise… it's really the vision." He valued shared responsibility, describing people as "the very important asset in your company," and volunteered that his faith in God framed the origin of the vision and the provision of people and resources. He insisted that the venture "will not be a one-man show," and said the experience changed him "180 degrees" in how he leads. His account showed persistence and recalibration rather than completed transformation. He hoped government would adopt digital tools to replace manual processes.

4.2.7 The Anchor: a disruptor for mental health access. The Anchor was a lawyer practicing abroad. He reoriented his life after a personal crisis, which he survived partly through technology-enabled support. He described the change as a move "from the dark side to the light side." He first declined to invest. He then studied the Philippine mental health landscape, which he described as small clinics, "zero technology, no data protection, no government support". He joined the venture to "lower the cost for access" through digital services. A foreign government grant provided what he called "catalytic funding" along with technical mentorship in security and infrastructure. The pandemic brought mental health "to the surface," and the platform grew through corporate, local government, professional, and hospital clients.

He was driven by frustration and urgency about suicide and the neglect of mental health, by a biopsychosocial rather than purely pharmacological view of care, and by a commitment to keep "humans in the loop" in an age of AI. His challenges included employers who saw mental health support as a cost rather than an investment, and currency volatility. Local grants were small and slow ("not conducive to technological disruption because the amounts are too small and they're given over too long a period"), and paper-based administrative processes made him feel "we're living in the 1970s." He survived a rupture among co-founders and maintained government relationships despite his frustration: "even though I'm frustrated at government, it is still a necessity to maintain a relationship." Acquired financial and institutional literacy gave him "internal commercial resilience." He called for accessible entrepreneurial education on unit economics and investment terms, and urged innovators to "look for allies where you have a common goal."

4.2.8 The Trailblazer: opening pathways for local diagnostics. A physician-scientist who returned from specialty training abroad, the Trailblazer met a resource-constrained research environment and "ended up building the initiative from scratch." He volunteered to lead an understaffed institute, built a national diagnostic research program, and produced an internationally recognized diagnostic product, only to find an industry wary of domestic technology. He studied technology transfer law and waited for years for institutional approval, he founded a university spin-off. He funded it with his own savings and those of family and friends. Operational costs for staff and materials were carried by his clinical earnings. Pandemic demand for local diagnostics, when international supply chains failed, brought commercial success but also intense competition from import interests that, in his account, threatened his personal safety: "I hated the day that I created the [technology]."

He continued, building subsidiaries that integrated technology development, diagnostic services, quality, commercialization, and ethics support, and expanding toward non-communicable diseases and AI. His guiding value was to ask, "Why not?" of any claim that something could not be done, and he held that "there is a value in creating technology, providing profitability, and still serving humanity." His challenges began with the cost of diagnostic development and regulatory delays that "delay the innovation cycle". Academic procurement was unsuited to commercial delivery. He attributed local buyers' preference for imported technology to colonial mentality: "Even if we develop a technology, a multi awarded at that, there will always be hesitancy and preference for imported technology". He also had to learn finance, marketing, governance, and people management himself. Mentors, family, and faith were protective resources: "Don't separate your family from your dreams." His identity accumulated rather than replaced roles, from clinician and scientist to institution builder, entrepreneur, and ecosystem architect: "It has already got ingrained into my DNA… I can't turn my back anymore." He called for stronger enforcement of policies favoring local products and for linking research push with procurement pull.

4.3 Cross-narrative synthesis

Across the eight accounts, there were overlapping thresholds linked problem-led entry to legitimate, adoptable innovation: arrival or entry; building and validation under constraint; regulatory qualification; procurement and adoption; and relational reconfiguration both external

and internal. These were recurring passages, not fixed stages (Coyne & Van de Ven, 2024; Van de Ven et al., 1999). The sharpest divergence occurred after validation, when institutional recognition and sustained use did not necessarily follow technical achievement.

Figure 1 maps the first four thresholds; relational reconfiguration runs throughout and is not plotted. Regulatory obstruction (Builder), weak uptake despite registered products (Steward, Trailblazer), and a shift from public to private clients after prolonged delay (Strategist) distinguish technical completion from qualification, market entry, and sustained adoption.

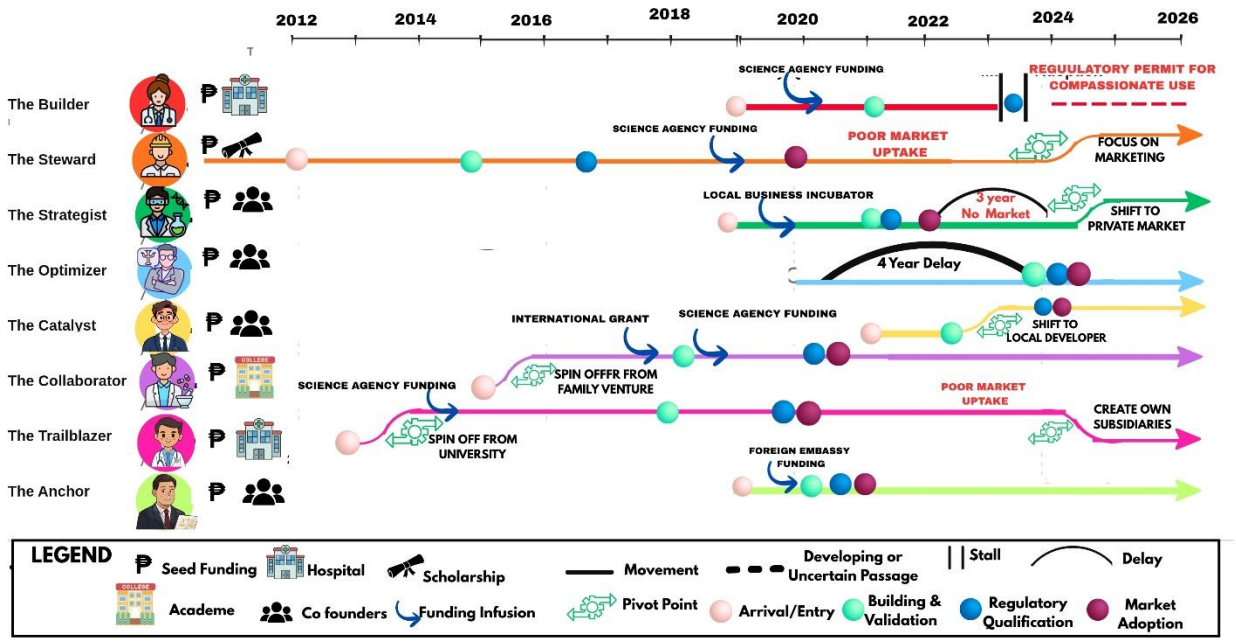


Figure 1. Cross-narrative journey map of eight biomedical and health technology founders across four innovation thresholds. *Note.* Temporal positions are based on founders' narrated accounts and supporting records. Colored nodes represent thresholds; symbols mark selected enabling conditions, funding events, pivots, delays, and obstructions. Arrows extending beyond the last documented event indicate anticipated direction, not achieved outcomes.

4.3.1 Threshold one: arrival or entry

Entry was serendipitous, relational, and problem-led rather than driven by deliberate market search. Professional exposure, invitation, obligation, civic networks, or personal crisis made a health care gap visible before commercial intent formed. Founders mobilized existing

knowledge, equipment, roles, and relationships, consistent with effectuation's emphasis on available means (Fisher, 2012; Sarasvathy, 2001).

Commitment centered on identifiable beneficiaries, from patients needing affordable implants, medicines, and diagnostics to communities seeking accessible primary and mental health care. Table 2 distinguishes the motivational logics sustaining this purpose, consistent with Philippine mission-driven entrepreneurship research (Jarabe et al., 2025; Vadil et al., 2023). Arrival therefore established commitment and enabling relationships, not a complete commercial plan.

Table 2. *Motivational logics across the eight narratives*

Motivational logic	**Founders**	**Representative formulation**
Equity of access	Builder, Trailblazer, Steward, Catalyst, Anchor, Collaborator	Locally produced technology as a direct response to cost and distance as barriers to care, or to unavailable services
Technological sovereignty	Collaborator, Steward, Trailblazer	Reversal of a raw-material mindset; belief that innovation capacity can be developed locally
National and generational repair	Strategist, Anchor	More employment for Filipinos, making working abroad "an option, not a requirement"
Civic duty and servant leadership	Catalyst, Optimizer	Venture framed as a social enterprise and a continuation of civic commitment
Faith and providence as an operative frame	Optimizer, Trailblazer	Volunteered declaration that a "higher being" has a purpose for the venture
Inherited obligation and legacy custody	Steward	Venture held in trust for a founder's purpose rather than pursued for return

Financing accompanied the journey rather than being limited to the entry stage. All eight accounts used personal resources to begin their startup. Five reported grants (Builder, Collaborator, Trailblazer, Strategist, Anchor), while the Steward, Catalyst, and Optimizer did not report an initial grant route.

4.3.2 Threshold two: building and validation under constraint

All eight founders described reaching a functioning product through improvisation, resource recombination, and partnership. The Builder upgraded equipment, the Collaborator drew on academic expertise, the Trailblazer financed scientific staff through clinical earnings, and the Optimizer released features incrementally (Ries, 2011). The pandemic initiated or accelerated several journeys but mattered little to the Steward and Collaborator, underscoring the uneven impact of external shocks.

The Optimizer's four-year build, the Strategist's three years without a paying client, and the Collaborator's registration waits exposed a prolonged pre-revenue interval, consistent with the translational "valley of death" (Miller, 2009; Parrish et al., 2019). Technical achievement did not resolve who would authorize, purchase, or sustain the innovation; development and market search often continued together.

4.3.3 Threshold three: regulatory qualification

Qualification varied by technology and venture. Device and pharmaceutical founders faced problems with product authorization. Digital and service founders were more often described challenges on registration, taxation, and data protection. The threshold was faint for the Catalyst and Optimizer and primarily administrative for the Anchor. The Builder's case exposed the distinction between technical validity and commercial eligibility. She was authorized for individual clinical use, without a registrable commercial category. .

The obstructions were distinct, not a single regulatory failure: missing categories (Builder), requirements disproportionate to startup capacity (Collaborator), long assessment timelines (Trailblazer), unfriendly taxation practices (Strategist, Builder) and fragmented business registration process (2). Table 3 summarizes the detailed code families. Founders responded through anticipatory learning, continued submissions, limited deployment, and changes in product scope or timing.

No founder advocated lower standards. Their requests concerned clear categories, proportionate requirements, consistent administration, and predictable timelines; the Steward

sought priority processing rather than reduced requirements. These distinctions underpin the recommendations for regulatory clarity and simpler administration without deregulation.

Table 3. *Regulatory and administrative code families in founders' narratives*

Problem	**Code family (coded segments)**	**Founders**	**Object of the obstruction**
Missing categories	Regulatory ambiguity or gap (9)	Builder, Collaborator, Trailblazer	Absence of a registrable category or settled rules for the productgra
Proportionality	Misaligned technology vs. regulation (6)	Collaborator, Steward, Trailblazer	Standards calibrated to multinational capability rather than local technological capacity
Proportionality	Unfriendly taxation to startups (6)	Strategist, Builder	Fiscal treatment of pre-revenue firms
Administrative fragmentation	Bureaucratic red tape (11)	Collaborator, Optimizer, Anchor, Trailblazer	Procurement approvals, interagency fragmentation, manual submission to agencies
Duration and transparency	Lengthy regulatory process (6)	Collaborator, Steward, Trailblazer	Duration and transparency of assessment
Duration and transparency	Business registration ambiguity (2)	Anchor	Absence of consolidated registration pathways

Note. Numbers in parentheses are coded segments recorded in the coding audits and indicate coding density.

4.3.4 Threshold four: procurement and adoption

Procurement and adoption most clearly separated working technologies from sustained commercial use. The Steward and Trailblazer reported weak uptake despite registered products; the Strategist pivoted from public to private clients; the Anchor sought employer commitment; and the Builder maintained in-house clinical use while pursuing a spin-off. The Collaborator described

the industry's limited uptake of academic technologies. Conversely, the Catalyst's insurance and local government partnerships and the Optimizer's bounded private deployment were negative cases: neither narrated the same adoption obstruction.

Adoption depended on procurement units, local governments, employers, insurers, and private clinics, not clinicians alone. Buyer confidence also mattered: the Trailblazer described local preference for imported technology, while the Anchor encountered reluctance to fund mental health support. The Steward and Collaborator identified a disconnect between publicly funded development and purchasing, captured by the Steward:

> So, they spend money to develop products. But then they spend more money to buy products that are not developed locally… [One agency] is funding it, but [a different agency] is the user. (Steward)

Financing and adoption were mutually constraining: weak uptake limited cost recovery, which restricted further development, staffing, and qualification. Responses included pivoting (Strategist), withdrawing to rebuild commercial capacity (Steward), and continued capability building and vertical integration (Trailblazer). The Trailblazer explained the cycle:

> So, think about it, you're putting out significant resources to create something, but you're having difficulty convincing local [clients] to buy it. So, the recovery of expenditure is very challenging. So, you don't have enough resources to continue your work, to build better technologies. (Trailblazer)

Grants sustained technical work but did not replace dependable revenue. This distinction grounds the recommendations to connect development funding with procurement and reimbursement, finance the pre-revenue interval, and engage intended purchasers early.

4.3.5 Threshold five: relational reconfiguration, resilience, and identity

The fifth threshold is not a terminal ecosystem stage. It becomes visible whenever onward movement requires founders to reconfigure relationships with government, academe, industry, or community. These relations were encountered during entry, building, qualification, adoption, withdrawal, and re-entry. They supplied resources, legislation, legitimacy, feedback, service,

settings, resistance, and demand. This threshold therefore describes how founders positioned and repositioned their ventures within those relationships.

Founders sought different relational routes. The Builder used a hospital innovation unit and later considered a spin-off. The Collaborator combined academic and commercial work while learning the institutional language of regulation. The Strategist moved from a government laboratory and pushed toward private clinic partnerships. The Catalyst worked through a founding peer group, insurance systems, local government, and communities. The Optimizer moved from a professional invitation to user feedback, team-based iteration, and bounded private rollout. The Anchor combined foreign support, enterprise clients, and continued institutional engagement. The Trailblazer moved repeatedly among clinical work, academe, medical product development, qualification, and complementary ventures. The Steward withdrew from an attempted scale route and suspended R&D to rebuild commercial capacity.

Academe provided laboratories, partners, and legitimacy but could restrict commercialization through mandate and process. Industry and private organizations supplied both clients and revenue but were also marked by risk-aversion or a weak willingness to pay. Government and development institutions funded and authorized work. Founders encountered delays, fragmented administrative processes, and limited market support. Communities supplied feedback and purpose, while presenting affordability and acceptance constraints.

Figure 2 summarizes the four relational domains narrated by the founders. Its unequal spheres reflect coding density, rather than measured institutional influence. Government and community were the most frequently coded domains in the narratives.

Resilience was individual or ritualized (Builder, Strategist, Anchor, Trailblazer), team-distributed (Catalyst, Optimizer), or organizational and strategic (Steward, Collaborator), with overlapping tendencies rather than fixed types (Richardson, 2002), as seen in Table 4. Persistence included learning, pausing, and redirecting, supported by beneficiaries, teams, partners, family, and faith.

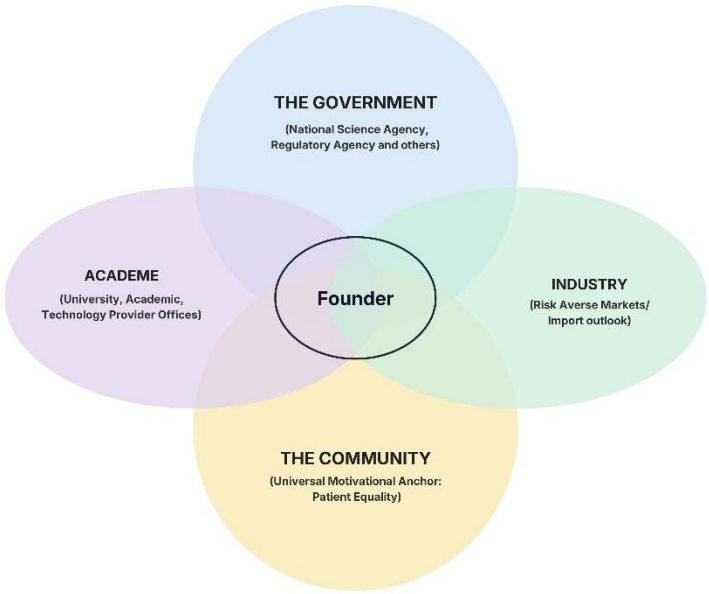


Figure 2. Asymmetrical relational domains encountered by Philippine biomedical and health technology startup founders.

Note. Sphere sizes reflect coding density, not independent institutional influence.

Identity reconstruction varied across participants. Sequential reconstruction characterized five accounts. While the Trailblazer was seen to have layered accumulation when he combined concurrent clinical, scientific, and entrepreneurial roles. The Catalyst and the Optimizer already an experienced entrepreneur, described continuity and deepening. These contrasts challenge the assumption that adversity necessarily transforms identity.

Together, resilience and identity formed an adaptive architecture shaped by venture structure and prior experience, not personal endurance alone. The accounts support capability building, multidisciplinary partnerships, and clearer institutional pathways while retaining the central distinction: founders could adapt and build viable technologies, but sustained public benefit still depended on qualification, purchasing, and continued use.

Table 4. *Resilience loci and identity reconstruction modes across the eight narratives*

Founder	Predominant locus of resilience	Mode of identity reconstruction	Protective resources narrated
Builder	Individual (Ritualized)	Sequential	Patients' recovery, trainees
Steward	Organizational (Strategic)	Sequential	Inherited mission, founder's values
Collaborator	Organizational (Strategic)	Sequential	Academic partners, regulatory learning, acceptance of risk
Strategist	Individual (Ritualized)	Sequential	Nightly rituals, co-founders, national purpose
Catalyst	Team-distributed	Continuity and deepening	Founding peer group, patient stories
Optimizer	Team-distributed	Continuity and deepening	Shared vision, team, faith
Anchor	Individual (Ritualized)	Sequential	Survival of personal crisis, acquired financial literacy
Trailblazer	Individual (Ritualized)	Layered accumulation	Mentors, family, faith, patients

4.4 Envisioned futures and founder proposals

The founders' visions were projected continuations of their own journeys, and scale remained prospective and uneven rather than a shared achieved endpoint. Their proposals clustered around the constraints they had narrated:

1. **Regulatory improvement without deregulation:** clear categories (for example, for patient-specific devices), proportionate requirements, useful feedback, consistent administration, predictable timelines, monitoring of unregistered devices sold online, and priority processing for local manufacturers.
2. **Alignment of development funding with procurement and adoption:** a whole-of-government approach that connects agencies funding local development with public purchasers, including long-term procurement arrangements with local developers.
3. **Funding designed for the pre-revenue interval:** larger and faster grant tranches suited to fast-moving technology, and evaluation of startup funds through validated business indicators rather than compliance documentation alone.

4. **Simpler, digitalized, coordinated administration:** consolidated business registration, digital submission, and taxation that does not penalize pre-revenue firms.
5. **Human and institutional capability:** entrepreneurial, financial, and tax literacy for scientists, engineers, and health professionals; supported hospital-based R&D units in every region; and stronger industry-academe translation.

These proposals were stated in founders' own terms. The Steward asked not for lower fees or standards but for "just a priority in terms of processing" for local manufacturers and argued that the state could grow the industry by participating in it as a buyer. The Anchor described a grant environment in which "you need… large swaths of grant funding immediately so that you can actually construct and engineer" technology that changes "every quarter." The Strategist hoped that startup funds would be judged by business results, and that taxation would be progressive and startup-friendly. The Builder envisioned hospital-based innovation units institutionalized in every region, and the Trailblazer called for the political will to enforce existing policies favoring local products.

Founders' messages to future innovators emphasized collaboration ("Look for allies where you have a common goal. Because you can't do it alone," Anchor), early attention to a paying market ("Look for paying customers first," Strategist; developers must "consider the market," Steward), and adaptive persistence that includes revising, pausing, and redirecting, not only enduring.

5. Discussion

The study set out to understand how Philippine biomedical and health technology founders narrate their journey from ideation to market. Its central finding is that the decisive challenge was not invention but the translation of viable technologies into institutionally accepted and sustained public benefit. The founders could build and validate technologies under severe constraints; their journeys diverged most sharply after validation, at the points of qualification, procurement, and adoption. This section discusses what the findings add to the theories that informed the study.

5.1 Theoretical contributions

Effectuation describes entry better than causal opportunity recognition. Entry and early development were relational and means-driven. Founders began with who they were, what they knew, and whom they knew, and bird-in-hand, affordable-loss, and lemonade logics appeared in terms close to Sarasvathy's (2001) formulation. The pandemic functioned as a contingency that founders converted into opportunity. However, effectuation's pilot-in-the-plane principle, which assumes that outcomes can be controlled through action, was strained at later thresholds, where regulatory categories, procurement rules, and buyer risk-aversion lay beyond founders' control. Effectuation thus fits arrival and building more cloarsely than qualification and adoption, where founders combined effectual improvisation with deliberate capability building, as the Trailblazer's and Collaborator's accounts show.

Resilience is a process whose locus depends on venture structure. Richardson's (2002) process of disruption and reintegration was visible in all eight accounts, but its locus varied: individual and ritualized, team-distributed, or organizational and strategic. This qualifies dispositional readings of entrepreneurial resilience (Conduah & Essiaw, 2022). Resilience could not be attributed to temperament alone; it was shaped by whether founders worked alone, with long-time peers, or within an inherited institution.

Narrative identity reconstruction is variable, not universal. The findings support narrative identity theory (McAdams, 2018; Mishler, 2004) but not the common assumption that adversity produces transformation. Sequential reconstruction, layered accumulation, and continuity and deepening represent distinct modalities, and the Catalyst's case provides negative evidence: an experienced entrepreneur's identity deepened rather than changed. This extends work on founder identity and adversity (Castelló et al., 2023; Powell & Baker, 2014) by suggesting that the same adversity is metabolized differently depending on the identity configuration a founder brings. Resilience and identity are better understood as two descriptions of one adaptive architecture than as separate constructs.

Diffusion operates at two levels. First, at the level of technology, adopters extended well beyond individual clinicians to procurement units, human resource managers, local governments, and insurers, reinforcing Greenhalgh et al.'s (2004) organizational view of health innovation diffusion. Weak organizational uptake, not clinical rejection, was the most common barrier.

Second, at the level of policy, the founders' accounts suggest that supportive instruments such as the Philippine Innovation Act was not maximized in their startups journey. In Rogers' (2003) terms, a well-designed policy instrument can itself fail to diffuse when its relative advantage is not communicated to, or operationalized for, those it is meant to serve.

The innovation journey is non-linear, and financing runs beneath it. The findings support Van de Ven et al.'s (1999) and Coyne and Van de Ven's (2024) proposition that innovation journeys are overlapping and cyclical rather than sequential, here in a resource-constrained setting. The thresholds are recurring passages and not sequential stages. Financing did not occupy a single position within this sequence but ran beneath all of it, and its most acute form was not early seed capital but the pre-revenue interval between validated output and continuing demand. This reframes the translational "valley of death" (Miller, 2009; Parrish et al., 2019) for biomedical ventures in LMICs. This valley of death may lie after technical validation, where development funding ends, and procurement, reimbursement, and adoption have not yet begun.

5.2 Mission, culture, and the moral register of founding

The findings also extend the mission-driven orientation described in Philippine entrepreneurship research (Jarabe et al., 2025; Vadil et al., 2023). Beneficiary-centered purpose was not only an initial motive; it was the logic founders returned to when deciding whether to persist, pause, or redirect. The six motivational logics in Table 2 (equity of access, technological sovereignty, national and generational repair, civic duty, faith, and inherited obligation) give founding a moral register that commercial models of opportunity pursuit rarely capture. Several of these logics are distinctively national: the Strategist's wish to make overseas work "an option, not a requirement," the Collaborator's and Trailblazer's rejection of a raw-material and import-dependent mindset. Faith, volunteered rather than prompted, functioned as an operative frame for interpreting provision and timing, not as incidental encouragement.

Culture also shaped adoption. Founders described a preference among local buyers for imported technology, which the Trailblazer linked to colonial mentality, and employers who treated mental health support as a discretionary cost. These are social-system attributes in Rogers' (2003) sense, and they suggest that policies supporting local products need to address buyer confidence as well as product quality. Conversely, the collaborative ethic captured in *bayanihan*

appeared in founders' strong emphasis on teams, partners, and allies. Unlike high-income ecosystems where venture capital often finances the pre-revenue interval, these founders relied on personal savings, family, peer groups, grants, and institutional hosts, which made relational capital a substitute for financial capital at almost every threshold.

5.3 Implications for policy and practice

The founders' accounts suggest that Philippine biomedical innovation is impeded less by a lack of capable innovators or supportive legislation than by fragmented pathways linking development funding, regulatory approval, procurement, and adoption. Several implications follow, offered as directions grounded in narrated experience rather than tested prescriptions.

For **regulators**, the priority is not lower standards but clearer and more predictable ones: registrable categories for patient-specific and customized devices, proportionate requirements for small local firms, transparent timelines, useful feedback, and priority processing for local manufacturers. Such measures preserve safety and efficacy while reducing the unpredictability that founders found most damaging.

For **funding and health agencies**, the priority is to align development grants with public procurement. Publicly funded products that meet the standards should have pathways for public purchase and reimbursement.. Grant mechanisms could provide larger, faster tranches suited to the pace of digital health and evaluate funded ventures on validated business milestones. Strengthening hospital-based R&D units, especially in underserved regions, would build on the problem visibility that frontline clinicians already have.

For **fiscal and administrative agencies**, consolidated and digital business registration and a tax treatment that does not penalize pre-revenue startups would reduce burdens that consumed founders' time and resources.

For **universities and higher education regulators**, embedding practical business and financial literacy (unit economics, financial planning, investment and shareholder terms, and taxation) in science, engineering, and health curricula would better prepare future biomedical innovators, and clearer spin-off pathways would ease academic-to-commercial transitions.

For **founders**, the narratives counsel collaborative, market-informed innovation: building multidisciplinary teams and partnerships early, engaging intended purchasers and adopters, not only end users, from the outset, and planning for the pre-revenue interval between validation and dependable revenue.

6. Limitations and Future Research

Several limitations qualify these findings. These are (a) the narratives are retrospective and subject to selective recall, hindsight, and reconstruction; triangulation with documents and member checking mitigated but did not remove this; (b) the sample comprised eight founders of ventures that had met success criteria, so discontinued, early-stage, and failed ventures, whose accounts might reveal different dynamics, were excluded; (c)the findings reflect founders' perspectives alone and do not represent regulators, funders, procurement officers, clinicians, or investors, (d) the interviews captured each journey at one point in time rather than through direct observation of day-to-day decision making; and (e) its interpretive findings are intended for transferability to similar LMIC contexts rather than statistical generalization. The first authors' positionality as a health practitioner may have shaped interpretation, although reflexive journaling and peer debriefing were used to address this.

Future research could (a) validate and challenge these findings through the perspectives of other ecosystem actors, including incubator managers, funding institutions, clinician users, procurement officers, hospital administrators, and local governments; (b) conduct sector-specific studies, given that the journey varied by technology type and development timeline; (c) examine how financing, procurement, and adoption interact across a larger number of ventures; (d) use longitudinal or ethnographic designs to observe founders' decisions in real time; and (e) study discontinued or stalled ventures to identify the factors that contribute to failure.

7. Conclusion

This narrative inquiry traced how eight Philippine biomedical and health technology founders navigated the journey from a concrete clinical or social problem toward legitimate, adoptable, and accessible innovation. Their entry was relational and problem-led, and commitment

to identifiable beneficiaries sustained them. They built and validated technologies through improvisation and resource recombination. Their journeys diverged most clearly after product validation. At that point, regulatory qualification, procurement, and adoption either enabled movement or produced delay, redirection, withdrawal, or re-entry, while financing and adoption constrained each other. Resilience and narrative identity formed an adaptive architecture through which founders interpreted disruption and reconfigured roles, resources, and strategies, but transformation was not universal.

The study's central conclusion is that the decisive challenge in the Philippine biomedical innovation journey is not invention but the translation of viable technologies into institutionally accepted and sustained public benefit. Aligning development funding, regulatory pathways, procurement, and adoption is essential if locally developed biomedical and health technologies are to reach the Filipino patients and communities they were first intended to serve.

Declarations

Ethics approval and consent to participate: The study was approved by a university research ethics committee UPOU FMDS Research Ethics Committee and REC Protocol No. 2026-002-GS-FMDS/ All participants provided written informed consent.

Consent for publication: Participants consented to publication of de-identified findings and quotations.

Data availability: Interview recordings and transcripts are not publicly available to protect participant confidentiality, as specified in the approved protocol and informed consent. De-identified excerpts are provided in the article and Supplementary Material S1.

Prior dissemination: This manuscript is derived from the first author's master's thesis masters, "Narrative Inquiry on the Innovation Journey of Founders of Biomedical Startups in the Philippines." Submitted to the Faculty of Management and Development Studies, University of the Philippines Open University, in September 2026 in partial fulfillment for the degree of Master of Research and Development Management. The thesis may be deposited in the university's repository. The findings have not been published in a peer-reviewed journal and the manuscript is not currently under consideration by any journal.

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Author contributions:

Christina Quiñones-Marquez: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Visualization, Project administration, Writing – original draft, Writing – review and editing.

Leo Mendel D. Rosario: Conceptualization, Methodology, Validation, Supervision, Writing – review and editing.

Both authors read and approved the final manuscript. This study was conducted as the first author's master's thesis under the supervision of the second author.

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