Awareness of the low fidelity nature of a MVP – How the initial Technology Acceptance is influenced

Author: Maximilian Möllers
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT: Through the years, entrepreneurship has gained a scientific perspective. Scholars around the world aim to solve the issues start-ups and scale-up face during their pursuit of growth. Within the Lean Startup, Eric Ries provides guidance to entrepreneurs in order to reduce the time a startup spends on activities which do not contribute to growth. This paper discusses the problems which may arise during early customer tests and investigates solutions in order to solve these problems without spending time on activities which do not contribute to the start-ups' growth. Ries emphasizes that such early user tests need to be conducted with a certain type of potential customer called early adopter. By taking a look at the characteristics which describe these valuable users, the acceptance of a prototype presented is identified as a crucial factor to such testing phase. However, due to limited resources or varying business concepts many start-ups are forced to build a low quality prototype as suggested in the Lean Startup Methodology. This study found that whether or not the user is aware of the situation, which forced the entrepreneurs to build a low quality prototype, the technology acceptance is not affected. Therefore, we are able to state that any effort in teaching the user about missing features at the current state, will not contribute to the start-ups overall learning process and can be avoided.

Supervisors: PD Dr R. Harms (Rainer)

Keywords
The Lean Startup, Prototyping, Technology Acceptance, User testing, MVP, Adoption

7th IBA Bachelor Thesis Conference, July 1st, 2016, Enschede, The Netherlands.

1. INTRODUCTION

Eric Ries´ Lean Startup Methodology (LSM) is not just a success story of a young Entrepreneur but also a well-recognized new perspective on how to systematically manage startups. Ries aim is to build upon the first century of management initiated by Frederic Taylors Scientific Management and to introduce the second century of management, which applies a rather lean methodology to management. This methodology is built on theories such as Lean manufacturing (Toyota) or Design Think and suggests techniques such as validated learning, the minimum viable product (MVP) and pivoting. The main concept of the lean startup methodology is based on the principle of validated learning, meaning to design processes and procedures in such a way that everything that does not contribute to the learning effect can be accounted as waste and therefore should be avoided. Entrepreneurs should consider identification and testing of the most important assumptions of a venture before building a final product which may or may not meet the expectations of the market (Blank 2013). This strategic process should be managed in a scientific way (Ries 2011). The concept of seeing entrepreneurship from a scientific perspective has gained great reputation in the past years. Having different perspectives on strategic entrepreneurship enables a scientific investigation in different Lean Startup Methodologies which today's corporations also take advantage of (Furr and Dyer 2014, Owens and Obie 2014).

Especially the concept of building a minimum viable product has exceeded the boundaries of startups and scale-ups. The concept is today applied even in corporations all over the world and included in most business schools' curriculums. Due to the fact that the minimum viable product helps entrepreneurs with starting the learning process as quickly as possible, the concept is well understood by today's entrepreneurs of all kinds (Ries 2011). In order to understand the variety of minimum viable products, Ries states that the appearance of a minimum viable product might even take the form of an advertisement which aims is to proof a concept to actual early prototypes that have missing features and show a range of problems. In particular, this paper will discuss the concept and efficient application of an MVP as well as the consequences of such method on the individuals who are willing to do the initial tests. The core function of the minimum viable product is the fast learning process the prototype facilitates. Therefore, Ries suggests that when low acceptance of the prototype by initial users due to limited functionality or low quality occurs, the entrepreneur might consider an investment into a superior design (Ries 2011). However, the focus of this paper will lie on the analyse of alternative options to expensive and time consuming improvements on the prototype, when low acceptance is present in early stage prototyping.

2. LITERATURE GAP

So far scholars have focused on the concept of building a better mousetrap, meaning optimizing the product and its usability in order to attract more user and potential customers (Rogers 1983). The researchers have taken different approaches into consideration which aim to improve the rate of adoption by such early customers. The five characteristics, Relative advantage, compatibility, complexity, trial ability, and observability which when combined should attract a significant higher amount of early adopters to innovation then by neglecting these factors (Rogers 1983). Furthermore, Rogers notes that the type of innovation, the communication channels, the nature of the social system and the extent of change agent promotion effort also stand in correlation with the rate of adoption of an innovation. The persuasion of such attributes is however conflicting with the core assumptions of a minimum viable product and therefore cannot be applied in order to attract an initial base of customers who are willing to test the entrepreneurs early prototype. Instead of investigating resources into the adoption of users by focusing on a high quality product and service, the existing literature did not take the concept of focusing resources on the development of potential customers into consideration. Meaning, not to neglect user who do not accept the product yet but rather to help them understanding the product and the development process. Ries (2011) mentions the apparition of doubt when a invited test user does not provide the feedback that was initially expected. "If he doesn't give good feedback he might be not the right customer." This kind of doubt is a general problem to entrepreneurs who seek opinions from the pool of potential customer at hand (Ries 2011).

2.1 Problem Statement

Entrepreneurs who make use of a minimum viable product as suggested within the lean startup methodology are highly dependent on receiving feedback within the "measure phase". Feedback is especially important in order to experience validated learning and finally to build an upgraded version of the product based on the new insights. A study conducted by the research institute Standish Group states that there are 3 main reasons why projects are late, over budget or fail to deliver desired functionality. The reasons listed are a lack of user input, incomplete requirements and changing requirements. When a lack of user input occurs and feedback is missing, continuing the cycle might not be possible. In order to ensure a continuous interaction and attraction of new users who are willing to provide this feedback, an improved product or service to attract new user (Rogers 1983). However, this method would contradict the build measure learn cycle by omitting the "learn" aspect which should eventually lead to the decision to improve the prototype. This paper will investigate the possibilities an entrepreneur has in order to find early test user who accept a minimum viable product and are willing to provide the needed feedback.

3. RESEARCH QUESTION

This paper focuses on finding a viable solution to the problem of experiencing a lack of test users. This problem can be caused due to low acceptance of a low quality minimum viable product. In order to do so, this paper will focus on elaborating an alternative to the process of improving the prototypes quality and functionality. Many scholars described different types of prototypes from which one of the more commonly used distinctions differentiates between low fidelity and high fidelity Prototypes (Ruud, 1996). Meaning that the degree of fidelity is dependent on the representativeness of the prototype in regards to the prototypes actual concept. Therefore, test users are introduced to the requirements and difficulties of testing a concept with a prototype in form of a MVP. By giving the user an introduction to the product development phase and the test purpose the aim is to raise the awareness of the low fidelity nature of a minimum viable product as discussed in section 4.1. This paper hypothesizes that, when familiar with the difficulties and requirements of product testing, the test user shows a higher

degree of technology acceptance and therefore is more viable for the initial testing. This concept will be used to tests whether transparency of the entrepreneurial process stimulates people to engage into the product development.

- How does the awareness of the low fidelity nature of the MVP correlate with the user acceptance of the product?
    - How does the awareness of the low fidelity nature of the MVP correlate with the perceived usefulness of an MVP?
    - How does the recognition of the minimum viable product correlate with the perceived ease of use of the MVP?

3.1 Hypothesis:

When aware of the low fidelity nature of a minimum viable product, initial test users show greater acceptance towards the prototype.

4. THEORETICAL FRAMEWORK

This section provides a general understanding of the different theories and their relation in order to form a generally understood basis for this research. The discussed theories concern the topics of the lean startup methodology, information systems as well as users and prototypes concepts in regard to innovation research.

4.1 The Minimum Viable Product

In order to understand the nature of a prototype such as an MVP and its role within the product development this section will review the literature concerning the concept and different applications of prototyping. Generally speaking, a prototype is a tool which serves as a common ground between customers and developers, so they can understand the application of the product or service in a way which cannot be obtained by reading the functional specifications. Furthermore, a prototype is able to serve for educational purpose so the user gains an understanding about how the tested application works (Bellantone, C.E. and Lanzetta, 1992). Other scholars refer to a prototype as: „ … any representation of a (design) idea, regardless of the medium "(Houde&Hill, 1997, p. 369)

In regards to the concept of the minimum viable product (MVP), this form of a prototype can be described as the version of the product that enables the entrepreneur to conduct tests with a minimum amount of effort and the least amount of development time. The minimum viable product shows only the core features which are needed to test the assumptions made concerning a specific market or product. An MVP is built in order to reduce the time spend on building something which is not appreciated by the customer. This form of a prototype is the fastest way to get through the Build measure learn feedback loop with a minimum amount of effort (Ries 2011). The build measure learn cycle, which builds the core of the lean startup model, is generally the process of creating a tool in order to measure assumptions, gathering valuable information concerning the product and finally improving the concept based on the information collected (Ries 2011). It is of crucial importance to set aside traditional professional standards and to make use of the process of validated learning as soon as possible (Ries 2011). Therefore, it is suggested to remove any process, feature or effort which does not contribute directly to the desired learning process. Removing processes and features seems to decrease the quality of the prototype. However, Ries argues that "If we do not know who the customer is, we do not know what quality is." (Ries, 2011) Especially within a startup, it is risky to assume that the company already knows which attributes are perceived as worthwhile by the customer. Therefore, building an MVP which has limited functionality can be perceived as low quality by the customers (Ries 2011). Entrepreneurs should use the customer's low-quality perception of the MVP as an opportunity to learn what attributes customers care about. (Ries 2011 p.109) In order to define the advantages and disadvantages of such prototype with limited functionality, scholars classified prototypes in regard to the amount of features and functions as low or high fidelity Prototypes (Rudd 1996). The characteristics of an MVP as a low fidelity prototype are discussed in following section (3.2)

4.2 Low/High-Fi Prototype

The fidelity of a prototype is determined by the degree to which the prototype is experienced by the person viewing it, rather than the similarity to the actual application (Tullis 1990). The prototyping literature is highly influenced by Jim Rudd, who emphasizes that there is a clear distinction between two different types of Prototypes. His distinction is based on the fidelity to the original concept of a prototype. Therefore, he distinguishes between a low fidelity and a high fidelity prototype. In his paper "Low vs high-fidelity prototyping debate, 1966" the core concepts and differences between different types of prototypes are discussed in this respect for the first time. Low-fidelity prototypes are generally limited in functionality and the degree of interaction possibilities. Furthermore, the intentions of using a low fidelity prototype are usually to depict concepts, design alternatives, and screen layouts. Furthermore, it is stated that low fidelity prototypes supposed to communicate, educate, and inform, but not to train or serve as a basis from which to code (Rudd 1996).

In order to distinguish the low-fi prototype from a high-fi prototype Rudd's defined advantages and disadvantages of the high fidelity prototype. This prototype is described to be fully functional and interactive and therefore can be applied for detailed user testing (Rudd 1996). Besides the functionality these types of prototypes can furthermore serve as marketing and sales tools. The disadvantages of this kind of prototype compared to a low fidelity prototype are usually the development costs and the relative high time consumption in the development phase. Defining the characteristics and different design versions of a prototype can help the entrepreneur to identify the most important aspects to focus on while building the prototype. In order to measure whether or not the user is aware of the different stages a prototype can have, survey items were constructed based on the characteristics of a low fidelity prototypes described by Rudd (1996)

4.2.1 Customer expectations in regard to prototyping.

When operating in uncertainty, the competitive landscape and dynamic customer expectations might be changing rapidly. This effect requires firms to seek flexibility in product development. (Zhang , Vonderembse, Cao, 2009) Furthermore today's firms are experiencing increased customer expectations (Sethi et al. 2003). Therefore, applying the concept of a minimum viable product allows the entrepreneur to stay flexible during the prototype developing process. Customer needs serve as input to the process of building a product concept that meet customer expectations (Zhang , Vonderembse, Cao 2009). However, customers often experiencing difficulties when describing their expectations. Therefore, rapid prototyping can serve as a communication tool which gathers customer needs which otherwise remain unknown. By applying this process, the prototypes provide a real feel and touch to its users. (Zhang , Vonderembse, Cao, 2009) Furthermore "product concept flexibility" and "product prototype flexibility" become the foundation for creating customer satisfaction. This satisfaction can be achieved by aligning the coordination of development processes with the customer's expectations. (Zhang , Vonderembse, Cao, 2009)

The next step in conducting this research is to clarify the optimal user to test the concept with. According to Ries 2011 (Page 94) the most viable group of a social system in regards to testing a prototype are the early adopters. He describes the difficulties in early product testing is to find the early adopter rather than an average customer. (p.68) Ries supports this claim by stating that those early adopters tend to be more forgiving in regards to mistakes and are especially keen to provide feedback.

4.3 Adopter categories

In order to get the most viable feedback on the concept which is represented by the prototypes, not every individual is equally qualified. Ries distinguishes in this regard between a test user and customer. While you can invite any potential customer regardless of his or her attitude towards the product, that person will not become an early adopter just by testing a prototype. However, by identifying and testing with the individual who might become an early adopter in the later product stage, Ries (2011) argues that the feedback received is positively influenced. This section distinguishes the average customer from the early adopter by elaborating the process that describes the adoption of new products by different individuals.

The term early adopter is widely used by today's innovation researchers, entrepreneurs and marketeers, however originated already in 1962 within E.M Rogers' Diffusion of Innovation. Diffusion is described as a process of communication which aims to reach members of a social system throughout certain communication channels (Rogers, 1995) However other terminology can be found in the literature which refer to the same phenomenon of early customers. One of the most widely read literatures witch build upon Rogers 'Diffusion of Innovation' is Geoffrey Moore's Crossing the Chasm. Furthermore, Eric Von Hippel's research into "lead users" shows great similarity with the concept of early adopters. The term earlyvangelist was used by Steve Blank in order to emphasize the evangelical powers of such early customers.

The concept discussed in this paper is the diffusion of Innovation by Rogers, which divides the mass market into five segments. While Early adopters make 13.5 % of a social system to adopt an innovation there are 4 further types of adopter categories. The first 2,5 % of the social system consists of the so called innovators. Furthermore, Rogers, lists the early majority (34%), the late majority (34%) and finally the laggards (16%). Roger (1995) showed that most distributions of individuals have been found to be normal categorized by the standard deviations from the mean. (see Appendix 11.6) According to Ries 2011 (Page 94) the most viable group of this social system in regards to testing a prototype are the mentioned early adopters. He describes the difficulties in early product testing is to find the early adopter rather than an average customer. In addition, Rogers states that early adopters have the highest degree in regards to opinion leadership within the social system. (Rogers 1995). The early adopters are the individuals who show the greatest need for the product while simultaneously showing a high willingness to give feedback and be more forgiving in regards to mistakes within the product (Ries 2011). The success of an innovation is determined by what the early adopters say and expresses about that particular innovation to the public, what marks the early adopter as highly valuable for the product testing phase (Ries 2011). Furthermore, early adopters accept and even prefer a prototype which might only represent 80% of the final concept. Therefore, it is necessary that new products need to be sold to early adopters first before a successful mass market adoption can be achieved. (Ries, 2011)

By having identified the need for involving early adopters in the initial user tests we can conclude that the acceptance of the prototype by the user is crucial in order to build upon the initial testing.
Which means that in order to assess an initial test users influence on the product development, the acceptance of the given innovation by the user needs to be measured.

4.4 Technology Acceptance Model

In order to examine whether the user's degree of acceptance of the MVP is influenced by the users' awareness of the low fidelity nature of the MVP, it is necessary to define the term acceptance.

Therefore, the concept of technology acceptance (Davis, Bagozzi & Warshaw 1989) will be taken into account when validating the acceptance of the minimum viable product.
This model distinguishes between the perceived usefulness and the perceived ease of use as a cause to either accept or reject a technology based on the behavioral Intention to use the innovation. The technology acceptance model serves the function to represent a causal relationship between a system's design characteristics and the acceptance and usage in the workplace. The model posits that the behavioral intention to use a system is constructed based on the user's perceived usefulness and perceived ease of use. Where the perceived usefulness can be described as the degree to which an individual is convinced that using a certain system would enhance the user's job performance and perceived ease of use which can described as degree to which user believe that using a certain system is free of effort while at the same time the user might perceive the system as useful. The ease of use when compared with the perceived usefulness requires direct experience with the system in order to become well formed. Therefore, the measures are likely to deviate over time while additional features and functions are added to the system. In order to finally assess the actual system,

use and therefore the technology acceptance the behavioral intention to use the system is preconditioned. This factor is constructed by measuring the two indicators of perceived usefulness and perceived ease of use. When both indicators are validated, a behavioral intention to use the system can be assumed (Davis, Bagozzi & Warshaw 1989). The causal relation between the factors is displayed under Figure 1.

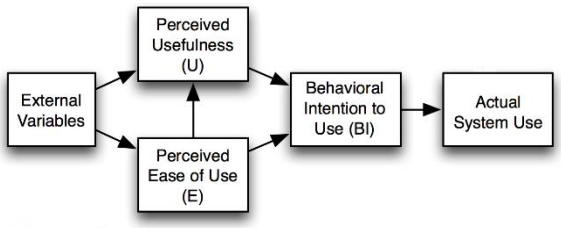


Figure 1

5. METHODOLEGY

Conducting user evaluation during the early stage of a product or service is generally designed to collect feedback concerning improvement options for design or conceptual aspects. However, for the purpose of this research, we were interested in the user's general attitude towards the product rather than the mentioned improvement opportunities. Therefore, the focus lies on evaluating how influential an individual's awareness of the product appears when taking the overall acceptance into consideration. In order to study this issue, the approach of taking an already existing MVP for the research purpose was chosen. By exposing the prototype to initial test user, reactions concerning the acceptance were obtained. A team of student entrepreneurs within the Hardstart foundation at the University of Twente in the Netherlands provided a minimum viable product for test purposes. The team developed an early prototype in order to test the concept of a social gaming platform. The concept was designed in order to provide video game enthusiasts the opportunity to indicate a willingness to collaborate in a video game chosen from a great pool of possible games to play. For further information, see Appendix 11.8.

5.1 Sample

The analysis is based on a sample of in total 33 participants who identified themselves as a user of video gaming software on a regular basis. The participants were approached individually and randomly assigned to either group A (18 participants) or group B (15 participants) with an exception which took the user's already existing knowledge concerning the state of the prototypes into consideration as explained later in this section. Participants of group A received an introduction to the process of prototyping and the role of an MVP, in order to provide awareness of the low-fi nature of the MVP. Therefore, a standardized introduction text was provided to the participants of group A before the testing. The introduction text can be found under Appendix 11.7. Participants of group B did not receive any form of introduction to role and state of the minimum viable product. Those participant who indicated that he or she were to any extend familiar with the state of the prototype before the testing and introduction process were assigned to group A. Due to existing knowledge about the state of the prototype by 5 participants, the division of the two groups experienced an imbalance.

During the testing phase participants proceeded through three part. While group A was provided with the standardized text in order to ensure awareness of the low fidelity nature of the prototype, group B did not receive an introduction and therefore initiated with a 5 minutes' test of the prototype. Group A proceeded after the introduction, under the same conditions as the other group, with the 5 minutes' prototype testing. The prototype testing phase was not guided and therefore the participants were able to get familiar and explore the system independently.
Finally, all participants were asked to answer 36 questions in form of survey items in order to elaborate the perceived usefulness (14 items) and the perceived ease of use (13 items) of the prototype as well as the awareness of the low-fi nature of the MVP (9 items).

5.2 Constructs and variables

The intention to use a prototype was selected as the dependent variable for this study, due to the Technology Acceptance Models (TAM) characteristics of being the most widely researched models in regards to the user acceptance literature. TAM is particularly suited to study user reactions to prototypes due to its beliefs in technology acceptance, e.g., perceived usefulness and perceived ease of use (Davis, Venkatesh 2004). Furthermore, most usability tests focus primarily on a system's ease of use and therefore usually fail to evaluate the usefulness of the systems functionality. Consequently, the chances of error detection are decreased when assessing the system's core requirements (Davis, Venkatesh 2004). Therefore, both factors, perceived ease of use and the perceived usefulness are taken into consideration when assessing the test user's individual intention to use the system. The two factors were individually analyzed in regards to the influence of the independent variable. As such the awareness of the low fidelity nature of the MVP is assigned as the independent variable. In order to asses a difference in technology acceptance between two groups a general awareness of the state and function of the prototype was analyzed.

5.3 Scale formation process

5.3.1 Dependent Variable: Technology Acceptance

The candidate items designed for measuring the technology acceptance were divided into the perceived usefulness and perceived ease of use of the prototype. The items were formulated by Davis 1989, based on their conceptual definitions, as stated in section 4.4. In order to choose the number of items for the two scales perceived ease of use and perceived usefulness, the Spearman-Brown Prophecy formula was applied, which is used to eliminate reliability errors that might occur from choosing an insufficient amount of items. The estimated items then should also ensure reliability while comparing with existing scales. Therefore, the formula suggests that in order to achieve a reliability of at least .80, ten items are needed per variable (Davis, 1986). In order to allow item elimination, four additional items were generated for the measurement of perceived usefulness and three items for the ease of use measures. Therefore, within each set of items the questions tend to have an overlap within their meaning. This however is due to the fact these items are intended as measure of the same underlying construct.
Davis 1989 furthermore emphasizes that even though there is a chance that different individuals attribute different meanings to a

stated item, the goal in regards to the multi-item approach is to decrease the level of extraneous effects of the listed items. This process allows the other items to cancel out idiosyncrasies, which ultimately results in a purer indication of the chosen conceptual variable. The questionnaire asked participants to rate the extent to which they agree with each statement by choosing a number from one to seven arranged horizontally beneath anchor point descriptions "Entirely Agree," "Neither Agree nor Disagree," and "Entirely Disagree." Find the items in regards to perceived usefulness as well as the items used to measure perceived ease of use under Appendix 11.1. Each individual item is measured on a Likert.Scale as indicated via Figure 2

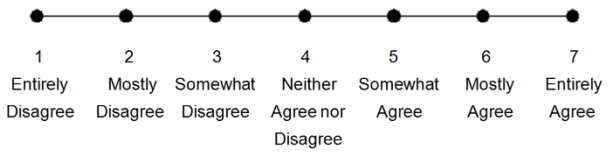


Figure 2

After recoding the negative items of all scales, the importance of each item in regards to the influence on the individual variables was assessed by conducting a factor analysis.

While conducting the reliability measure of the items in regard to the perceived usefulness, a high consistency was observed. With a Cronbach's alpha of 0.916 we are able to accept the reliability of this measure. Also the items measured which relate to the perceived ease of use showed a high consistency in its measure. The cronbach's alpha in this case was an indicator for acceptance with a value of 0.904.

5.3.2 Independent Variable: Awareness of the Low-Fi Nature of the MVP

In order to test the awareness of the low-fidelity nature of the MVP, 9 items were constructed. Source for the constructed items was the paper "Low vs. high-fidelity prototyping debate" by Rudd (1996). The author listed certain characteristics in form of advantages and disadvantages of the prototype design in regards to low and high fidelity which serve as basis for the item construction. (see Appendix 11.5)
The questions are measured on a Likert scale from 0-7 as described for the technology acceptance measures. Find the items in regard to awareness testing in Appendix 11.1

While analysing the factors of the scale in regards to the awareness of the low fidelity nature of the MVP, no sufficient reliability between all items was found. However, 3 subgroups were identified which showed internal consistency. The first group identified consists of 2 items within a total of 9 items (1,4), the second sub group showed 3 items (2,3,8) and the third subgroup included 4 items (5,6,7,9). Whilst the first sub group seems to correlate with the short term development of the service, the second group distinguishes itself from the others by a high correlation between items which indicate a missing awareness of personal influence on the development process. The items of the third group could be grouped as managerial and economic aspects. Due to its sole purpose as manipulation check the variable awareness of the low fidelity nature of the MVP, could be split in 3 sub-groups from which one showed a significant difference between the groups as explained in section 6.2. The items in regards to their subgroups can be found under Appendix 11.2.

5.4 Method of Analysis

The data collected as described in section 5.1 is the result of a 1-7 likert scale. This type of data can be categorized as ordinal data. Jamieson S. (2004), argues that frequencies, $\chi 2$ tests, contingency tables, the Mann-Whitney U test, or the Spearman rho assessment are suited for the analysis of ordinal data rather than parametric tests, which require interval data. However, Jamieson S. (2004) also states that under certain conditions parametric tests can be used to analyze ordinal data collected via a Likert scale. The first assumptions are a sufficient sample size of at least 5–10 observations per group. Secondly the data needs to be normally distributed (or nearly normal). Furthermore, Norman (2010) describes parametric tests to be sufficiently robust in order to yield largely unbiased answers which are acceptably close to the true value when analyzing Likert scale responses. Rickards G, Magee C, Artino AR., Jr (2012) clarify that when to measure concepts which are less concrete, meaning where a single item is not likely to capture the full concept, researchers group the items into a survey scale and calculate a mean score for the scale items. Therefore, we can conclude that in order to analyze the construct of technology acceptance and the low fi awareness of the MVP we need to test the assumption of normal distribution and insure a sample size larger than 10 for each groups.

6. ANALYSIS

6.1 Test for normal distribution.

In order to test the whether or not the samples follow a normal distribution which is assumed for a wide range of statistical tests, we took a look at the criteria of skewness and the kurtosis in regards to the individual scales of perceived usefulness, perceived ease of use, awareness of the low fidelity nature of the MVP as well as the individual subgroups in regards to the awareness variable used as manipulation check. All mentioned items showed a close to normal distribution when considering the criteria of skewness and kurtosis proposed by George and Mallery (2010) where the values should lie within ± 2. The exact skewness and kurtosis for each variable can be found under appendix 11.3

6.2 Test of independence

When analysing the variable awareness of the low fidelity nature of the MVP which is used to verify the manipulation of Group A, we identified three sub categories. Each category was tested based on its independency in order to identify a difference between the two groups. The subgroups 1 and 3 did not show a significant result. However, when analysing the second sub group a clear distinction between the groups was identified with an alpha of 0.013. As mentioned earlier the second subgroup including the items 2,3 and 8 which can be related to a missing awareness of personal influence on the development process. Therefore, we can conclude that the manipulation had a significant influence on the groups. A pilot test of the constructed manipulation check variable might have resulted in a clearer distinction and is discussed under Limitations in section 8.

7. RESULTS

In order to analyse the influence of the awareness of the low fidelity nature of an MVP on the acceptance of a prototype an independent sample t- test of the constructs means was constructed after verifying the assumption of normal distribution. Table 11.4 in the appendix shows that the independent variable has no influence on neither the perceived usefulness (0.835) nor the perceived ease of use (0.177). Therefore, we can conclude that there is no significant relation which indicates a relation between the awareness of a prototype and the two variables which determine the technology acceptance of an initial test user. We fail to support the initial hypothesis that the awareness of a low fidelity prototype has an influence on the initial user's acceptance of a minimum viable product.

8. CONCLUSION AND DISCUSSION

The results give evidence that when making use of initial user testing especially when the lean startup methodology is applied the pre knowledge and awareness of prototyping procedures does not influence the test users' acceptance of the tested prototype. In regard to Ries statement that early adopters show a higher acceptance and tolerance towards the prototype we can state that these early adopters do not need to be familiar with the entrepreneurial process linked to the product development in order to show a high degree of acceptance. In this regard it is possible to state that when the entrepreneur considers to market a product for early user testing, the focus of converting users to test and interact with the system does not need to lie on an explanation of the current prototype state and its development. The user will accept or reject the prototype based on his or her position in the adopter categories (Ries 2011) Therefore, we can conclude that when considering early user testing with the help of a minimum viable product, the acceptance of the user should be influenced by other factors than the awareness of the test users concerning the state and role of the current product or service. According to this study, by explaining and justifying the prototype, the entrepreneur does not contribute to the validated learning effect as desired within the lean startup methodology. Therefore, explanation and justification concerning missing features and the purpose of the prototype should not be considered when the initial purpose of the user testing is related to the products concept and usability improvement. When experiencing a lack of user to participate in these early tests traditional, methods such as monetary compensation or vouchers for returned survey might appear more efficient.

By filtering processes which do not contribute to the growth of a start-up, or how Eric Ries defines, those who do not contribute to the validated learning effect, it is possible to decrease the high mortality rate of start-ups. For further theoretical research which builds upon the findings presented in this study, an investigation in factors which may have a significant influence on the technology acceptance of early test user is suggested. By constructing a multivariate analysis of different factors such as the initial users' demographics, ability to learn new concepts or previous experience with similar products, scholar dedicated to scientific entrepreneurship might be able to eliminate find significant correlations. After filtering which process may or may not correlate with the acceptance of a prototype, we are able to avoid those which do not contribute to the validated learning process.

9. LIMITATIONS

Experiencing a low consistency within the awareness constraint we had to use subgroups for analyzing the representativeness of the variable. In order to construct a more reliable manipulation check a pilot test with 3-4 participants before the data collection process should be conducted. This test should concern the items used to measure the initial user's acceptance of the state of the MVP, in order to provide a clearer distinction between the groups. However, the factor analysis showed that there is a difference between the groups based on the second factor found when dividing the construct into three subcategories.

Furthermore, by including a multivariate analysis in order to draw conclusions to this paper's research question, we would have been able to control associations between additional variables which might influence the technology acceptance of the initial user. By taking the gender, nationality, occasion or age into consideration, regression models can provide more insight into the relationships between the variables used within this study. However due to the limited timeframe which affected this study, demographics and further variables would appear as the same. This is due to the fact that the time limitations affected the reach of potential test user.

10. REFERENCES

Bellantone, Lanzetta (1992) Works as Advertised: Observations and Benefits of Prototyping. Technical Report TR-36.0005. IBM Corporation, Southbury, CT, 1992.

Blank (2013) Why the lean start-up changes everything Harv. Bus. Rev. 91 64–8

Blank (2013). The Four Steps To The Epiphany. Pescadero, California: K&S Ranch.

Standish, G. (1994). Charting the Seas of Information Technology-Chaos.The Standish Group International.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. Management science, 35(8), 982-1003.

Davis, Venkatesh (2004) Toward Prototype User Acceptance Testing of New Information Sytsems: Implications for Software Project Management. Transactions of Engineering Management, Vol. 51 No. 1

Rogers, E. (1971). M.(1962). Diffusion of innovations. New York, USA: Free Press of Glencoe, 1, 79-134.

Furr, N., Christensen, C. M., & Dyer, J. (2014). The Innovator's Method: Bringing the Lean Start-Up Into Your Organization. Harvard Business Press.

Taylor, F. W. (1911). Principles of Scientific Management New York. Harper and Row, 191, l.

George, Mallery (2010). Using SPSS for Windows step by step: a simple guide and reference. Boston, MA: Allyn & Bacon.

Houde, Hill (1997) What do prototypes prototype?, in Handbook of Human-Computer Interaction (2nd Ed.), Helander M., Landauer T., Prabhu P. (eds.). Elsevier Science B. V. Amsterdam.

Jamieson (2004) Likert scales: how to (ab)use them. Med Educ. 2004;38(12):1217–1218.

London (2003). Job feedback: Giving, seeking and using feedback for performance improvement (2nd ed.). Mahwah, NJ: Erlbaum.

Maurya, A. (2012). Running lean: iterate from plan A to a plan that works. " O'Reilly Media, Inc.".

Moore, G. A. (1991). Crossing the Chasm: Marketing and Selling Technology Products to Mainstream Consumers.

Norman (2010) Likert scales, levels of measurement and the "laws" of statistics. Adv Health Sci Educ Theory Pract. 2010;15(5):625–632.

Tullis (1990) High-fidelity prototyping throughout the design process.In Proceedings of the Human Factors Society 34th Annual Meeting (Santa Monica, CA, Human Factors Society 1990), p. 266.

Ries (2011) The Lean Startup (New York: Crown Publishing) Lean startup for materials ventures and other science-based ventures: under what conditions is it Useful?

Rickards G, Magee C, Artino AR., Jr (2012) You can't fix by analysis what you've spoiled by design: developing survey instruments and collecting validity evidence. J Grad Med Educ. 2012;4(4):407–410.

Rogers, Everett M. (1983). Diffusion of innovations (3rd ed.). New York: Free Press of Glencoe

Rogers, E. M. (1995). Diffusion of Innovations (4th Eds.) ACM The Free Press (Sept. 2001). New York, 15-23.

Rudd, J., Stern, K., & Isensee, S. (1996). Low vs. high-fidelity prototyping debate. interactions, 3(1), 76-85.

Sethi R., Pant S., Sethi A. (2003) Web-based product development integration and new product outcomes: A conceptual framework Journal of Product Innovation Management, 20 (2003), pp. 37–56

Von Hippel (1986) "Lead Users: A Source of Novel Product Concepts", Management Science 32 (7): 791–806

Zhang , Vonderembse, Cao (2009) Product concept and prototype flexibility in manufacturing: Implications for customer satisfaction, European Journal of Operational Research Volume 194, Issue 1, 1 April 2009, Pages 143–154

11. APPENDIX

11.1 Items

Perceived Usefulness

1. Finding other gamers would be difficult to do without xpradar.com.
2. Using xpradar.com can give me greater control over online friends.
3. Using xpradar.com can improves my gaming experience.
4. xpradar.com addresses my gaming-related needs.
5. Using xpradar.com saves me time.
6. xpradar.com enables me to find gamer to game with more quickly.
7. xpradar.com supports critical aspects of online gaming.
8. Using xpradar.com allows me to accomplish find more gamers than it would be possible otherwise.
9. Using xpradar.com reduces the time I spend on searching for others to game with.
10. Using xpradar.com enhances my fun experience while gaming.
11. Using xpradar.com improves the quality of my gaming skills.
12. Using xpradar.com increases my search productivity.
13. Using xpradar.com makes it easier to find gamer.
14. Overall, I find xpradar.com useful for gaming.

Perceived Ease of Use

1. I often become confused when I visit xpradar.com.
2. I make errors frequently when using xpradar.com.
3. Interacting with xpradar.com is often frustrating.
4. I have a lot of questions when using xpradar.com.
5. Interacting with xpradar.com requires a lot of my mental effort.
6. xpradar.com is rigid and inflexible to interact with.
7. I find it easy to get the xpradar system to do what I want it to do.
8. xpradar.com often behaves in unexpected ways.
9. I find it cumbersome to use xpradar.com.
10. My interaction with xpradar.com is easy for me to understand.
11. It is easy for me to remember how to perform tasks using xpradar.com.
12. xpradar.com provides helpful guidance in performing tasks.
13. Overall, I find xpradar.com easy to use.

Awareness of the low-fi nature of the MVP

1. I suggest that the xpradar team should rather concentrate on converting new users than collecting feedback concerning design and concept.
2. I assume that the impact I have on the development of xpradar is limited.
3. It seems to me that the xpradar team experienced high development costs.
4. I expect the concept and design of xpradar.com not to change within the next months.

5. The website can help me to express and clarify my expectations of the service to the developers
6. It seems to me that xpradar.com has identified its market and user requirements.
7. Xpradar.com appears very detailed to me.
8. I am convinced I can influence the next steps the xpradar team does.
9. I perceive the goal of xpradar, at the current state, to be profit maximization.

11.2 Subgroups EFA (Awareness)

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means	
	F	Sig.	t	df
AwarenessofLFnatureMEAN	.064	.801	1.934	31
AwarenessSub1	1.178	.286	.271	31
AwarenessSub2	6.985	.013	1.616	31
AwarenessSub3	.009	.926	1.107	31

11.3 Normality testing

Descriptives

		Statistic	Std. Error
PerceivedUsefulnessMEAN	Mean	4.4156	.18935
	Skewness	-.759	.409
	Kurtosis	.686	.798
PerceivedEaseofUseMEAN	Mean	4.9441	.18248
	Skewness	-.975	.409
	Kurtosis	.945	.798
AwarenessofLFnatureMEAN	Mean	4.1717	.08446
	Skewness	-.535	.409
	Kurtosis	.309	.798
AwarenessSub1	Mean	4.1818	.16111
	Skewness	.214	.409
	Kurtosis	-.441	.798
AwarenessSub2	Mean	4.3232	.13568
	Skewness	-1.304	.409
	Kurtosis	2.893	.798
AwarenessSub3	Mean	4.0530	.15416
	Skewness	-.563	.409
	Kurtosis	1.277	.798

11.4 Two Sample T-Test

Independent Samples Test

	t-test for Equality of Means		
	t	df	Sig. (2-tailed)
PerceivedUsefulnessMEAN	.210	31	.835
PerceivedEaseofUseMEAN	1.381	31	.177

11.5 Low-fi Pro/Cons

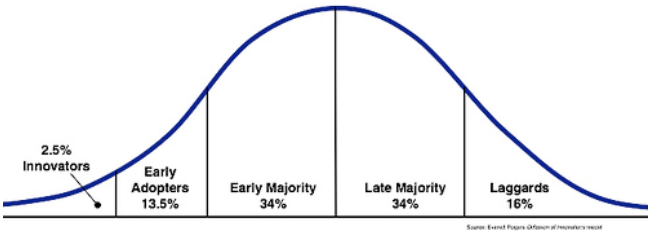
Advantages of Low-fidelity Prototype (Rudd 1996)

Lower development cost.
Evaluate multiple design concepts.
Useful communication device.
Address screen layout issues.
Useful for identifying market requirements.
Proof-of-concept.

Disadvantages of Low-fidelity Prototype (Rudd 1996)

Limited error checking.
Poor detailed specification to code to.
Facilitator-driven.
Limited utility after requirements established.
Limited usefulness for usability tests.
Navigational and flow limitations.

11.6 Adopter Categories Normal Curve



11.7 Standardized Introduction text (xpradar.com)

Xpradar is a project which aims to facilitate video gamers to find other gamers who would be willing to play the same games together, whether it is online or via local cooperation. The project is guided within Hardstart the student association for Entrepreneurs in Twente. Currently the team is working on

collecting feedback in order to improve its first version of the xpradar prototype.

The major focus on the collection of feedback is part of the Lean Startup methodology which the team takes into consideration while planning its strategic development.
The goal is to use the prototype in order to attract user who are willing to try the concept which is facilitated by this type of prototype called Minimum Viable Product (MVP). The MVP allows the team to test the basic assumptions without developing a very comprehensive program that includes all features and functions as stated in the business plan. Having spent little time on development, the team is now able to present its prototype to you so you can help improving the prototype. All your feedback is highly appreciated and will be taken into account when considering different concepts of the idea.

11.8 Case: xpradar.com

Xpradar.com is a web based application which is supported by a map in order to brows a certain location for video gamers in regards to specific video games. The program is designed to indicate a location on the map at which the individual user represents his profile. By interacting with the map pin (Marker) which represents the indicated location, other users are able to display the information needed to connect with the person that is represented by this particular marker. The information displayed are regarded to the games played, languages spoken and communication channels used (e.g. Skype Steam etc.) on a regular base.
In order to insert this information into the system a menu panel is displayed which under settings displays options to add or change information of the user. Furthermore, the general menu panel provides the user with an overview of the best fitting markers, matching with the personal information provided.