

## Appendix D Supplemental Material for the Typology of Startup Activity

This section provides additional information on the hierarchical typology of startup activities. **Table D8** summarizes three existing classifications of startup activity developed by Carter *et al.* (1996), Reynolds (2000), and Bennett & Chatterji (2023). For each of the previous classification system, I show whether and how their categories map to the categories in my classification system.

Carter *et al.* (1996) survey nascent entrepreneurs on 14 precursor activities, finding that some (e.g., prototyping) differ substantially between persisting and abandoning entrepreneurship. Another large-scale survey that spurred several studies divides activities into pre- and post-registration (Reynolds, 2000). This classification is the most detailed with 25 activities, though it is highly stage-specific with a focus on early start up and firm registration steps. Bennett & Chatterji (2023) survey entrepreneurs on 21 pre-entry activities, finding that nascent entrepreneurs are more likely to make significant commitments early-on than to engage in learning. This classification has the highest overall overlap with my classification because it spans all four conceptual categories of analysis, experimentation, implementation, and resource acquisition

**Table D9** shows definitions of action classes, along with examples and exclusions. Note that definitions were not set ex-ante. They were created after clustering of the pool of objectives into action classes was complete. To illustrate the iterative clustering of objectives, **Table D9** shows a more granular 48 action classes, which include a few more categories that were later merged to arrive at 34 actions in the final hierarchy shown in **Figure 3**. For example, “Develop Revenue Model” and “Develop Pricing Strategy,” the fifth and sixth rows of **Table D9**, are merged into “Dev. Financial Plans, Models:  $a_4$ ” in **Figure 3**.

Finally, **Table D10** shows the mean of all categories of startup activities for proposed and finalized objectives along with *t*-statistics for difference in means tests. Statistics are separately reported for each of the three levels of aggregation. These levels are four classes for Conceptual Categories, twelve classes for Tasks, and 34 classes for Activities.

**Table D8:** Comparing between the Typology of Early-Stage Startup Activities & Existing Classifications

<b>Reynolds (2000)</b>		<b>This Paper</b>	
<b>Category</b>	<b>Activity</b>	<b>Activity</b>	<b>Category</b>
Start-Up	Did you spend a lot of time thinking about this new business, or did the idea suddenly occur?	DNA (not an objective)	
	Has a business plan been prepared?	Develop Business Plan: $a_6$	Analysis
	Has a start-up team been organized?	Hire Co-Founder: $a_{30}$	Resource Acquisition
	At what stage of development is the product or service this start-up will be selling?	DNA (Not an objective)	
	Have marketing or promotional efforts been started?	Do Marketing: $a_{24}$	Implementation
	Has an application for a patent, copyright, or trademark relevant this new business been submitted?	License, Patent IP: $a_{33}$	Resource Acquisition
	Have any raw materials, inventory, supplies, or components for the start-up been purchased?	Dev. Production Capability: $a_{21}$	Implementation

Have any major items like equipment, facilities, or property been purchased, leased, or rented for the new start-up?	Dev. Production Capability: $a_{21}$	Implementation
Has an effort been made to define the market opportunities by talking with potential customers or getting information about the competition?	Conduct Market Research: $a_1$	Analysis
Have projected financial statements, such as income and cash flow statements or a break-even analysis, been developed?	Dev. Financial Plans, Models: $a_4$	Analysis
Are you now saving money to invest in this business?	DNA (Pre-entry/Unobserved)	
Have you invested any of your own money in this business?	No Equivalent (Unobserved)	
Have financial institutions or other people been asked for funds?	Raise Money: $a_{34}$	Resource Acquisition
Has credit with a supplier been established?	Dev. Production Capability: $a_{21}$	Implementation
Have you arranged child care or household help to allow yourself time to work on the business, either formally or informally with friends and relatives?	DNA (Unobserved)	
Have you begun to devote full time to the business – 35 or more hours per week?	Hire Co-Founder: $a_{30}$	Resource Acquisition

	Hire Employees: $a_{31}$	Resource Acquisition
Have any employers or managers been hired for pay – workers that would NOT share ownership?		
Has a bank account been opened exclusively for this new business?	DNA (pre-entry objective)	
Has the new business received any money, income, or fees from the sale of goods or services?	Grow Sales, Customers: $a_{25}$	Implementation
Have you taken any classes or workshops on starting a business?	DNA (Pre-entry objective)	
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Firm Registration	DNA (Unobserved)	
Does the new business have its own listing in the phone book?		
Has the new business paid any state unemployment insurance taxes?	DNA (Unobserved)	
Has the new business paid any federal social security taxes (FICA payments)?	DNA (Unobserved)	
Has the new business filed a federal tax return?	DNA (Unobserved)	
To your knowledge, is the new business listed with Dun and Bradstreet, the credit rating firm?	DNA (Unobserved)	

<b>Bennett &amp; Chatterji (2023)</b>		<b>This Paper</b>	
<b>Category</b>	<b>Activity</b>	<b>Activity</b>	<b>Category</b>
Learning	Discussed the idea with a friend	DNA (Pre-entry objective)	
	Searched to see if someone already offers the product	Conduct Market Research: $a_1$	Analysis
	Consulted with an expert you knew	Conduct Market Research: $a_1$	Analysis
	Consulted with an expert you did not know yet	Conduct Market Research: $a_1$	Analysis
	Explicitly considered how other firms might respond	Conduct Market Research: $a_1$	Analysis
	Built a prototype or pilot	Build Prototype, MVP: $a_{15}$	Experimentation
	Tested demand	Do Demo, Pilot, POC: $a_{11}$	Experimentation
		Obtain Letter of Intent: $a_{12}$	
		Quantify Value Proposition: $a_{13}$	
		Validate ProductMarketFit: $a_{14}$	
	Collected feedback from pilot to change business idea	Develop Business Plan: $a_6$	Analysis

Admin	Created a presentation, executive summary, etc.	DNA (Several objectives)	
	Built a website for the business	Build Organization: $a_{20}$ (See definition in <a href="#">Table D9</a> )	Implementation
	Created spreadsheets, financial models, etc.	Dev. Financial Plans, Models: $a_4$	Analysis
	Wrote a business plan	Develop Business Plan: $a_6$	Analysis
	Registered the business (for a tax ID)	DNA (Pre-entry/Unobserved)	
Other	Made a sale	Grow Sales, Customers: $a_{25}$	Implementation
	Explored financing options with a bank, etc.	Raise Money: $a_{34}$	Resource Acquisition
	Applied to an incubator/accelerator program	DNA (Unobserved)	
	Researched the legal or tax implications	Determine Regulatory Reqs: $a_3$	Analysis
	Explored using IP	License, Patent IP: $a_{33}$	Resource Acquisition
	Hired an employee	Hire Employees: $a_{31}$	Resource Acquisition

Quit your job to work on the proposed business

DNA (Pre-entry objective)

**Carter *et al.* (1996)**

**This Paper**

Category	Activity	Activity	Category
Discriminating Activities	Bought facilities, equipment	Build Organization: $a_{20}$	Implementation
		Dev. Production Capability: $a_{21}$	
	Got financial support	Raise Money: $a_{34}$	Resource Acquisition
	Developed models/prototypes	Build Prototype, MVP: $a_{15}$	Experimentation
Other precursor activities	Organized start-up team	Hire Co-Founder: $a_{30}$	Resource Acquisition
		Devoted full time	Hire Co-Founder: $a_{30}$
	Asked for funding	Raise Money: $a_{34}$	Resource Acquisition
	Invested own money	DNA (Pre-entry/Unobserved)	

Looked for facilities/equipment	DNA	
Applied license/patent	License, Patent IP: $a_{33}$	Resource Acquisition
Save money to invest	DNA (Pre-entry/Unobserved)	
Prepared plan	Dev. Financial Plans, Models: $a_4$	
	Dev. Sales, Mktng Strategy: $a_5$	
	Develop Business Plan: $a_6$	
	Develop Hiring Plan: $a_7$	Analysis
	Develop IP Strategy $a_8$	
	Prepare for Financing: $a_9$	
Formed legal entity	DNA (Pre-entry objective)	
Hired employees	Hire Employees: $a_{31}$	Resource Acquisition
Rented facilities, equipment	Build Organization: $a_{20}$	
	Dev. Production Capability: $a_{21}$	Implementation



**Table D9:** Definitions of Action Classes

Action	Definition	Exclusions	Examples
Conduct Market Research	Research or define the addressable market opportunity. Includes initial surveying of potential customers.	Late-stage feedback with pilot customers, demos and prototypes (see “Validate Product Market Fit”).	Define a customer profile (persona) and customer success criteria. Typically intended to identify the appropriate target market, including understanding the barriers to entry, competitive landscape, industry trends, and corporate relationships.
Conduct Product Research	Define use cases of the technology. Specify target problem(s). May overlap with “Conduct Market Research”.	Future development plans of the product and the user journey process (see “Develop Product Roadmap”). User interview feedback (see “Validate Product Market Fit”).	Define requirements of the MVP. Understand the main value proposition for identified target customer segment(s).
Determine Regulatory Requirements	Identify requirements for a legal approval or compliance.	IP related requirements (see “Develop Intellectual Property Strategy”).	Determine data privacy compliance. Identify regulatory pathways (i.e., 510(k) vs. De Novo). Collaborate with regulatory bodies (e.g., FDA).

Develop Financial Plan	Evaluate current or projected financial state.	Preparing for dilutive or non-dilutive funding (see “Prepare For Financing”).	Project revenues and expenses. Prepare budget projections. Calculate ROI, CAC or LTV. Determine cash runway.
Develop Revenue Model	Determine how product(s) will be monetized.	If analysis includes cost, see “Develop Financial Plan”.	Develop commercialization strategy. Understand the unit economics and how revenue is generated.
Develop Pricing Strategy	Establish a pricing model for product(s) and customer segment(s).	None.	Determine unit cost and desired margins. Research price of comparable products in the market.
Develop Sales and Marketing Strategy	Plan for how to market, sell and deliver the product.	None.	Define customer acquisition strategy. Develop sales playbook. Establish growth KPIs (e.g., international expansion). Determine market entry point. Understand distribution channels. Determine marketing strategy, branding, and messaging.
Develop Business Plan	Understand key business objectives and document how they will be achieved.	Specific planning activities (see “Develop Pricing Strategy”, “Develop Sales And Marketing Strategy”, and “Develop Financial Plan”).	Develop a business plan. Present a long-term business outlook. Set company key performance indicators (KPIs).

Develop Hiring Plan	Determine staffing requirements. Plan for future hiring and onboarding.	None.	Develop human resource plans or hiring strategies. Draft HR policies. Define roles and responsibilities.
Develop Intellectual Property Strategy	Define the IP and how it is or will be protected. May overlap with “Develop Regulatory Requirements”.	None.	Understand viability and defensibility of IP (may involve lawyers).
Prepare For Financing	Prepare for dilutive or non-dilutive funding.	None	Create funding strategy or prepare due diligence documents. Identify potential investors. Determine size of the financing round. Clean up the cap table.
Develop Technology Roadmap	Outline future technology development requirements and plans.	Future product development plans (see “Develop Product Roadmap”).	Determine future product feature requirements. Create project plan (resourcing, timelines, technical milestones).

Develop Product Roadmap	Outline future product development requirements and plans.	Future technology development plans (see “Develop Technology Roadmap”).	Determine future product feature requirements. Create project plan (resourcing, timelines, technical milestones).
Do Demo	Demonstrate the product.	None.	Develop or present demo. Demonstrate user experience.
Do Pilots	Conduct a pilot project with potential customers.	Clinical trials (see “Validate Technology”).	Obtain or sign a pilot contract. Engage with early customers for a pilot.
Do Proof Of Concept	Conduct a POC engagement with potential customers.	None.	Complete POC data package from current project.
Obtain Letter Of Intent	Obtain purchase or pilot commitment from potential customers.	None.	Obtain Expressions of Interest (EOI), Letter of Intent (LOI) or Master Service Agreements (MSA).
Quantify Value Proposition	Define the value proposition.	None.	None.

Validate Product Market Fit	Establish existence of a widespread set of customers that resonate with the product (Ries, 2011).	Technology validation (see “Validate Technology”).	Validate market-desirability and feasibility of the product. Validate stated value proposition. Gather product feedback.
Build Prototype	Develop embodiment of critical elements of the intended design (Lauff <i>et al.</i> , 2018). May overlap with “Build Minimum Viable Product”.	None.	Enhance communication, enable learning, and inform decision-making in design process by building a prototype.
Build Minimum Viable Product	Develop a product with minimum effort and features (Ries, 2011). May overlap with “Build Prototype”.	None.	Gain key insights, measure customer response, or determine the need for pivot.
Validate Regulatory Process	Validate hypothesized regulatory processes.	Prepare documentation for a regulatory meeting (see “Determine Regulatory Requirements”).	Verify regulatory reimbursement pathways with regulatory bodies or consultants.

Validate Technology	Test technical functionality and feasibility of the technology.	White Papers as they are not peer-reviewed (see “Do Marketing”).	Conduct clinical trial. Establish efficacy. Validate externally or via peer-reviewed journal publication.
Choose Market	Pick the target market to pursue.	None.	Pivot to a new vertical. Choose a beachhead market.
Modify Pricing	Change the pricing model.	None.	Change price for specific product(s) or customer(s). Add pricing tiers. Adjust the profit margin.
Develop Sales Processes	Develop a repeatable sales workflow.	None.	Add sales tools and automation. Provide sales training. Set sales SOPs.
Build Organization	Set up a functional aspect of the firm.	None.	Incorporate the business. Appoint BoD. Determine vision of the firm. Set up office space. Create an org chart.

Develop Production Capabilities	Increase production throughput or capacity.	None.	Develop soft or hard production capabilities. Improve current manufacturing infrastructure.
Form Partnership	Establish strategic relationships with an entity that is not a customer or investor.	Pilot project with potential customers (see “Do Pilots”).	Establish a partnership agreement, JDA, or MOU with a university, channel distributor, or OEM.
Deliver Product	Bring the product to end-users’ hands.	None.	Deliver updated product to customers. Deploy a solution. Complete a technological integration. Complete manufacturing current order.
Do Marketing	Conduct marketing activities.	None.	Create marketing material (videos, white papers, collateral). Launch marketing campaign. Obtain marketing analytics.
Generate Sales	Generate revenue or sales. May overlap with “Get New Customers”	Acquire new customers (see “Get New Customers”).	Close sales deals. Increase recurring revenue. Build a sales pipeline.

Get New Customers	Obtain a new customer.	None.	Convert a pilot customer (contract) to sales. Generate or secure meeting with a sales lead. Onboard new users. Sign contracts or POs with new customers.
Develop Technology	Develop the core technology.	Productize the technical development into a product (See “Build Product”)	Train a ML model. Develop protein folding algorithm.
Build Product	Build a fully-functional product.	None.	Convert the prototype into a market-ready product. Finalize the user interface.
Improve Product	Implement changes that improves the product. May overlap with “Develop Technology”.	None.	Iterate on existing features. Add new features. Scale existing features. Improve product performance.
Launch Product	Release a validated beta or public product to market.	None.	Release the product to initial users. Launch a new service offering.
Obtain Regulatory Approval	Obtain approval from a regulatory body.	Define regulatory requirements (see “Determine Regulatory Requirements”).	Establish compliance with laws and regulations. Submit an application to a regulatory body (e.g. FDA, EMA). Submit a REB application.



Hire Advisors	Recruit (paid or unpaid) business or technical advisors.	Board of Directors (see “Build Organization”).	Recruit key opinion leader (KOL), mentors, consultants, expert scientists, and technical or scientific advisors.
Hire Co-founder	Recruit a co-founder.	None.	Develop a shortlist. On-board a new co-founder.
Hire Technical Staff	Hire technical employees with specific STEM skills.	None.	Hire software engineers, chemists, or AI experts.
Hire Business Expert	Hire non-technical employees with professional expertise.	None.	Hire a sales, business development, customer success, marketing, operations, finance, or product expert.
Hire Em- ployees	Hire employees with no specified expertise.	HR (see “Hire Business Expert”), IT (see “Hire Technical Staff”).	Address staffing needs.
Hire Executive Officers	Hire a member of the C-Suite.	CTO (see “Hire Technical Staff”).	Hire a CFO, CMO, COO, and CSO.

Get Data	Acquire data for software purposes.	Understand user engagement (see “Conduct Product Research” or “Conduct Market Research”). Acquire data for testing (see “Validate Technology”)	Acquire data from pilots, clients, partners or vendors.
License Technology	License IP.	Evaluate technology transfer options (see “Determine IP Strategy”). License technology to a partner or customer (see “Generate Sales”).	License technology from the patent holder. Transfer IP rights from university to the firm.
File Patent	Submit a formal patent application.	Develop a patent strategy (see “Develop IP Strategy”).	Draft the application and patent assessment with a lawyer. Convert a provisional patent to full utility. Complete prior art searches.
Raise Money	Acquire dilutive or non-dilutive funding.	None.	Acquire funds for operations or growth. Secure lead investors. Book meetings with investors. Negotiate term-sheets and valuation.

**Table D10:** Summary Statistics of Business Objectives

	Proposed <i>N</i> = 2,271	Finalized <i>N</i> = 2,271	<i>t</i> -statistic
<b>Conceptual Categories</b>			
Analysis	0.18	0.24	5.45
Experimentation	0.22	0.26	2.71
Implementation	0.36	0.28	-5.27
Resource Acquisition	0.24	0.22	-2.19
<b>Tasks</b>			
<i>Analysis</i>			
Market Product Research	0.06	0.09	3.90
Planning (Financial, IP, Sales, Reg.)	0.10	0.13	3.34
Product, Technology Roadmap	0.02	0.02	0.87
<i>Experimentation</i>			
Product Market Fit Validation	0.14	0.16	2.59
Tech, Regulatory Validation	0.09	0.10	0.82
<i>Implementation</i>			
Market Selection, Sales Processes	0.02	0.03	1.53
Organization Building	0.08	0.07	-1.26
Sales and Marketing	0.14	0.10	-3.64
Tech Dev., Approval, Launch	0.11	0.08	-3.97
<i>Resource Acquisition</i>			
Hire Employees, Advisors, Co-Founders	0.08	0.07	-2.16
License, Patent IP; Obtain Data for ML	0.03	0.03	1.29
Raise Money	0.13	0.12	-1.74
<b>Activities</b>			
<i>Market Product Research</i>			
Conduct Market Research	0.04	0.06	3.81
Conduct Product Research	0.01	0.02	2.16
Determine Regulatory Reqs.	0.01	0.01	-0.58
<i>Planning (Financial, IP, Sales, Reg.)</i>			
Dev. Financial Plans, Models	0.03	0.02	-0.68
Dev. Sales, Marketing Strategy	0.01	0.01	0.83
Develop Business Plan	0.01	0.02	3.13

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Develop Hiring Plan	0.01	0.01	0.16
Develop IP Strategy	0.01	0.01	1.99
Prepare For Financing	0.04	0.06	2.30
<i>Product, Technology Roadmap</i>			
Dev. Product, Tech Roadmap	0.02	0.02	0.87
<i>Product Market Fit Validation</i>			
Do Demo, Pilot, POC	0.07	0.07	-0.06
Obtain Letter Of Intent	0.02	0.03	0.67
Quantify Value Proposition	0.00	0.01	2.20
Validate Product Market Fit	0.04	0.06	2.99
<i>Tech, Regulatory Validation</i>			
Build Prototype, MVP	0.03	0.03	0.28
Validate Regulatory Process	0.00	0.01	2.20
Validate Technology	0.06	0.06	0.06
<i>Market Selection, Sales Processes</i>			
Choose Market	0.00	0.00	0.78
Develop Sales Processes	0.02	0.02	1.33
<i>Organization Building</i>			
Build Organization	0.03	0.03	0.53
Dev. Production Capability	0.02	0.02	-0.78
Form Partnership	0.04	0.03	-1.84
<i>Sales and Marketing</i>			
Deliver Product	0.01	0.01	-1.92
Do Marketing	0.01	0.01	-1.49
Grow Sales, Customers	0.11	0.09	-2.81
<i>Tech Dev., Approval, Launch</i>			
Develop Technology, Product	0.09	0.06	-3.99
Launch Product	0.02	0.01	-1.56
Obtain Regulatory Approval	0.01	0.01	0.69
<i>Hire Employees, Advisors, Co-Founders</i>			
Hire Advisors	0.01	0.01	0.84
Hire Co-Founder	0.00	0.00	1.51
Hire Employees	0.07	0.05	-3.07
<i>License, Patent IP; Obtain Data for ML</i>			
Get Data	0.01	0.01	1.14

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License, Patent IP	0.02	0.02	0.75
<i>Raise Money</i>			
Raise Money	0.13	0.12	-1.74

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Notes: This table shows the average priority of different activities in proposed and finalized objectives. The last column shows the t-statistic of the difference in means tests.