

Improving Software Startup Viability: Addressing Requirements Prioritization Challenges Amid Increasing Interest Rates

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Abstract

Effective Requirements Prioritization (RP) underpins the viability of software startups. Despite its importance, a significant disconnect persists between RP processes and vital financial health markers, leaving startups vulnerable to economic fluxes. This study addresses the intersection of RP and financial considerations, with a specific focus on the evolving landscape of rising interest rates. Our ongoing research, based on an analysis of 40 studies spanning 10 domains and encompassing 358 unique RP references, highlights the notable absence of cash flow management—a determinant in 82% of startup failures—from RP research. The contemporary financial climate accentuates the importance of integrating financial ratios into RP criteria, driven by heightened investor scrutiny and the necessity of ensuring sustainable financial stability. This paper seeks to bridge the existing gap by systematically investigating RP criteria and proposing pragmatic solutions to address the context-specific challenges startups face, as well as extending the almost non-existent startup research related to the RP domain. With investors now adopting more discerning investment strategies, moving beyond growth metrics, it is imperative to consider a comprehensive set of metrics including, but not limited to Cash flow analysis, Return on Investment (ROI), Internal Rate of Return (IRR), and Net Present Value (NPV), while upholding user-centric metrics. This research advocates for an integrated approach, emphasizing both user-centric and financial metrics, assisting startups in navigating the intricate balance between growth and financial sustainability. By offering actionable insights to academia, practitioners, and startup founders, our study aligns RP strategies with the financial well-being of startups in an ever-changing economic landscape.

Keywords

Startups, Requirements Prioritization, RP, Requirements Selection, Requirements Triage, Software Product Management, Cash flow, Product Manager, PM, Private Equity, PE, Venture Capital, VC

1. Problem definition

Software startups, notorious for their high-pace, uncertainty, and resource limitations [1], face numerous challenges, including premature scaling, cash flow mismanagement (82%), difficulties in obtaining investment (47%) [2, 3], and simply running out of funds (21 to 44%) [4, 5]. The failure rate stands at 63% [5], with 25% occurring in their inaugural year [6]. The situation is exacerbated by an overemphasis on feature-dense, slow to market [6] Minimum Viable Products (MVP) devoid of strategic foresight or user traction [1].


Cash flow management, strategic planning, and efficient resource allocation are thus critical for startup survival. Improving early product [7] decision-making, especially requirements selection and prioritization, could significantly [8] influence future performance [9, 10]. The current financial climate is marked by steadily rising interest rates over the past two years, touching decadal peaks [11, 12], complicating startups' debt capital acquisition [13]. This has precipitated shifts in investor dynamics, reflected in diminishing fundraising deals in Europe by 92,26% [14]. Thus, startups must reassess their RP processes, including their methods and especially selection criteria.

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1.1. Knowledge Gap

The intersection of cash flow with Requirements Prioritization (RP) in startups remains largely unexplored [13, 15] in academic literature [1]. This study aims to bridge this gap by examining RP criteria within the context of startups' financial realities and rising interest rates.

Furthermore, it's well established that the role of the Product Manager (PM) is still very opaque in the world of startups, and even if the product management is already known, practically all of them doing it wrong [16]. So therefore, hopefully offering insights to enhance early-stage decision-making and bolster startup success rates. Because if they don't, most probably the already high bankruptcy rate of the sector will surely further increase [13].

2. Research Plan

Our research plan (Figure 1) shows the processes by which insights related to economic-contextual requirements prioritization are provided to software startup founders and Product Managers. Preliminary phases of this research, although foundational, have significant implications for subsequent stages, shaping the study's trajectory.

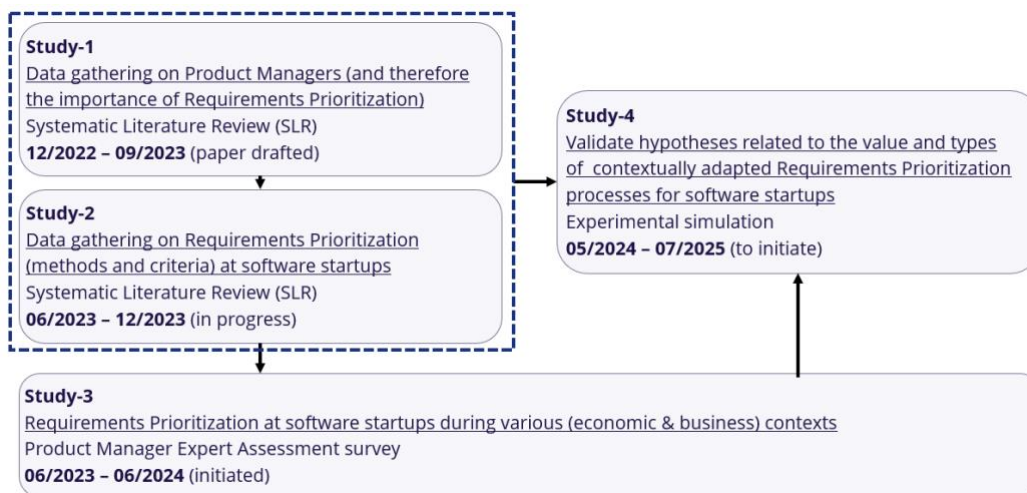


Figure 1: Research Plan

2.1. Study-1: Systematic Literature Review (SLR): importance of RP

Study-1 encompasses a Systematic Literature Review (SLR), meticulously documented in a non-published supporting technical report [17]. This report describes the intricate methodology employed for the SLR. The comprehensive report, accessible via ResearchGate, encompasses the delineation of the Review Protocol's sequential steps, search strategies, stipulation of inclusion, exclusion and quality assessment criteria, and outcomes derived from a pilot run of the Review Protocol to 100 papers.

Distinguishing this SLR from its contemporaries within the same domain is its distinctive research objectives. Specifically, Hujainah, Bakar [9], Ma [18], emphasize the selection variables and methods employed within Requirements Engineering (RE) while neglecting the domains of interest, namely the role of the PM and the startup context. On the other hand, Gupta, Fernandez-Crehuet [19] demonstrates a strong focus on the startup context, however, it remains descriptive, lacking a tangible connection to the practitioner's perspective.

Currently, an aggregate corpus of 1,087 papers has been compiled, with 134 papers deemed suitable for further scrutiny (Figure 2), following the meticulous application of predetermined inclusion, exclusion, and quality assessment criteria [17]. The knowledge amassed from this study serves as input for both Study-3 (see section 2.2) and Study-4 (see

section 2.3). Upon meticulous analysis, the prominence of RP in overall Project Management (PM) activities, particularly within software startups, will be distinctly illuminated.

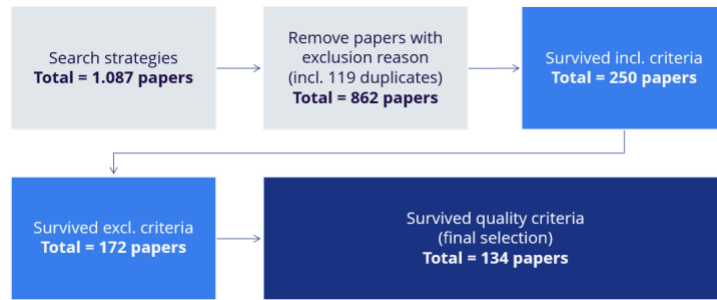


Figure 2: Study-1, Protocol research strategy results

2.1. Study-2: Systematic Literature Review (SLR): RP at software startups

The principal objective of Study-2 is a comprehensive Systematic Literature Review (SLR) that meticulously gathers and synthesizes pertinent trace evidence from academic literature concerning activities tied to requirements prioritization criteria (RPC). This review uniquely accentuates research pertinent to the software startup context. By examining the available literature, our investigation seeks not only to identify existing practices but also to structure and envision their impact on startups, considering current best practices.

To shepherd this endeavor, a set of meticulously formulated research questions (RQs) is presented in Table 1, serving as a definitive guide for our systematic investigation. Through this SLR, we aspire to offer valuable insights that can inform decision-making processes and contribute to the overall success and sustainability of software startups within today's dynamic business landscape.

Table 1
Study-2: Research questions

N°	Research questions
RQ1	Are there scholarly investigations that address the activities associated with RPC?
RQ1.1	What is the chronological pattern to be observed in the literature regarding these types of studies?
RQ1.2	Which academic journals and conferences serve as prominent venues for publishing research on product manager activities?
RQ1.3	What is the overall quality assessment of the research conducted related to this topic?
RQ2	What are the RPC that could be considered by a Product Manager when shaping its process?
RQ2.1	How is the distribution of identified criteria across publications represented in terms of frequency?
RQ2.2	What are the RPC that are discussed in the retained publications?
RQ3	Which studies within the literature also consider the context of software startups (Subset of RQ1.3)?
RQ3.1	What are the RPC that are highlighted in academic research that are especially taking into account the software startup context?
RQ3.2	Do the RPC that are highlighted in software startup research, appropriate in an era of rising interest rates?
RQ3.3	What requirements prioritization criteria show the most promise to improve decision-making at software startups in an economic context with higher interest rates?

A highly similar Review Protocol has been used as in Study-1 (see section 2.1). In this instance 161 studies got identified, with 40 selected for further scrutiny (Figure 3). The knowledge amassed in this study will be used as input for both Study-3 (see section 2.2) and Study-4 (see section 2.3). Subsequent to comprehensive analysis, a discerning overview of RPC discussions, especially within the context of software startups, will emerge.



Figure 3: Study-2, Protocol research strategy results

2.2. Study-3: PM Expert Assessment survey

The primary objective of this study is generate input that will be used to generate the hypotheses to be tested during Study-4 (see section 2.3). The envisaged data will be amassed via a customized survey. The target demographic for this survey comprises product management experts, distinct from startup founders, with expert assessment as the favored approach. This inquiry is poised to yield groundbreaking insights into the intricacies of startup product management, culminating in the identification of contextually appropriate key activities. The survey instrument will be subjected to a trial run, involving academics specializing in RE and Product Management, affording them an opportunity to furnish feedback, thereby refining the methodology for the final survey instrument.

To ensure relevance, the survey probes not only specific demographic aspects but also tailors each respondent's context, accentuating deviations from the baseline context. The proposed inquiries encompass:

1. Rank the importance of various requirements prioritization criteria.
2. Allocate 100 points across distinct requirements prioritization criteria to formulate an optimal 'prioritization algorithm.'
3. Sequence the preferred methods for optimizing requirement prioritization processes.
4. Elaborate on the reason why (the top-ranked method from question 3) is your number 1.
5. Detail the ideal process for prioritizing existing ideas for roadmap consideration, considering variables such as timing, selection, and methods.

2.3. Study-4: Experimental simulation

Guided by input from Study-3 (see section 2.2), a multitude of hypotheses pertaining to the utilization of diverse methods and criteria across varying economic and business contexts within software startups will be constructed. Upon formulation of these hypotheses, the simulation protocol will be meticulously outlined, delineating the experiment, dependent and independent variables, and requisite confidence level for model approval. These theoretically validated models will subsequently undergo real-world testing using startup case studies in future investigations. Pertinent research questions underpinning these hypotheses include:

- RQ1: What RP methodologies show the greatest potential for adaptation by incorporating financial ratios, particularly cash flow analysis, to better cater to software startups in an economic climate of escalating interest rates?

- RQ2: Can empirical evidence be provided that, ceteris paribus, the prioritization variables for software startups indeed matter in different interest rate environments? And if so, which ones actually confirmed to generate the highest probability of survival?

Through these meticulously designed studies, this research aims to illuminate the intricate interplay between requirements prioritization, economic factors, and startup success, furnishing valuable insights to practitioners and scholars alike.

2.4. Timeline

At this juncture, the research endeavors are in the preliminary stages, and there are no journal publications yet (Table 2). Nevertheless, considerable progress has been made in developing a comprehensive knowledge base and fostering a community of scholars and practitioners who share similar interests. These efforts are crucial as they lay the foundation for future research outcomes, provide a framework for evaluating research outcomes, and facilitate the dissemination of knowledge. It is important to note that the early stages of research play a vital role in setting the tone for subsequent phases and have a significant impact on the trajectory of the study. Thus, the current status of this research underscores the importance of investing in the foundational stages to ensure the success of the overall study.

Table 2
Timeline

Study	Description	Status	Ready for submission
Study-1	Data gathering on Product Managers (and therefore the importance of Requirements Prioritization) through a Systematic Literature Review (SLR)	paper drafted	09/2023
Study-2	Data gathering on Requirements Prioritization (methods and criteria) at software startups through a Systematic Literature Review (SLR)	in progress	12/2023
Study-3	Requirements Prioritization at software startups during various (economic & business) contexts using a Product Manager Expert Assessment survey	initiated	06/2024
Study-4	Validate hypotheses related to the value and types of contextually adapted Requirements Prioritization processes for software startups through Experimental simulation	to initiate	07/2025

3. Results achieved

3.1. Study-1: Systematic Literature Review (SLR): importance of RP

Initial findings [20] accentuate the underrepresentation of the software startup context in academic discourse. Moreover, “Requirements Prioritization” emerges as the foremost cited activity within startup contexts with 8,43%.

3.2. Study-2: Systematic Literature Review (SLR): RP at software startups

Svahnberg, Gorschek [21], Hujainah, Bakar [9] have each contributed significantly to the understanding of the diversity of criteria and techniques associated with Requirements Prioritization (RP). A collective review of prominent research generated over a hundred distinct criteria and techniques. Yet, the broader academic canvas [24] barely touches upon the startup

context [13]. Consequently, financial ratios like ROI, IRR, and payback period [28], and NPV [29], critical within this context are often overlooked [13].

4. Contributions

Considering the contemporary research on software product management within software startups, particularly with respect to the realm of requirements prioritization and its variables, a substantial gap emerges, evident in both academic and practitioner contexts. This gap expands notably in times of adverse macro-economic conditions when the startup ecosystem becomes more investor-centric.

The present economic landscape, characterized by rising interest rates, has fundamentally reshaped the requirements prioritization (RP) paradigm for startups. This paradigm shift necessitates a novel perspective within scholarly discourse that takes into account these renewed economic circumstances. Central to this novel perspective is the integration of financial ratios as criteria into RP methods, accentuating cash flow analysis, net present value (NPV), return on investment (ROI), internal rate of return (IRR), break-even analysis, and payback period analysis.

Despite the pivotal role accorded to cash flow analysis within the startup milieu, the prevailing research inadequately addresses this facet. The distinctive challenges confronted by startups, encompassing the temporal nature of cash flow and the ramifications of payment delays, presently find insufficient representation within RP literature.

Thus, it is of substantial import for the domains of software product management, requirements engineering, and startups that concerted endeavors be undertaken to comprehensively comprehend the causality and impact on the value and success of software startups within diverse economic and business frameworks, premised on the methods and criteria for requirements prioritization that they employ. This approach enables startup founders and product managers to gain insights into adopting an agile stance in their RP processes and optimizing their early-venture decision-making, thereby augmenting their prospects for future success.

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