

MVP Explained: A Systematic Mapping Study on the Definitions of Minimal Viable Product

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Abstract

Context: One of the most important steps of the Lean Startup methodology is the definition of Minimum Viable Product (MVP), needed to start the learning process by integrating the early adopters' feedbacks as soon as possible.

Objective: This study aims at identifying the common definitions of MVP proposed and the key factors identified to help entrepreneurs efficiently define their MVP, reducing errors due to unconsidered unknown factors.

Method: We identified the MVP definitions and key factors by means of a systematic mapping study, defining the research questions and the protocol to be used. We selected the bibliographic sources, the keywords, and the selection criteria for searching the relevant papers.

Results: We found 97 articles and, through inclusion and exclusion criteria, removed 75 articles, which reduced the total to 22 at the end of the process. The results are a classification schema for characterizing the definition of Minimum Viable Product in Lean Startups and a set of common key factors identified in the MVP definitions.

Conclusion: The identified key factors are related to technical characteristics of the product as well as market and customer aspects. We found a positive improvement of the state of the art of MVP and the definition of Minimum.

Keywords—*Minimum Viable Product, Lean Startup, Startup, Entrepreneurship*

I. INTRODUCTION

The definition of Minimum Viable Product (MVP) is a fundamental concept of the Lean Startup methodology. The definition of MVP is an iterative process based on continuous feedback obtained from the early adopters.

The term MVP was defined by Frank Robinson [S1] in 2001 and then disseminated by Eric Ries from 2009 [S2] and Blank [S3] from 2010. MVP is a continuously evolving concept, defined by Eric Ries in 2011 [6] as “*a version of a new product, which allows a team to collect the maximum amount of validated learning about customers with the least effort*”. Starting from this definition, a lot of different proposals have been made. In order to understand the differences, we propose a systematic mapping study of the literature. In this work, we want to identify the different MVP definitions proposed and the key factors considered in the definitions itself.

For this reason, the mapping study is intended to answer the following main research question: What are the common definitions of Minimum Viable Product (MVP)?

This paper is structured as follows. In Section 2, we present the background of this work, briefly describing the systematic mapping process and the Lean Startup methodology. In Section 3, we describe the research questions and the systematic mapping protocol. In Section 4, we show the systematic mapping results and in Section 5, we explain the threats to validity of the study. Finally, in Section 6, we draw conclusions and sketch future work.

II. BACKGROUND

In this Section, we will briefly introduce the background. First, we will outline the domain, focusing on the Lean Startup methodology and the role of Minimum Viable Product (MVP). Second, we will summarize the systematic mapping procedure underlying the relevant steps.

A. Lean Startup Methodology

Eric Ries [6] proposed an innovative methodology for developing businesses and products called Lean Startup. According to Ries, the product development process can be reduced by combining business-driven hypothesis experimentation and iterative product releases. Building a product iteratively based on the needs of early customers could lead to reduced market risks such as expensive product launches and failures.

The Lean Startup methodology is based on the following five core principles:

- Entrepreneurs are everywhere;
- Entrepreneurship is management;
- Validated learning;
- Build-Measure-Learn;
- Innovation accounting.

Build-Measure-Learn is the fundamental activity where the entrepreneur must turn ideas into products, then measure how customers respond, and finally learn whether to give up or persevere. The fundamental aspect of Build-Measure-Learn is the Minimum Viable Product (MVP), defined as: “*a version of*

a new product, which allows a team to collect the maximum amount of validated learning about customers with the least effort”. Several others definitions have been proposed since then, and entrepreneurs and researchers usually face the problem of selecting the most appropriate definition of MVP.

B. Systematic Mappings

According to Kai Petersen et al. [1], a systematic mapping study is a useful method for getting an overview of a particular research area and for identifying the quantity and type of the research and the results available within it. Unfortunately, systematic mapping studies are not taken into account by software engineering researchers often enough, compared with other research fields [3][4]. In Fig. 1, we show the process adopted in this work. More details on the systematic mapping process can be found in [1].

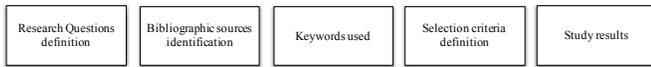


Fig. 1. The Systematic Mapping Process

III. STUDY DESIGN

In this Section, we will describe the study design, defining the research questions and the systematic mapping protocol. We selected the bibliographic sources, the keywords, and the selection criteria so as to retrieve the most relevant papers.

A. Research Question definition

In this step of the systematic mapping process, we formulated the Research Questions (RQ) so as to define the protocol to be followed. We structured the RQ based on the PICO structure [5], PICO being the acronym of Population, Intervention, Comparison and Outcome. This structure makes it easier to identify the keywords in the next steps. Our research question is:

In the field of Lean Startups (P), what are the common key factors (I) that characterize the Minimum Viable Product (MVP) (O) compared with the original definition (C)?

We refined the general RQ into four sub-questions:

RQ1.1: What is the chronological overview of the research on the definition of Minimum Viable Product (MVP)?

RQ1.2: How has the definition of Minimum Viable Product (MVP) evolved compared to the original one?

RQ1.3: What are the common definitions of “minimum” and their related main MVP purposes?

RQ1.4: What are the common key factors that characterize the definitions of Minimum Viable Product (MVP)?

B. The protocol

In this step of the systematic mapping process, we defined the bibliographic sources, the keywords used, and the selection criteria for identifying the relevant papers.

1) Identification of bibliographic sources

The search process can be conducted automatically or manually among specific journal and conferences. In order to better address this step, we decided to combine both procedures. As source engines, we selected:

- ACM digital Library
- IEEEExplore Digital Library
- Springer Link
- Google Scholar
- Science Direct

2) Keywords used

We defined the keywords used based on the PICO [5] terms of our Research Questions. From the terms Population (P) and Intervention (I), we identified different acronyms as keywords as shown in Table I in order to retrieve the relevant papers from the selected source engines.

TABLE I. THE KEYWORDS USED

P: Lean Startups	P1 terms: “Startup”, “Lean Startup”, “Entrepreneurship”, “Entrepreneur”
I: MVP definition	I1 terms: “Minimum Viable Product”
(“Startup” OR “Lean Startup” OR “Entrepreneurship” OR “Entrepreneur”) AND “Minimum Viable Product”	

3) Selection criteria

The search was conducted after defining the selection criteria in order to identify those articles in the bibliographic sources that are closest to our research questions. We conducted a manual search over title, abstract, and keywords. We selected the papers first by keyword, then by title, and finally by abstract. After retrieving the results, we applied the selection criteria to refine the identified papers:

- **General selection criteria:** We included only papers published in journals and at conferences. We excluded not peer-reviewed papers not written in English and works that are clearly obsolete. We also considered the contributions of gray literature and blogs so as to consider possible opinions reported in non-scientific papers.
- **Selection by title and abstract:** We removed all papers that do not provide a potential definition of MVP.
- **Selection by full papers:** We removed those papers that did not correctly satisfy our research questions: (1) showing a definition of MVP in the paper and (2) clearly defining MVP.

IV. STUDY RESULTS

Starting from the keywords defined in Table I, we retrieved 97 papers including the gray literature. Then we selected the papers based on the inclusion and exclusion criteria both for title and abstract. With this selection, we removed 75 papers; and through a detailed review of each article, we finally reduced the set of papers to 22 main articles. In Fig. 2, we show the number of articles remaining after each step of the process.

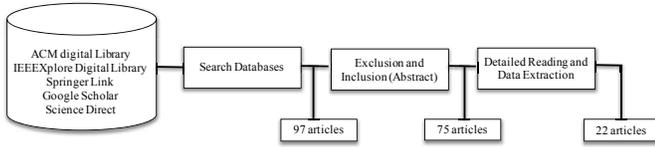


Fig. 2. Exclusion of articles and number of primary studies [1]

We report the distribution and type of relevant publications in the source engines used for the search in Table II. Among the studies selected, only 22 focus on the goal; the other papers are aimed at analyzing the Lean Startup process underlying the business aspect and the role of the entrepreneur. We found the 22 papers from the most relevant journals and conferences as shown in Table III. However, as reported in Section 3, since there is a lot of work on MVP reported in the gray literature

such as blogs and websites, here we also analyze this and report it in Table III.

TABLE II. DISTRIBUTION OF RELEVANT PUBLICATIONS PER SOURCE ENGINE AND PUBLICATION TYPE

Source Engine	Number
ACM	1
Google Scholar	89
Springer Link	4
IEEEExplore Digital Library	9
Science Direct	3
Publication Type	Number
Conferences	21
Journals	31
Workshops	3
Gray Literature	45

TABLE III. PUBLICATIONS CONSIDERED FOR THE SYSTEMATIC MAPPING STUDY

Title	Type	Study Id.	Year
A Proven Methodology to Maximize Return on Risk	Gray Literature	[S1]	2001
Minimum Viable Product: a guide	Gray Literature	[S2]	2009
Perfection By Subtraction – The Minimum Feature Set	Gray Literature	[S3]	2010
Developing a Minimum Viable Product	Gray Literature	[S4]	2010
Scaling Agile @ Spotify	Gray Literature	[S5]	2012
Minimum Viable Product and the Importance of Experimentation in Technology Startups	Gray Literature	[S6]	2012
Global Mindset: An Entrepreneur’s Perspective on the Born-Global Approach	Gray Literature	[S7]	2012
An Ecosystem-Based Job-Creation Engine Fuelled by Technology Entrepreneurs	Gray Literature	[S8]	2013
Lean Product Development in Early Stage Startups	Conference	[S9]	2013
Now and Later? Mentorship, Investor Ties and New Venture Performance in Entrepreneurial Seed-Accelerators	Gray Literature	[S10]	2013
Course Development and Sequencing for Interdisciplinary Entrepreneurship Education	Conference	[S11]	2013
Customer Development, Innovation and Decision-Making Biases in the Lean Startup	Journal	[S12]	2014
Development of a Mobile Application Using the Lean Startup Methodology	Journal	[S13]	2014
From Agile Software Development to Mercury Business	Journal	[S14]	2014
Developing Entrepreneurial Skills in IT Courses: The Role of Agile Software Development Practices in Producing Successful Student Initiated Products	Conference	[S15]	2014
Creating Minimum Viable Products in Industry-Academia Collaborations	Conference	[S16]	2014
Minimum Viable Product (MVP) for Product startup: A in Indian perspective	Gray Literature	[S17]	2014
Maximizing Product Value: Continuous Maintenance	Conference	[S18]	2014
The Relationship Between Business Model Experimentation and Technical Debt	Journal	[S19]	2015
Lean Startup: Why Large Software Companies Should Care	Workshop	[S20]	2015
The Lean Start-up Approach versus Scrum A case study of German startup Student Couch	Gray Literature	[S21]	2015
Accelerating Web-Entrepreneurship in Local Incubation Environments	Journal	[S22]	2015

1) RQ1.1: What is the chronological overview of the research on the definition of Minimum Viable Product (MVP)?

The 97 papers identified by keywords and selection criteria were published between 2001 and 2015, as shown in Fig. 3. The results show an improvement of the research in terms of quantity from 2012 to 2015. The selected papers were mainly published between 2012 and 2015.

RQ1.2: How has the definition of Minimum Viable Product (MVP) evolved compared to the original one?

As reported in Table IV and Fig. 4, the first definition of MVP was proposed by Frank Robinson [S1] in 2001, with a strong focus on the economic point of view. Then, in an interview for Venturehacks in 2009, Eric Ries proposed a new definition of MVP [S2], then confirmed this in his book in 2011 [6] and adopted as is, or rephrased, in eleven other works. In

2010, another new definition was proposed by Steve Blank [S3], which was then rephrased in 2014 [S18], extended with a partially new contribution in 2015 [S22] and partially adopted in five works. In 2011, [S4] reported a definition of MVP considering the sum of the three previous ones [S1], [S2], and [S3]. In 2012, two completely new definitions were reported ([S5] and [S7]).

In 2013, another new definition appeared in the literature [S11], with a small influence, only on the minimum point of view from Blank [S3]. However, it has never been considered or extended any further by other works.

In 2014, [S17] proposed a definition of MVP based on the sum of the definitions by Ries [S2] and Robinson [S1] and influenced also by Blank [S3].

Table IV lists the different definitions of MVP. When the definition is based on the sum or on the extension of an existing one, the original definition is referenced and not copied.

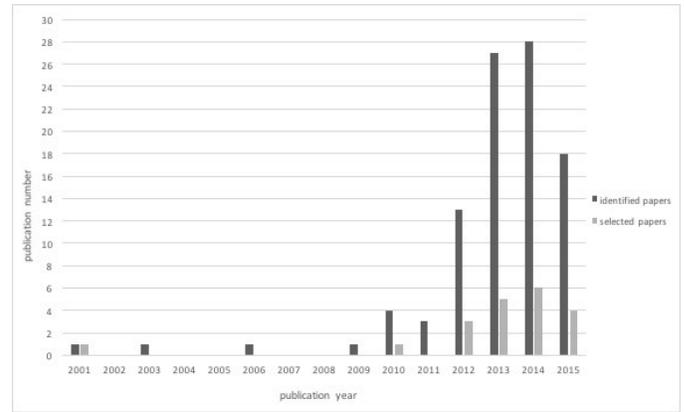


Fig. 3. Distribution of identified and selected publications per year

TABLE IV. RQ1.2 RESULTS – MVP DEFINITIONS

Year	Study ID	Definition
2001	[S1]	MVP is not a minimal product, it is a strategy and process directed toward making and selling a product to customers.
2009	[S2]	MVP is a version of a new product, which allows a team to collect the maximum amount of validated learning about customers with the least effort. It is an iterative process of idea generation, prototyping, presentation, data collection, analysis and learning.
2010	[S3]	A MVP has just those features (and no more) that allow the product to be deployed.
2011	[S4]	[S1] + [S2] + [S3]
2012	[S5]	MVP means releasing early and often, and validated learning means using metrics and A/B testing to find out what really works and what doesn't.
2013	[S6]	MVP is a product with a minimum feature set targeting market opportunities while profitably solving customer pain points.
2012	[S7]	A MVP is an offer that generates revenue for the company and that motivates customers to provide feedback and recommend it to other potential customers.
2013	[S8]	MVP is the minimum value organization to accelerate sales to first customers.
2013	[S9]	A MVP is typically the first version of a product released to customers, and should contain only the absolute minimum in terms of features and design for it to become viable to the customer.
2013	[S10]	MVP represents the minimum functionality or set of features within the product, allowing the firm to test the product in the market and gather customer feedback, consistent with the second principle.
2013	[S11]	MVP is a product with a minimum feature set targeting market opportunities and validate its value and growth hypotheses as soon as possible.
2014	[S12]	MVP is a set of “minimal requirements,” which meet the needs of the core group of early adopters or users.
2014	[S13]	MVP starts the learning and building process quickly. It allows the start-up team to collect as maximum validated learning about customers with least effort. The goal is to test the fundamental business hypothesis. It is not meant to be perfect-meant for Early Adopters.
2014	[S14]	MVP aims at defining the smallest possible implementation that brings added value to customers.
2014	[S15]	MVP is a product capable of being deployed to a subset of customers for evaluation.
2014	[S16]	MVP is an experimental object that allows for empirical testing of value hypotheses.
2014	[S17]	[S1] + [S2] + MVP is a product that includes just enough features to allow useful feedback from early adopters.
2014	[S18]	MVP is a key concept. The goal is to identify the most valuable features by iteratively experimenting the market.
2015	[S19]	MVP is used to test the business model by gathering and measuring customer feedback. Create a viable product with minimum effort. Requires the generation and testing of numerous ideas
2015	[S20]	MVP is a tool to collect customer feedback on the product in order to improve the product.
2015	[S21]	MVP is a product with low quality, early prototype.
2015	[S22]	[S3] + allow to reason with early adopters; some of whom will pay you money or give you feedback.

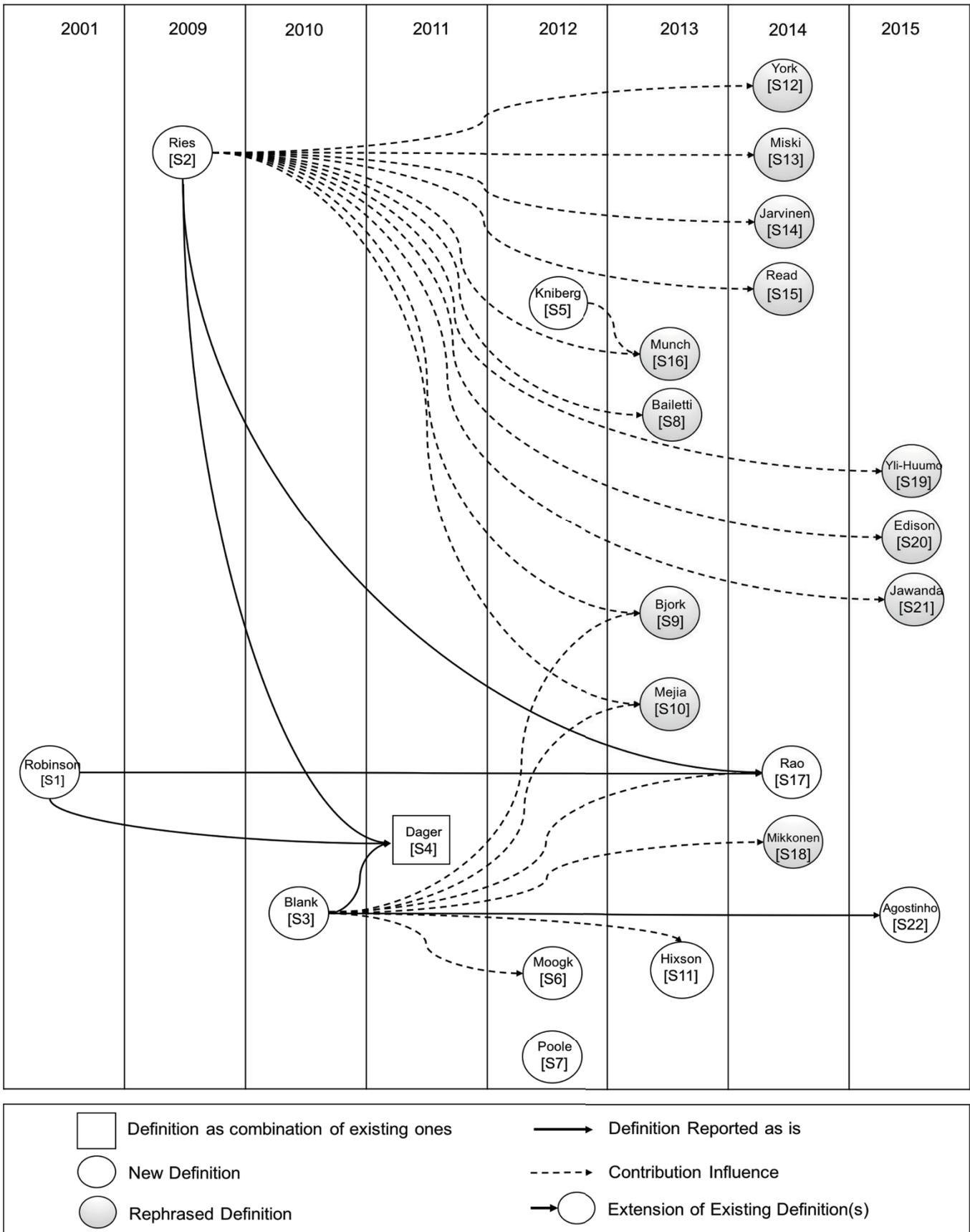


Fig. 4. Genealogical Tree of MVP Definitions

TABLE V RQ1.3 RESULTS – MVP MINIMUM DEFINITION AND PURPOSE

Minimum	Main purpose of MVP	
Minimum Functionalities/Feature	To allow the product to be deployed To target market opportunities To create a viable product for the customer To test the fundamental business hypothesis To allow to test the product in the market To gather customer feedback To identify the most viable features by iteratively experimenting the market	[S3] [S4] [S22] [S6] [S9] [S11] [S11] [S10] [S18] [S10] [S17] [S22] [S18]
Minimum Requirements	To meet the needs of early adopters	[S12]
Smallest possible implementation	To motivate customers to provide feedbacks and recommend it to other customers To bring added value to customers	[S7] [S14]
Minimum Effort	To collect the maximum amount of validated learning about customers To test the fundamental business hypothesis To develop a product that includes just enough features to allow early adopters feedbacks To gather customer feedback	[S2] [S4] [S13] [S17] [S13] [S17] [S17] [S19]
Minimum Value Organization	To accelerate sales to first customers	[S8]

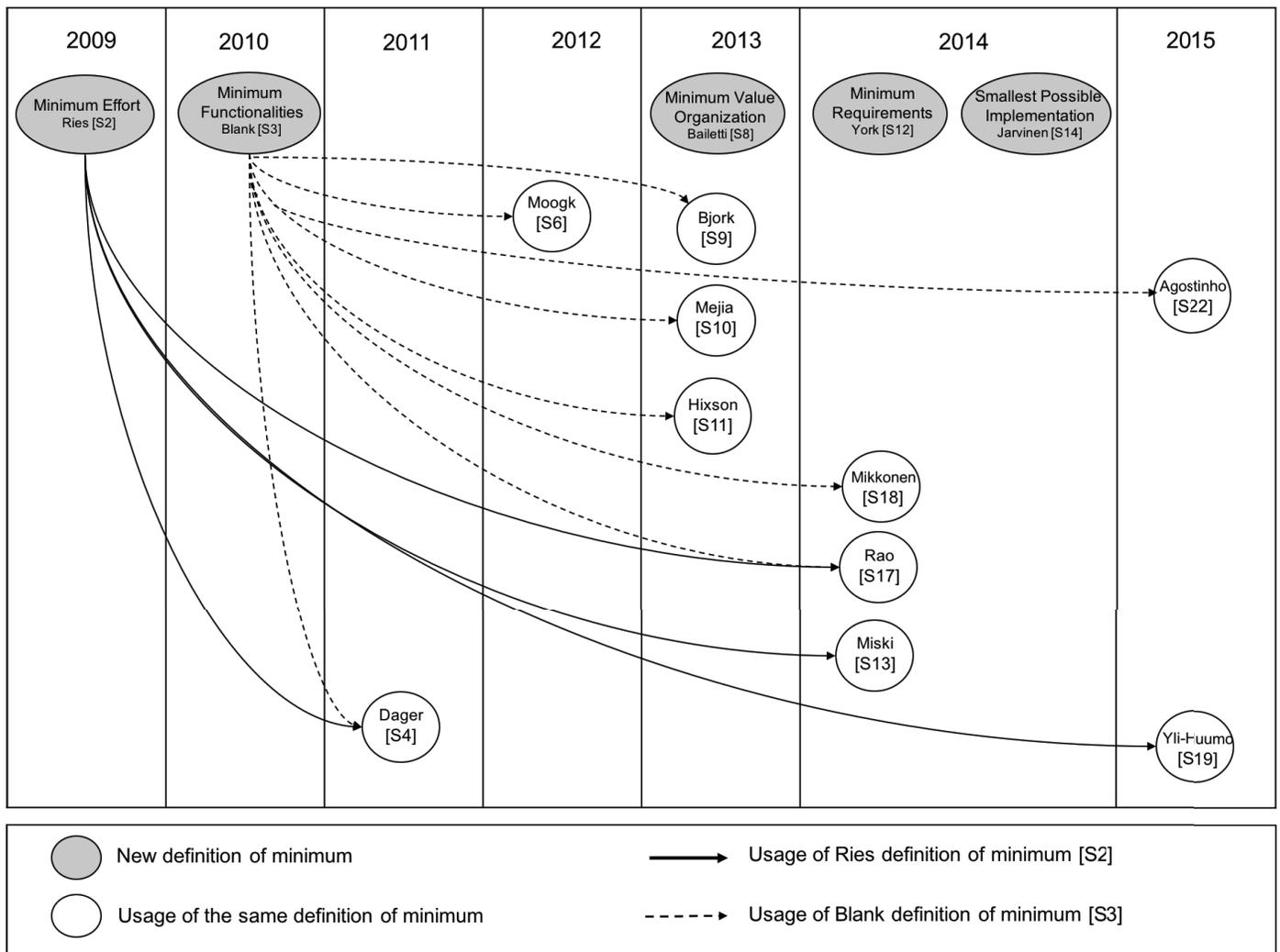


Fig. 5. Genealogical Tree of Minimum Definitions

RQ1.3: What are the common definitions of “minimum” and their related main MVP purposes?

Starting from the MVP definitions, reported in Table IV, we identified the definitions of minimum and their purpose, as reported in Table V.

Only fifteen works clearly state the meaning of minimum in the MVP definition, while the remaining seven ones only report the purpose of the MVP. Among those fifteen works, there are five different definitions of minimum: “*minimum effort*”, “*minimum functionalities*”, “*minimum value organization*”, “*minimum requirements*” and “*the smallest possible implementation*”.

As reported in Figure 5 and Table V, the first definition of minimum has been formulated by Ries as “*minimum effort*” [S2]. The same definition has been reused by two other works [S4][S17] in combinations with [S3] while two other ones used the same definition extending the main MVP purpose [S13][S19].

In 2010 Blank [S3] defined the minimum as “*minimum set of features*”. This definition has also been mentioned as is in other six works [S6][S9][S10][S11][S18][S22] while, as reported before, it has been combined with [S2] in [S13] and [S19]. This definition is associated with seven different MVP purposes. More details can be found in Table V.

In 2013 a new definition of minimum has been proposed by Bailetti [S8] as the “*minimum value for the organization*”. However, this definition has never been extended or reused.

Finally, two new definitions have been proposed in 2014 [S12] and [S14]. Those definitions are not explicitly referred to any previous one.

RQ1.4: What are the common factors that characterize the definitions of Minimum Viable Product (MVP)?

Starting from the MVP definitions presented in Table IV we identified the main key factors that characterize the definitions of MVP reported in the papers we considered. In Table IV the key factors are highlighted in bold.

In the Eric Ries definition [S2], two main key factors: “**minimum effort**” and “**maximum customers validated learning**”. We found these factors in three papers (13.6%), whereas in the remaining contributions, (86.4%) are identifiable other key factors.

In terms of technical characteristics, we also found Minimum in the sense of “*minimum set of features*”, as proposed by Blank [S3], in seven papers (31.8%) and “*minimum effort*” as proposed by Ries [S2] in four papers (18.2%).

Taking into account the market and customer aspects, we identified the key factor “**customer feedback / evaluation**” mentioned in seven papers (31.8%). We also found the key factor “**early adopters**” in three papers (13.6%).

The remaining factors such as “**minimum design**” and “**low quality product**” are considered only in one paper (4.5%).

B. Discussion of the Results

Several definitions of MVP have been proposed in the last fifteen years. However, only few have been used or extended. Most of the new definitions were published from 2012 to 2015.

However, none of them have later been extended or used as a standard definition. The remaining recently published work mainly adopts and rephrases the existing definitions[S2] and [S3].

Among the initial definitions provided by Robinson [S1], Ries [S2] and Blank [S3], [S2] is the most frequently reused as is or rephrased (36.3%) while [S3] is reused as is or rephrased in 18.18%. In 9% of the selected works [S2] is combined with [S3] while in other 9% of works [S1] is combined with [S2] and [S3]. Other two new definitions [S5] and [S7] have been proposed in the grey literature but they have never been reused or extended.

Considering the definition of Minimum, Blank’s one as “*minimum features*” [S3] is the most recurring one (53.3%). Ries’ minimum definition as “*minimum effort*” [S2] is reported in 26.6% of the papers analyzed. Moreover, two other definition of minimum could be referred to “*minimum features*” [S3] (“*minimum requirements*” [S12] and “*smallest possible implementations*” [S14]), increasing the percentage of Blank definition of minimum to 66.6%.

Taking into account the key factors that characterize the MVP definition “**maximum customer validated learning**” is only reported in 26.6% of the papers analyzed, while it is extended as “**customer feedback/evaluation**” in 31.8% of the contributions. Moreover, “**early prototype**” is also considered to a limited extent (9%), whereas other factors cannot be considered as relevant since they are reported only in one contribution.

The results also show that the contributions of the gray literature in recent years can be neglected since we did not find any relevant contribution to the definition of MVP there.

V. THREATS TO VALIDITY

Next, we will analyze threats to validity, considering construct validity, reliability, internal and external validity.

Construct validity reflects to what extent the phenomenon under study really represents what the researchers have in mind and what is investigated according to the research questions. The terms Lean Startup, Minimum Viable Product, Entrepreneur, and Startup are sufficiently stable to be used as search strings. In order to assure the retrieval of all papers on the selected topic, we searched broadly in general publication databases, which index most well-reputed publications. Moreover, we also included gray literature, so as to consider possible opinions reported in non-scientific papers.

Reliability focuses on whether the data are collected and the analysis is conducted in a way that it can be repeated by other researchers with the same results. We defined search terms and applied procedures that can be replicated by others. Since this is a mapping study and no systematic review, the inclusion/exclusion criteria are only related to whether the topic of MVP is present in a paper or not, as suggested by [1].

Internal validity is concerned with the analysis of the data. Since our analysis only uses descriptive statistics, the threats are minimal. External validity is about generalization from this study. Since we do not draw any conclusions about mapping studies in general, external validity threats are not applicable.

VI. CONCLUSION

In this work, we proposed a systematic mapping study on the definition of Minimum Viable Product (MVP) in order to obtain an overview of existing definitions and focusing on the state of the art. We identified 22 main articles to be included in our study and we found promising results in terms of state-of-the-art definitions, definition of minimum and key factors that identify the MVP.

Starting from the definition of Robinson [S1], Ries [S2] and Blank [S3], we found that Ries definition is the most influencing one and its extensions are mainly rephrased without adding extra details while, in few cases, the three definitions are combined together.

Unexpectedly the definition of minimum as “minimum features” [S3] is the most recurring one.

The main key factors identified are related to the technical characteristics of the product and to market and customer aspects such as “minimum set of features”, “customer feedback”, “minimum effort” and “early prototype”.

In conclusion, we suggest to complement Ries MVP definition [S2] with the “minimum features” proposed by Blank [S3], as also adopted in several other works.

As regards future work, we want to understand the process used by entrepreneurs to define MVP in practice.

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APPENDIX: THE SELECTED STUDIES

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