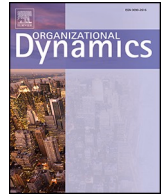


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Bridging ideas and market success: A framework for managing proof-of-concept projects

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ABSTRACT

While the world is full of potential moonshot projects, there is an ever-growing disconnect between new ideas and their successful transformation into commercialized new products. Companies often struggle with inefficient resource allocation and the challenge of quickly assessing an idea's feasibility. The burgeoning number of proof-of-concept (PoC) projects reflects the need to mitigate the risk of investing resources in potential failures. This study introduces the PoC Framework, a strategic tool that guides managers through the PoC journey, transforming initial ideas into real-world applications. Importantly, it promotes a mindset shift that equally values the proving and disproving of concepts. This approach saves resources by preventing the further development of non-viable ideas. The PoC Framework has been gaining traction among Silicon Valley firms, underscoring its practical relevance and effectiveness in fostering strategic thinking and overcoming hidden challenges within the PoC process.

1. Introduction

In a world full of potentially moonshot projects, companies are facing an ever-growing disconnect between new ideas generated and their successful transformation into commercialized products or services. In the race to innovate, recognizing quickly whether an idea has a great chance to succeed or fail in the market is as crucial as the speed of innovation itself. Proof-of-concept (PoC) is an intuitive tool used to evaluate an idea's feasibility, potential market viability, and value. PoC is run at the very early stage of the innovation before committing to a concept full-scale development.

PoC calls for a mindset shift, valuing the possibility of disproving a new concept as much as proving it. If the concept is proved it can undergo further development, while disproving it will save companies time, money, and other resources. Even though PoC is becoming a common practice, companies are continually challenged by inefficient allocation or misdirection of efforts and resources on innovations that, despite their potential, ultimately fail to gain traction in the market. Our comprehensive research into the current landscape of frameworks and guidelines for PoC projects, as well as insights from our fieldwork, evidenced a surprisingly poor understanding of the specific PoC dynamics and the potential pitfalls they present. And as PoC grows into a trend, a more comprehensive framework is ever more needed.

Drawing on a rich cross-industry empirical experience and research, this study offers a fine-grained framework on how to run PoC. This PoC Framework has been gaining traction among Silicon Valley firms, underscoring its practical relevance and effectiveness. The value of the PoC Framework extends beyond mere step-by-step guidance. While it outlines three main phases and seven related steps, each with specific goals and activities, its real strength lies in fostering strategic thinking for PoC projects. PoC Framework helps firms turn ideas into either reliable proof that a concept is feasible or a reliable disproof. It is a framework for navigating complex transitions and, importantly, overcoming hurdles that do not become evident immediately but can affect the whole PoC outcome later. This Framework can be employed by both experienced PoC users and first-time adopters.

2. Embracing the jungle of innovation best practices

As resources like funding, human capital, or time, become increasingly constrained, companies face greater pressure to ensure that their investments generate substantial returns. Consequently, there is a rising demand for managerial tools that, on the one hand, foster innovation to keep up with competition, while on the other hand, save the company from initial significant investments.

In day-to-day practice, innovators often get involved in technological

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projects at the very early stage of their existence. To work on them, they built a best practices toolkit that has proven their efficiency worldwide (e.g., Technology Readiness Level, Minimum Viable Product, lean approach, and design thinking, among others). Those best practices address innovation challenges differently. Some emphasize ideation and design for better customer discovery while others focus on market feedback and further product refinement. Using a best-practices toolkit is beneficial, yet mixing up innovation practices can generate confusion and give the false perception of rich results, since each tool has its specific goal. We briefly highlight the main differentiating aspects between innovation best practices, sorting the jungle.

First, Technology Readiness Level (TRL), initially developed for large-scale projects like NASA and used in university contexts to facilitate technology transfer, mainly focuses on advancing the technology readiness level. It is worth mentioning that PoC represents a specific readiness level in TRL. Running TRL requires significant time, money, and resource commitment; thus, it is used for long-term projects with extensive research and development. Second, the Minimum Viable Product (MVP) methodology uses feedback to improve the new product or the process with each iteration and real-world testing. MVP prioritizes rapid market entry by developing a satisfactory solution through continuous user feedback on an actual product and incremental improvements. In this way, PoC comes first, and building a minimum viable product comes next. Third, the lean approach, closely associated with MVP, is a mindset that tolerates changes in a new idea at any time to pivot to a better business model or customer using minimum effort and resources. Finally, design thinking is a user-centric ideation approach to co-create and refine the problem and solution. Design thinking emphasizes empathy and deep customer discovery with stakeholders, using tools like design sprints to prototype and test ideas rapidly. For example, design sprints include five structured steps, such as understanding a problem and users' needs, sketching solutions to a problem, deciding on the most promising ideas, prototyping a user-testable prototype, and, finally, testing a prototype with real users.

Proof-of-concept (PoC) involves steps typical of most innovation practices—such as feedback, testing, iteration, or pivoting—and applies them distinctively to ensure resource saving. PoC strategically limits iterations to those necessary for proving a concept, emphasizing the importance of validating market viability and technological feasibility over extensive refinement. It offers flexibility for pivoting at key points, preventing aimless cycles of change. In this way, PoC aims to prove a concept's feasibility and value of innovation, focusing on essential testing and customer feedback without pursuing extensive technological advancements.

The distinguishing aspect of PoC from other tools is the presence of technology awareness that is needed to initiate any PoC projects. Indeed, PoC does not require specific technical knowledge at the start but *awareness* that a concept can be feasible. More specifically, *situational awareness*—accurate perception and comprehension of multiple elements within current time and space and their projection in the future. Situational awareness of PoC is usually fed by perceptions about technological trends, market, and users' needs and represents a quite holistic picture of the current and future opportunities of new technology in a given market. As PoC progresses, situational awareness qualitatively changes and moves from the “no technology knowledge” level to practical knowledge (PK)—practical, actionable, and field-specific knowledge aligned with specific commercial needs. By moving from situational awareness to practical knowledge innovators also prepare a concept for real-life scenarios.

3. Why do we need a PoC framework?

PoC projects operate within a highly uncertain environment with many unknowns and a lack of context-specific knowledge of technological features or users' needs. Drawing on our experience of managing PoC projects across various industries and company sizes, we have

recognized persistent patterns that lead managers and innovators to poor PoC performance or a failure to arrive at a definitive conclusion on a concept.

3.1. Pitfall #1. Proving a “no-market” concept

We noticed that when innovators have a technological idea in mind, it is easier for them to focus on the technological aspects of a new concept. However, omitting the natural market reasoning, in other words, overlooking whether there is an actual need and demand for a new solution in PoC would prove a concept that nobody will use. Indeed, in most cases, managers would constantly be referred to innovation, engineering, or design teams to check whether the concept works for them in terms of design, specifications, or standards, thus, developing a well-functioning concept that would have little or no clear value and not likely to be implemented. Checking the technical side without aligning with market needs, essentially leads to the creation of a technically sound yet potentially market-irrelevant solution. Often PoC projects prove technological feasibility without proving market viability. The question is, what is the reason to develop a solution if no one needs it and there is no market for it?

3.2. Pitfall #2. Over-positive perceptions drive false-positive results

PoC is usually characterized by the presence of a concept that innovators strongly believe to be fresh and promising from the very beginning. We found that managers heavily rely on their beliefs and enthusiastic perceptions. While these perceptions and beliefs stand at the basis of PoC initiation, we found that over-positive perceptions lead managers to harbor a distorted picture of a concept and false-positive results. This approach leads to subjective final decisions or even unintentionally forced PoC results as disproving the concept is commonly perceived as a failure.

3.3. Pitfall #3. Proving “whatever” concepts

A key PoC characteristic relies on the possibility of starting from an idea of technology or solving a business or user challenge. Indeed, PoC can be initiated with just a spark of innovation in mind or with a specific problem that needs a solution. Nevertheless, “having an idea” is not sufficient to run PoC effectively. When a concept is not clearly defined beforehand tests, managers are tempted to change concepts by adding new features or eliminating existing ones. We found that firms often do not define one clear concept to prove, thus creating an overload of similar concepts, and ultimately struggling to understand whether and which concept is proved or disproved. This effort is translated into additional cost, loss of time, and no clear path to leveraging newly created insights. How can firms prove a concept is feasible if it is not well-defined?

4. Qualitative studies

The proposed PoC Framework is grounded on a rich empirical base on how firms run PoC across industries. The Framework has been gaining traction among Silicon Valley firms, including showcasing it at the Berkeley Innovation Forum at UC Berkeley. Specifically, we took an approach where we combined scientific insights with practice-driven findings and tested them in real-life settings.

First, we conducted a comprehensive review of both academic and practitioner literature, discussed the most important steps to perform and challenges to address in PoC projects, and leveraged our practical experience from diverse innovation and PoC projects we were involved in as researchers. We analyzed fragmented rich insights from our research and developed the basis of the PoC framework. Second, to observe the whole process of PoC from problem identification and tech solution ideation to testing and assessments, and enrich our PoC

framework with more nuanced details, we examined the case of Red Ninja, the UK-based technological studio that develops stand-alone technological solutions for corporate customers. This stage of the research involved participatory observations and expertise-sharing interviews with the CEO of Red Ninja to derive knowledge features and grasp insights on PoC projects. Finally, we showcased the framework at the Berkeley Innovation Forum in Silicon Valley (organized by the University of California, Berkeley), where more than 30 top- and middle-level managers tested the framework during business simulation. The results of the final survey showed great interest in implementing the framework for innovation and R&D practices, and several companies have begun to integrate our framework into their PoC projects.

It is worth mentioning that in the present research, we used insights from the Red Ninja case to illustrate the most common errors and mistakes occurring in PoC projects not following the PoC framework. We present a brief description of four cases. “*Safe Steps*” is a digital platform for care homes and general practitioners developed for enhanced services for care home residents. The “*Little Moments*” platform was born as an idea of connecting mothers and prematurely born babies through a camera service. Specifically, a camera in the neonatal incubator can connect to the cloud and do it in a safe way (hygiene and cybersecurity), so the mother can watch her baby on a video in real-time on a tablet. “*LiFE*” is an AI- and big data-based concept to get ambulances to emergency cases on time. In England, paramedics are expected to reach emergencies within a time limit. From the moment they receive the call, ambulance drivers and paramedics must reach Category A callers in no more than seven minutes. Yet, roughly one out of three ambulances do not reach these life-threatening calls in time. The “*iSensing*” is an ML- and big data-based platform that aims at providing real-time insights into how pedestrians move around a city and plan public transport activities accordingly.

5. Proof-of-concept framework in action

We present the PoC Framework (Fig. 1), crafted from four years of rigorous research. This Framework includes phases, steps, characteristics, and awareness features into an elegant yet complex tool, navigating the most challenging pitfalls seamlessly.

We discovered three distinct phases of the PoC project: *Concept Positioning*, *Concept Activation*, and *Concept Proving*. Each phase has its related steps and specific characteristics that allow smooth and efficient moving from one phase to another. Moreover, these steps help to feed *situational awareness* to the level of practical knowledge (PK) or in other words, turn awareness into practical, actionable, and field-specific knowledge needed to prove the concept. The mechanism of how *situational awareness* is transformed into PK is based on nurturing different types of awareness to the level of PK. The distinctive feature of awareness at PoC is that it is fed firstly with the mainly outside-in information flows and later in combination with the internally developed insights. The distinctive feature of PK is that it is based on previously developed awareness and grows exclusively internally. Every phase and step has its role in feeding awareness and PK.

Finally, we introduce the notion of the two chasms, namely, the *Value* and *Expectations Chasms*, which are placed in the middle of PoC. Chasms refer to significant gaps or hurdles that need to be overcome during the PoC process. Crossing Chasms is the necessary condition to ultimately prove a concept and means reaching the more advanced level of awareness or moving to the PK level. Importantly, uncrossed Chasms do not become evident immediately but affect the whole PoC later.

6. Crossing the value chasm: concept positioning phase

Fig. 2 depicts the different steps composing the initial phase of PoC, namely, *Concept Positioning*. The goal of this phase is to recognize and position core aspects of a new concept related to the need, the value, and the solution. Consistently with this goal, three steps can be identified: 1a) Recognizing a need, 1b) Proving its value, and 1c) Identifying a solution. A recognized need and proved value are fixed at the phase, and all other steps and phases will be built accordingly. Well-positioned need, value, and solution allow crossing what we call the *Value Chasm* and enable the ultimate proof of the concept.

The *Value Chasm* is conceptually placed between a blurry idea at the beginning of Phase 1 and the well-articulated concept that has value and can potentially address pain points. Pain points regard burning problems of potential customers, users, or stakeholders that need to be solved through a new concept. Crossing the *Value Chasm* requires a small proof representing a necessary but not sufficient condition to the final proof of the concept. While the three steps of the *Concept Positioning* phase are crucial to cross the *Value Chasm*, proving the value is the key step, yet not plain to see. The absence of the value does not become evident immediately, and the project might seem to be going successfully with just a need and a corresponding solution identified. The early recognition of a disapproved value will allow implementing changes at very early moments up or quitting the PoC project without financial and emotional loss.

The *Concept Positioning* phase starts with *situational awareness*. Indeed, at this phase, prior experience and intuition become determinants in the situation of lack of well-informed insights on a potential need, market, and technology features. While, three performed steps nurture different types of awareness: *need*, *value*, and *technology awareness*.

6.1. Recognizing a need: Step 1a

The earliest step of the *Concept Positioning* phase consists of recognizing a pain point or need. Pain points regard burning problems of potential customers, users, or stakeholders that have to be solved through a new concept, while a need is a broader demand for a solution or improvement. The need or pain point recognition goes through a process that might involve several activities, including desk research; problem, need, or market validation; and customer discovery. Initially, desk research serves for broad exploration, while problem, need, or market validation for verifying that a recognized problem, need, and market opportunity exists and is significant enough to initiate a PoC

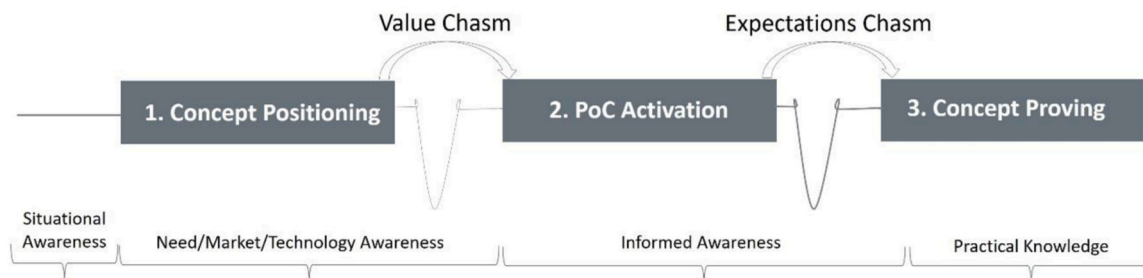


Fig. 1. PoC Framework.

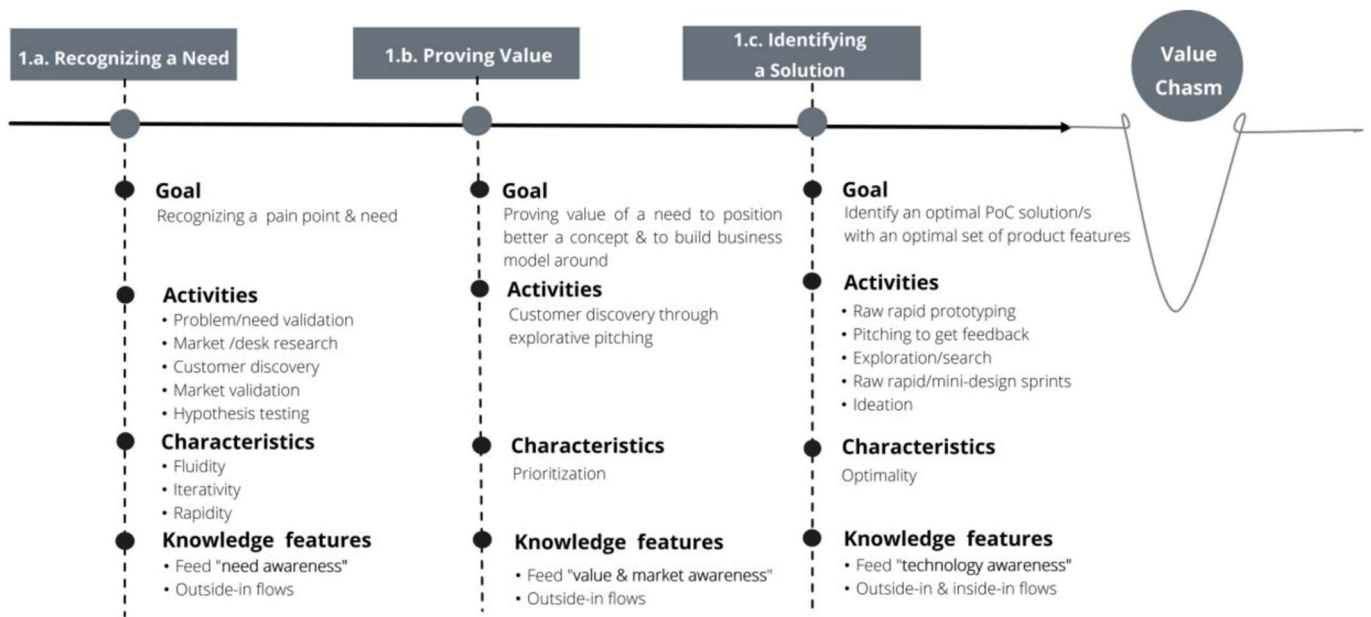


Fig. 2. Concept Positioning Phase.

project. In turn, customer discovery aims at getting feedback on potential pain points. Indeed, the customer discovery process while including direct interactions relies more on discovering and learning about potential pain points or needs.

The process of need/pain point recognition implies both being iterative and fluid in performing the activities mentioned above. Thus, iterativity allows managers to repeat the activities several times and refine the understanding of the need or pain point based on new insights with each iteration. Being iterative fosters a higher precision in discovering needs and helps to gradually narrow down the actual problems that need solving. In turn, being fluid allows flexibility and adaptability in conducting these activities. Importantly, it supports sensing and absorbing new incoming knowledge to adapt to unexpected insights on pain points.

At this step, the activities that we exposed aim at feeding *need awareness* with the incoming new insights to better position a concept. PoC managers should perform as gold diggers and harvest as much information on needs and pain points as possible by bringing information from outside to inside. In this way, *need awareness* is elevated from intuitive perception to consciously developed facts based on pain points. The main challenge relates to getting feedback from inner social and professional circles. This dynamic occurs as managers tend to seek feedback from people who are likely to prove the need. Indeed, inner circles are limited and prevent from going out of a comfort zone and exposing unexpected feedback on pain points. This omission might lead to a distorted picture of pain points and ultimately negatively affect the subsequent steps of PoC.

6.2. Insights from "Safe Steps" PoC in recognizing a need

In the "Safe Steps", the goal of the first step of PoC was to find out the most relevant pain point of the aging population inside care homes. Initial desk research performed to explore the industry and the ecosystem did not help to discover "unique" and did not address pain points. Desk research and hypothesis testing might run alongside more rapid and fluid activities, so it is possible "to shift the whole project to another direction" (Red Ninja CEO). "Safe Steps" went through a customer discovery process with potential customers and experts in the care homes world using just improvised tools (i.e., a pen and paper, sketch in a book, or phone calls) to come up with the list of pain points. In this way, "Safe Steps" discovered that falls of elderly people are the

most critical pain points in care homes. As the Red Ninja CEO stated: "We double-downed on that and excluded other pain points such as hydration, medication reviews, training the staff and other needs from PoC project. It prevented us from dedicating a long time to do something that probably would not have much value and being committed to maybe wrong pain points."

6.3. Proving the value of a need: Step 1b

PoC proceeds with proving its value to enable a better concept positioning. The value of a need can be proved/disapproved by answering the question "Who is willing to pay for that?", essentially asking if the need is significant enough for customers to spend money on resolving it. The proof that the need is valuable is crucial to developing a successful business model around that need once PoC is concluded. Step 1b represents a necessary condition to cross the *Value Chasm*. Moreover, it is one of the essential steps to finally prove the concept.

In Step 1b, value can be proved with a limited set of activities. At this specific step, customer discovery aims at getting feedback from stakeholders who are potential customers and not necessarily users through what we call *explorative pitching*. *Explorative pitching* is unique to the PoC activity where the concept is presented to potential stakeholders not to sell it, but to explore and validate its value. It aims to explore whether stakeholders recognize the need and are willing to pay to have it solved, in other words, proving or disproving the value. To this extent, *explorative pitching* differs from traditional pitching since the latter primarily aims at selling the idea.

The main characteristic in Step 1b is prioritization. Specifically, while innovators should prioritize and prove the main value, they also should note smaller values that can come along the way. This will help to find the best combination of values for everyone involved, including a firm that runs PoC. Sometimes, what is valuable to one stakeholder may be less important to the firm running PoC in terms of customer lifetime value, image, or compatibility with the values of other stakeholders.

At this step of PoC, the customer discovery activity through *explorative pitching* helps to feed *value awareness* with the incoming targeted information to position a concept more precisely. PoC managers should perform as snipers and hunt mainly for feedback from those stakeholders who can potentially prove or disprove the concept's value. Surprisingly, we observed a tendency among managers to not be able to distinguish between recognizing a need and proving its value (Step 1a and Step 1b).

The two big challenges arise. Firstly, there is a risk of getting stuck in the loop of need identification without proving its value. Indeed, as the need identification (Step 1a) requires significant effort and focus, managers often get stuck identifying the existence and importance of a need/pain point and forget to confirm the need's value. Sometimes, emotional investments made by innovators and their enthusiasm toward the identified need give the biased perception that the need is valuable without adequate evidence (Step 1b). This leads to the second challenge that suggests that those who identify needs or pain points are not necessarily the ones who prove the concept's value and are willing to pay. Therefore, in Step 1b, it is essential to enlarge the stakeholders' circle by targeting those willing to pay.

6.4. Insights from "Little Moments" PoC in proving the value

The initial desk research on a need proved that mothers and babies being separated from each other right after birth *"is not a small problem — over 90,000 babies are admitted to neonatal care every year because they have been born prematurely. Premature babies can be in hospital for months, and some families may have to travel hundreds of miles to their nearest specialist neonatal unit which can mean significant financial costs, as well as a lot of emotional strain"* (CEO, Red Ninja). Although the pain point was easy to comprehend—the moment of a mother's bond with the baby—"Little Moments" struggled to find and prove the value of a need to create a business model around. Thus, we found that PoC project was in the loop of recognizing the need to be deep with *"empathy and co-creation"* for months (CEO, Red Ninja): designers and managers were speaking to mothers who have been through the process and nurses who were the users but not the customers. Little Moments people were very empathic talking for hours with potential users and running design sprints. The iterative process allowed the team to refine their understanding of the user's needs and the potential solution. The question was, *"Even if everyone likes it [a concept] but nobody will pay for it, what is the point in proving that concept? Just from a technical point of view?"* (CEO, Red Ninja). The mistake was that when talking to mothers and nurses, managers did not prioritize getting feedback also from other stakeholders who could prove or disprove the value. Mothers, once a baby becomes ready to go home, would not need a solution; nurses, although emotionally involved with mothers and their trauma, were not willing to pay to have the Little Moment solution. After months of running the PoC project, the Little Moments project faced the critical issue of developing a solution that nobody was going to pay for; the project was about to be canceled. Ultimately, the value was proved unintentionally and unplanned; the Alder Hey hospital where PoC staff was speaking with mothers and nurses became enthusiastic about employing "Little Moments" and was willing to pay for this solution.

6.5. Identifying a solution: Step 1c

Step 1c has the goal of identifying an optimal technological solution and attributing optimal technological features to it. The activities can be performed solely by a technology provider based on insights gained in the previous two steps. The exploration and ideation activities are conventional for solution identification and do not obligatorily presuppose users' involvement. However, if a technology provider decides to involve users, the activities will probably be rapid. For instance, design sprints that usually require five days of the design process can become mini-design sprints that run in a couple of hours or less using improvised means (i.e., paper, drawings, sticky notes).

The step is characterized by optimality conceived as the point where all solution's aspects are at their minimum satisfactory level and balanced. Specifically, having a concept's aspects at the minimum satisfactory level ensures that every part of the solution does *just enough* to prove the concept works, without adding unnecessary complexity or features. In other words, it means having the simplest solution that still addresses the discovered need, and has proven value, but is not costly

and overloaded with technical features. Finally, managers and innovators should seek to find adequate consensus between users' requirements or the team's ideas and a realistic view to start prototyping a concept.

Performed activities inform *technology awareness*—consciousness on how a new solution might be applied and function. Unlike other types of awareness, *technology awareness* is fed not only by incoming from outside insights but also by those developed internally, such as new insights on technological features and their applicability in a given use case and domain. This implies the rise of tension as managers should identify an optimal set of technology features in a short time.

6.6. Insights from "LiFE Project" PoC in identifying a solution

"LiFE Project" was not able to identify an optimal solution and balance its complexities. It led to quitting the PoC project without proceeding with prototype development and tests. Specifically, even with the need and the value identified and proved (reach the emergency case in seven minutes, life is saved, NHS is willing to pay), the "LiFE Project" team realized that the initial assumption of traffic lights controlling using one single platform was not feasible. The concept required a very complex solution that would integrate ambulances, the traffic lights ecosystem, and transport systems. Thus, multiple stakeholders' ideas and proposed features should have been included in the proper working concept. Identifying an optimal combination was barely possible. Stakeholders were dissatisfied with every solution that the "LiFE" team proposed. Moreover, during co-creative activities with actual users of "LiFE"—ambulance drivers—the highest level of skepticism about algorithms driving ambulances through a city to life emergency cases was observed. The Red Ninja CEO stated: *"They simply did not want the machine to tell them how to get to somewhere."* What happened is that the solution was not feasible in an optimal way for all stakeholders. It was decided to quit the "LiFE" concept.

7. Crossing expectations chasm: concept activation phase

Once the concept has been positioned, it needs to be materialized into action. The *Concept Activation* phase aims at developing a concrete action plan and a rapid prototype. Fig. 3 depicts two steps composing this phase: 2a) Developing an action plan and 2b) Prototyping a concept. A well-developed action plan and prototype will allow crossing the *Expectations Chasm*.

The *Expectations Chasm* is a critical juncture, highlighting a common challenge where stakeholders' expectations may not align with the emerging prototype. Similar to the *Value Chasm*, the *Expectations Chasm* represents another small proof that occurs during the project, and it is one of the conditions for the PoC. It situates between the positioned concept and the developed prototype that will be used to prove the concept. Specifically, as the prototype is the first testable solution that stakeholders have in their hands, differences between what was expected and what has been delivered may emerge. Different stakeholders, for example, technology developers, users, or consumers, might expect an action plan, prototype, and its technological features and functionality differently.

The fact that the *Expectations Chasm* might not be crossed usually does not become evident immediately, but might cause the failure of PoC later on. Therefore, it is crucial to question the whole concept on the matter of alignment before moving on with concept tests. In case of discovered misaligned expectations, PoC managers should reverse and agree, without implementing dramatic changes; alternatively, they can either decide to adopt an expectation that is consistent with their expectations or quit the project.

Situational awareness is now informed by *need*, *value*, and *technology awareness*, and is elevated to the *informed awareness* level. Usually, *informed awareness* is enough to start the development of an action plan and a prototype. In turn, *informed awareness* is further fed mainly

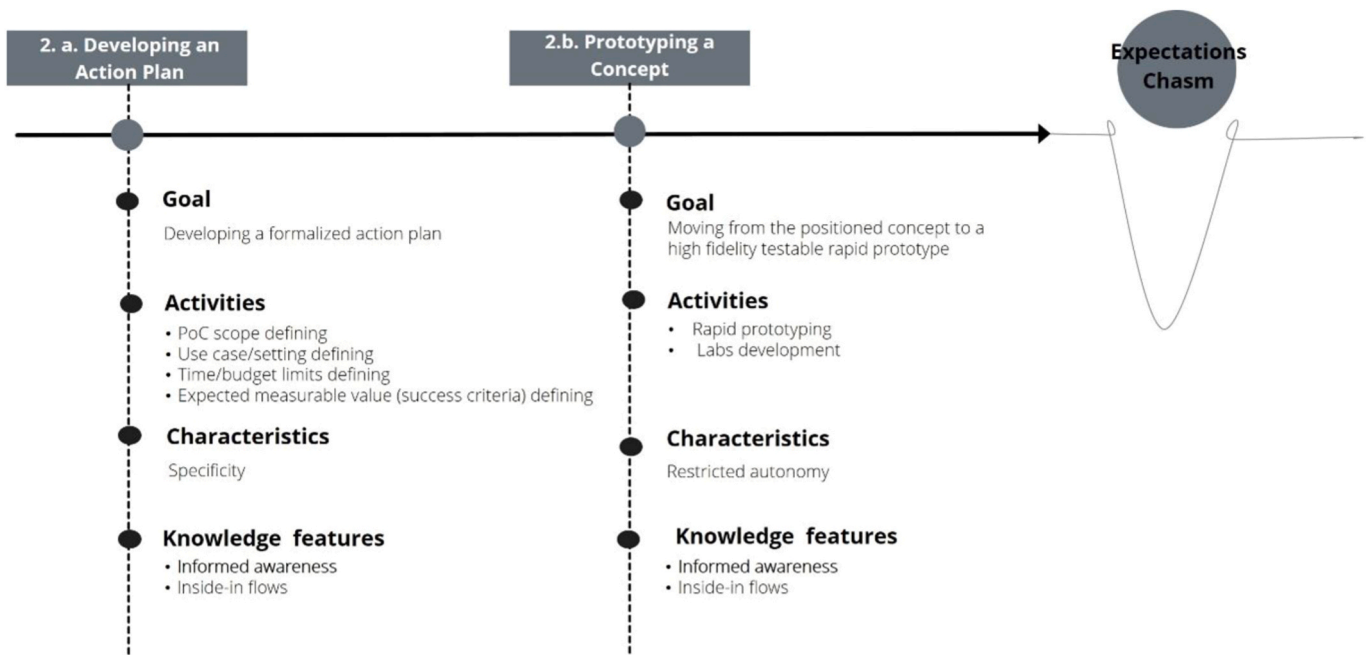


Fig. 3. Concept Activation Phase.

internally by developing new technology and domain-specific insights in practice while developing an action plan and a prototype.

7.1. Developing an action plan: Step 2a

The goal of Step 2a is to develop a formalized action plan for PoC execution. The action plan for PoC is a document where the scope (e.g., the specific concept's area or features to prove), setting (the environment or context in which the PoC will be tested), limits (such as budget constraints, time frames, or resource limitations), intentions (clearly defined outcomes expected from the *Concept Positioning* phase), and expected measurable value (precise metrics or outcomes used as PoC success criteria) are formalized. Specifically, limits serve as borders that are not possible to cross during the prototyping of a solution and PoC tests. Success criteria are expected measurable values set up before PoC tests to help understand whether a concept was proved at the end of a project.

The important characteristic of Step 2a is specificity in planning as it guides the action plan development in a well-defined way. Specific and formalized parts of an action plan will serve as the ground for prototyping a solution, PoC tests, and the ultimate decision to prove or disprove the concept. Omitting to define limits and success criteria and focusing more on actions that might seem more essential for concept tests, such as scope or setting defining, can lead to failure to prove the concept ultimately.

7.2. Prototyping a concept: Step 2b

The goal of Step 2b is to move from a concept to a high-fidelity, testable rapid prototype following the previously defined set of technological features and the action plan. While step 2b is mostly technical, it is also a strategic point where all previously defined features, needs, and values will be realized into a rapid prototype. Therefore, some changes could be implemented as new practice-driven insights might arise, yet these adjustments must not introduce entirely new features beyond the original PoC scope.

In this respect, a key characteristic of Step 2b is represented by the *restricted autonomy* that delineates the margins and degrees of freedom in changing some technological features and developing a more feasible

concept. The previously defined and fixed need, value, and the developed action plan play the role of margins. The main challenges at this step relate to failing the *restricted autonomy* characteristic and evolving a prototype into a consumer-ready product prematurely. This situation is often boosted by stakeholder feedback desiring a more advanced version at proof-of-concept costs. This could significantly inflate project costs or timelines and damage the concept's chances of being proven.

7.3. Insights from "Little Moments" PoC in crossing the expectations chasm

Although the PoC action plan for the "Little Moment" project was developed, it missed limits and a well-defined rapid prototype description. Specifically, the original idea of the rapid prototype was changed during the PoC following the customer's request. The initial intention was to create something "as simple as a laptop with the Raspberry Pi camera on a trolley, which is all clean and hygienic, so you can wheel it into the near incubator, connect it to a laptop and a scanning app, so it is possible to watch the baby on Skype on a mother's phone" (CEO, Red Ninja). This prototype cost around twenty pounds for the camera and ten pounds for the Skype license. However, the hospital requested expensive Sony cameras (about 800 pounds each) instead of affordable Raspberry Pi for the PoC project. What ultimately happened is that "Little Moments" went into a consumer-level product instead of a rapid prototype. Costs were inflated, and "Little Moments" spent four thousand pounds on cameras to play around with instead of spending thirty pounds for one prototype. The team did not manage customer expectations, and they were "[J]ust too nice" in accepting changes (CEO, Red Ninja).

8. Succeeding or failing fast: concept proving phase

The *Concept Proving* phase is the final in PoC, and it should result in a knowledge-driven clear decision on whether the concept is proved. Fig. 4 depicts the two steps: 3a) Concept tests and 3b) Final decision on the concept. Unlike in the other phases where the correct performance of all the steps leads to crossing the chasms, in this phase, completion of the two steps does not guarantee that the concept will be proven.

However, one feature will lead to taking a carefully weighed decision, namely, "following the book" and adhering strictly to the

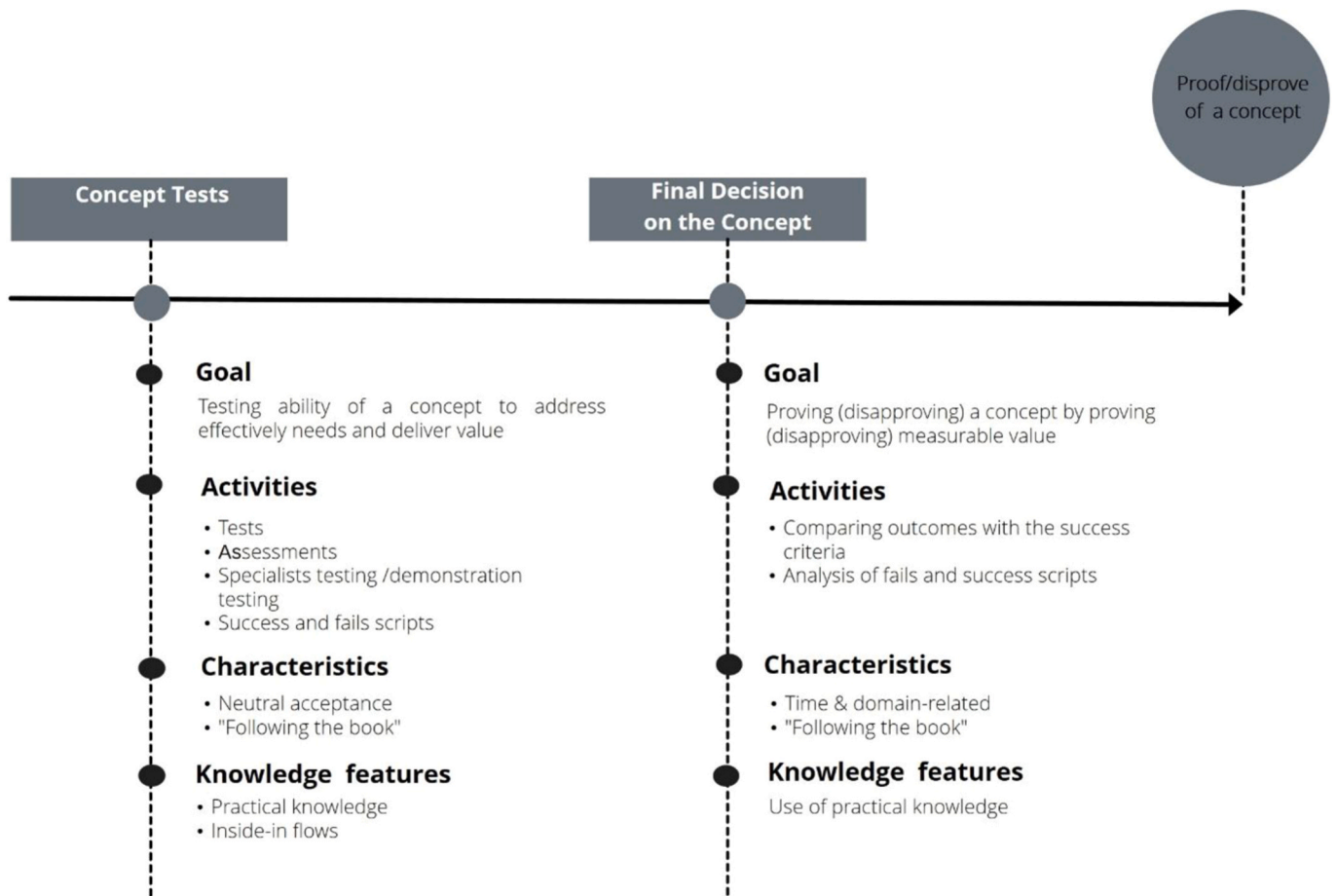


Fig. 4. Concept Proving Phase.

established protocol. The feature refers to respecting the defined rules, recommendations, and methodology. Following the book serves as a necessary condition that allows one to follow the developed action plan, respect limits, avoid introducing any significant changes in a concept, and inform the final decision with practical knowledge.

8.1. Concept tests: Step 3a

Step 3a aims to test the concept's ability to address pain points effectively and deliver measurable value proved in the previous phase. This process includes tests and assessments that presuppose the active development of practical knowledge. Documenting reactions or events that are either positive or negative is strongly recommended. This activity is critical for a final decision on proof or disprove of the concept and helps recall important facts without going emotional and biased at the final decision step.

Step 3a does not focus anymore on feeding awareness but on developing domain-specific knowledge of the product features and challenges in practice, that is, practical knowledge (PK). PK influences the final decision, and it will become a solid ground for future commercial application development in case of PoC success. Newly developed PK can substantially challenge actions and decisions that are awareness-driven. Therefore, it is crucial to script all inconsistencies that appear to be analyzed at the final step of PoC.

An essential characteristic of the step is neutral acceptance, which refers to the recognition of PoC events (either positive or negative) without attempting to change or protest them. The characteristic suggests that all outcomes and events in PoC are neutral and all serve to build PK and ultimately inform a final decision.

A challenge at this step is the generation of new intriguing insights,

potentially indicating alternative needs, values, or solutions. Nevertheless, pivot—a shift towards a new concept—at this step would necessitate turning back to the inception and performing all steps again with the risk of failing the *Value Chasm*. The second challenge refers to failing to respect two characteristics, neutral acceptance and “following the book”, as it can lead to transforming the PoC project into the loop of small minimum viable products in the attempt to implement changes immediately.

8.2. Insights from “Little Moments” in testing the concept

When the “Little Moments” concept of using cameras to connect mothers and their prematurely born babies to reduce stress and depression started being tested, new insights and ideas on how the concept might function differently appeared. It turned out that in the hospital there is a medical specialist who has worked for twenty-five years and is very experienced in spotting the moment when the baby is going to get sick. It is possible to intervene and prevent severe illness and even death. The “Little Moments” team immediately started thinking about how technology could help scale her expertise. Ideas were around machine learning (ML) that “detects in real-time some patterns that might be around the color of the baby or how the babies cry or move” (CEO, Red Ninja). The original concept of just connecting moms and babies using videos changed into saving babies’ lives using AI and ML. The team did not come back to evaluate new need and value but immediately started from a solution development planning how to put all babies in incubators on one screen to gather and train more data. It just kept growing until the team realized that the functioning solution would have to have many more videos of babies, something like 10,000 s. It was not feasible. The “Little Moments” pivoted back to the

original idea with the financial and time loss. What happened is that “Little Moments” omitting “following the book” quickly pivoted PoC, which they did not properly finish, into a consumer-level product.

8.3. The final decision on the concept: Step 3b

The goal of the final Step 3b is to prove/disprove a concept by proving or disapproving measurable value. Managers usually intuitively know whether the concept succeeded. However, it is crucial to avoid emotionally driven and biased decisions. Two activities of the step, namely, analyzing what went right and what went wrong during the concept testing (often documented as success and failure events) and comparing the test results with the predefined success criteria established in Step 2a, help inform the final decision. The concept is considered “proved” if it is possible to observe the measurable value as it was expected (see Step 2a). Measurable value can be expressed in numbers or any other tangible proof of the value. On the contrary, if it is not possible to measure and articulate clearly what is the value of the concept, or if it is significantly less than expected, it signals that a concept was not proved. Finally, as the value is proved within the timeframe and specific domain of a specific PoC project, a proved concept will not necessarily work in other contexts or its performance can be changed with time. Thus, another PoC project might be run to demonstrate a concept’s broader implementation.

8.4. Insights from “iSensing” PoC final decision

The initial PoC idea of the “iSensing” platform was to provide insights into how pedestrians move around a city and plan public transport activities accordingly. PoC was run together with the transport authority to count pedestrians, and the concept that WiFi sensors successfully gather Big Data and count pedestrians in real time was proved. The measurable value in terms of raised public transport performance was proved. Despite this, the technology developer realized that the concept had a temporary effect, as in two years or so the technology would be replaced with more advanced technologies (specifically, ML- and AI-based solutions). However, the strategic decision was to use the proven concept while preparing the new technological solution based on the CCTV cameras that use object recognition features of AI and ML algorithms to deliver the highest quality of insights not only on how pedestrians move but also enable more specific demographics facts. “We realized that the product did not have a lot of future in the market” (CEO, Read Ninja). Now the “iSensing” platform is video- and AI-based.

9. Conclusion

This research offers a first PoC framework, illuminating the path from vague ideas to well-defined knowledge, a transformation essential for successful concepts prove or disprove. The developed PoC framework serves as the canvas for technology innovation PoC projects, tailored to meet the needs of both small and large organizations. It offers a structured approach to navigating the complexities of PoC projects, guiding PoC initiatives from conception through to execution and a concept’s feasibility assessment.

The PoC framework will help to run PoC and exclude other types of seemingly similar activities. Thus, although PoC is experimental in its nature, an experiment is more instrumental than central for PoC. An experiment in PoC is a way to (dis)prove a concept rather than find better applications or improve the final solution. Thus, the PoC framework will prevent developing a ready customer solution or running multiple tests in an attempt to advance or change the concept. Indeed, in the PoC logic, a concept is not proven if it does not work as it was originally conceived. Implementing too many changes in the originally positioned concept will weaken the possibility of the concept being proven.

The value of the PoC framework extends beyond mere step-by-step

guidance. While it outlines three main phases and seven related steps, each with specific goals and activities, its real strength lies in fostering strategic thinking for PoC projects. It is a framework for navigating complex transitions and, importantly, crossing the Chasms—crucial for turning innovative ideas into real-life applications.

Specifically, it is crucial to develop PK that informs a final decision on a concept. As feeding awareness and transforming it into PK is essential but instrumental in PoC, managers might focus mainly on proving/disproving goals, omitting to focus on PK growing. Following the framework will help to feed awareness and elevate it to PK in an almost automatic way as all PoC steps have their distinct role in the awareness/PK transformation process.

Furthermore, managing the fast success or failure of a new concept consciously is the holy grail for firms. The discovered *Value* and *Expectations Chasms*, unlike the existing consensus that the concept is either proved or disproved, are the suggested points where managers can make their deliberate choice to quit the project (consciously fail) or reverse the direction if the chasms are not crossed (give it a chance). A fully informed choice on when and where to fail should become a natural part of every PoC, while a passive choice suggested by the lack of conscious management of PoC steps and chasms should be prevented. Moreover, managers should consider chasms as the set of small proofs that occur during PoC and manage them as the necessary milestones to reach. If the chasms are crossed, the probability of succeeding with new technology and doing it fast is higher.

Finally, a successful PoC is an important step that allows bringing a blurry idea to the market. However, moving forward requires considering market potential, marketing strategy, and team capability, among many other aspects for a successful market introduction.

CRedit authorship contribution statement

Maryia Zaitsava: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization. **Elona Marku:** Writing – review & editing, Formal analysis, Conceptualization. **Maria Chiara Di Guardo:** Writing – review & editing, Formal analysis, Conceptualization.

Declaration of Competing Interest

None.

Data Availability

Data will be made available on request.

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Further reading

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