

# The Various Challenges Faced by the Software Startup Industry in Saudi Arabia

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**Abstract**—With the increasing use of the Internet, Web and mobile technologies at present, software startups, which are newly created software companies with no history, have become an important phenomenon in the software industry. They have a wide impact on the technology market and a significant impact on the global economy. However, even with the increase in the importance of software startups for the economy and communities, little research has investigated the challenges of this phenomenon, especially with new software markets, such as the Saudi Arabia market. This study aimed to investigate the challenges faced by the software startup industry in Saudi Arabia. It presents a mixed-methodology study based on semi-structured interviews and questionnaires. The findings of this study revealed a list of challenges that need to be considered in order to improve the industry for software startups. The lack of transparency and funding can be considered the biggest concern for software startups in Saudi Arabia.

**Keywords**—Software startups; startup challenges; small software development; software industry; information startups

## I. INTRODUCTION

Software startups are newly created companies with little or no history that aim to grow rapidly in the software industry [16]. Software startups aim at innovation and building software products within a limited time and with few resources [32]. Blank [9] described startups as temporary human organizations with no prior operating history that aim to create new, high-tech products or services. Software startups are considered to be an important phenomenon in the modern economy and society. This phenomenon creates approximately three million new jobs each year in the USA. Information technology companies, such as Facebook, LinkedIn, Instagram and Dropbox, are good examples of how startups can transform into successful businesses, provide tremendous support to their national economies and have a significant impact on the global economy [18]. However, about 60% of startups do not survive the first five years [16]. Early stage software startups face key challenges to success in this industry such as lack of resources and experiences [18]. The competition in the industry drives most of the startups to exit the market within two years from creation [25]. Due to the high failure rates of software startups, communities, organizations and even countries are beginning to investigate this phenomenon. There is a current need for research to support startups with their software engineering practices [25]. This study is aiming to provide deep investigation of the challenges faced

by the software startup industry in Saudi Arabia in order to address the current gap of knowledge.

The remainder of this paper is structured as follows: background and previous studies is reported in Section 2. Section 3 addresses the research methodology. Results are reported in Section 4. Then the discussion is presented within Section 5. Finally, the study concludes in Section 6.

## II. STATE OF THE ART

Software startups are considered to face several challenges; they may encounter obstacles when attempting to sell their first products, acquire paying customers and establish entrepreneurial teams [32]. Giardino et al. [18] highlighted several challenges for software startups, including lack of resources, lack of experience, dependence on one product, the uncertainty of their conditions, time pressure and lack of sustainability. The nature of software startups, as newly created organizations working in uncertain markets and using cutting-edge technology, make them challenging endeavors [32]. Klonowski et al. [19] investigated software startups in Central and Eastern Europe and placed the challenges into four categories, namely problems with funding, problems with management, the change in corporate culture and acceptance of the business model and financial underperformance. Giardino et al. [16] also reported that the main challenges for many startups are thriving despite technological uncertainty and finding the first paying customers. Giardino et al. [17] reported similar challenges, as well as others such as obtaining initial funding, creating entrepreneurial teams, providing value to customers, starting to make a profit and configuration management. Little relevant research pertaining to software startups exists; Pateronster studied software startups via a systematic map study and reported a few studies in the area of software startups [25]. Unterkalmsteiner et al. [32] stated that research on software startups has increased over the last year, but there is still a need for more investigation in this area.

Alnafjan [2] investigated the applied software practices in Saudi Arabia and reported clear weaknesses in adopting software engineering practices, particularly for small organizations. Alnuem [3], who also investigated the software industry in Saudi Arabia, reported serious issues in the industry, such as culture, communications and understanding the requirements clearly.

The software industry in Saudi Arabia is considered to be in the early stages. A few companies could survive in this industry. The Saudi government has established a new vision

called “Vision 2030.” One of its goals is to help software startups to develop a successful market in order to support the national economy. The government also aims to support e-government transformation. On the other hand, there is a gap in the current knowledge regarding challenges faced by software startups in Saudi Arabia. There is a lack of empirical updated studies that provide deep investigation of the Saudi software industry. This paper aims to investigate this area in order to provide a better understanding of the challenges software startups face and to help the community to build a better software industry.

### III. RESEARCH METHODOLOGY

This paper presents a mixed-methodology study that includes both quantitative and qualitative data. Semi-structured interviews and questionnaires will be used as tools to collect data. The combination of quantitative and qualitative data aims to add more reliability and validity to the study’s results. Bryman [12] referred to mixed-methods research as follows: “*This term is widely used nowadays to refer to research that combines methods associated with both quantitative and qualitative research*”. Employing the mixed approach matches the study aims and objectives and should allow for a better understanding of the specific challenges of software startups in more detail. The quantitative form will provide the critical numbers and statistics needed to study the challenges, while the qualitative data will be applied as a secondary methodology to provide richer information and an explanation of the study findings. The findings from both approaches will be integrated to form a better understanding of software startup challenges.

#### A. Research question

This study aims to investigate the software industry in Saudi Arabia in order to provide a better understanding of the current barriers that software startups encounter by addressing the following research question:

RQ: What are the main challenges encountered by software startups in the Kingdom of Saudi Arabia (KSA) from the perspective of software development?

#### B. Data collection

##### 1) The quantitative data

The quantitative data were collected via a self-completed online survey. About 10 people were invited to pilot the questionnaire, including project managers, software developers and testers, most of whom were experts in software development. The questionnaire was distributed during two main startup events in the KSA (the SAP Startup Focus Forum Saudi Arabia in Riyadh, 2016, and the Small and Medium Enterprise Forum in Jeddah, 2017). It was also distributed online to approximately 120 software companies in the Kingdom. By the end of the data collection phase, 74 completed and eligible responses were received. The questionnaire investigated 19 phrases, which will be treated as possible hypotheses for the challenges faced by software startups in Saudi Arabia.

TABLE I. THE RESEARCH HYPOTHESES: THE EXPECTED OBSTACLES TO SOFTWARE DEVELOPMENT BASED ON PREVIOUS STUDIES

PH1	There is a lack of communication and collaboration during all the development stages. [4][21]
PH2	The development team has estimation difficulties with the development cost, scope, and development schedule. [4][21]
PH3	There is a lack of communication between the developers and the product owners.[4][21]
PH4	There is lack of team management skills.[16] [19]
PH5	During the development, we face issue with sharing knowledge and information. [13] [18]
PH6	There is a security risk during the development.[2] [3]
PH7	Some development teams have issues with poor infrastructures.[21][25]
PH8	The visibility level of the development progress is low. [13][18][29]
PH9	Customers sometimes do not have a clear idea for their requirement. [1][3]
PH10	There is lack of talent in the software industry in KSA. [13][17][25]
PH11	Provide high quality software is a challenge regarding the development team’s capabilities.[2][13][16]
PH12	There is lack of providing initial funding.[16] [19] [25][29]
PH13	There are barriers to access the market.[16] [17][29]
PH14	Some customers like to work with big software companies. [17][21]
PH15	Government regulations could challenge software companies. [1][3]
PH16	Software projects have issues with building a sufficient business model. [19] [25][29]
PH17	Providing products with competitive prices is a challenge. [13][19]
PH18	There is lack of information and transparency about the software market in Saudi Arabia.[13][17]
PH19	Customers are not aware of how software could add value to their business. [13][17][19][29]

These phrases represent the expected obstacles to software development based on previous studies. A five-point Likert scale was used to explore the questionnaire respondents’ degrees of agreement with these challenges. Table I presents the invested hypotheses and their references from the previous studies.

##### 2) The qualitative data

The qualitative data were collected via structured interviews. The interviews were face-to-face and were recorded using a voice recorder. In addition, notes of the main ideas and answers were taken during the interviews. The transcribed documents were then compared to the notes from the interviews to ensure the reliability of the data. Following this, a thematic analysis, which is an approach to identify the themes and patterns from the collected qualitative data, was conducted [11][14]. In addition, the data-driven method was selected for the thematic analysis of this study [5]. The interpretation of data has been reviewed by a colleague to ensure its accuracy.

### IV. RESULTS

This section reports the result of this study. First of all, it states the results of the descriptive analysis. Then, it will address the result of reliability test. Finally, the quantitative results and qualitative results will be reported.

A. Descriptive analysis

This section describes the background information about the study participants, including their experience, team size and the location of their development teams.

1) Development experience

Table II shows the participants' number of years of experience in software development. Most of the participants had from four to seven years of software development experience, while about 35% had from one to four years of experience. This shows that the study's participants had substantial software development experience.

TABLE II. THE EXPERIENCE OF THE STUDY'S PARTICIPANTS

Answer	Count	Percent
Less than 1	10	13%
1-4	25	35%
4-7	33	44%
More than 7	6	8%
Total	74	100%

2) Team size

Table III below indicates the size of the team that developers usually have. Most of the participants (42%) came from teams with five to 15 members; the second highest figure was 15 to 25 team members (37% of the sample), while less than 13% of the sample were from teams that had more than 25 members, and only 8% of the participants came from teams with fewer than five team members. This information is expected due to the nature of startup companies' sizes.

TABLE III. THE TEAM SIZE

Answer	Count	Percent
Less than 5	7	8%
5-15	30	42%
15-25	27	37%
25-45	3	3%
45-60	5	7%
Greater than 60	2	3%
Total	74	100%

3) Outsourced development

Table IV shows that most of the study's participants had outsourced or offshore teams. About 87% of the sample explained that some of their functions were developed outside of the country. Only 10 participants did not have outsourced teams. This result could relate to the difficulty of the software industry in Saudi Arabia, which leads most companies to outsource some of their development.

TABLE IV. OUTSOURCED DEVELOPMENT

Answer	Count	Percent
Yes	64	87%
No	10	13%
Total	74	100%

B. Reliability

According to Bryman and Cramer [12], "The reliability of measure refers to its consistency." Pallant [23] also stated,

"The reliability of a scale indicates how free it is from random error". With multiple-item scales, such as the Likert scale, variables of internal reliability need to be tested. The aim is to examine whether each scale is measuring a single idea and how each item affects the internal consistency of the scale [12]. Cronbach's alpha coefficient has been applied to test data reliability. This shows the correlation among all the items in the scale. The ideal Cronbach's alpha level is above 0.7 [23]. Table V shows the Cronbach's alpha values for the challenges under investigation. The alpha value was 0.776, which means that the items were internally consistent.

TABLE V. RELIABILITY STATISTICS

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.776	0.784	19

C. Quantitative results

TABLE VI. TESTS OF NORMALITY

Phrase	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PH1	.358	74	.000	.745	74	.000
PH2	.278	74	.000	.856	74	.000
PH3	.249	74	.000	.828	74	.000
PH4	.250	74	.000	.868	74	.000
PH5	.239	74	.000	.865	74	.000
PH6	.240	74	.000	.890	74	.000
PH7	.279	74	.000	.875	74	.000
PH8	.240	74	.000	.866	74	.000
PH9	.269	74	.000	.861	74	.000
PH10	.269	74	.000	.881	74	.000
PH11	.410	74	.000	.681	74	.000
PH12	.427	74	.000	.652	74	.000
PH13	.369	74	.000	.755	74	.000
PH14	.298	74	.000	.848	74	.000
PH15	.250	74	.000	.853	74	.000
PH16	.255	74	.000	.868	74	.000
PH17	.307	74	.000	.821	74	.000
PH18	.292	74	.000	.805	74	.000
PH19	.336	74	.000	.800	74	.000

Table VI shows the results of the normality test. The results show that the data were not normally distributed, with a significance of less than 0.05 for both the Shapiro-Wilk and the Kolmogorov-Smirnov tests. This means that the data pertaining to those scales will be treated as nonparametric data [23]. The median and mode should be used to describe nonparametric data [10][12]. Table VII shows the mean, median and mode for each phrase. It also shows the results of testing each phrase. The hypothesis will be accepted if the median is above 2.5 and rejected if it is less than 2.5.

TABLE VII. HYPOTHESES RESULTS

Phrase	Mean	Median	Mode	Accepted or Rejected
PH1	3.11	4.00	4	Accepted
PH2	2.35	2.00	2	Rejected
PH3	3.00	3.00	4	Accepted
PH4	2.46	2.00	2	Rejected
PH5	2.43	2.00	3	Rejected
PH6	2.41	2.00	2	Rejected
PH7	2.55	2.00	2	Rejected
PH8	3.01	3.00	4	Accepted
PH9	3.15	3.00	4	Accepted
PH10	3.51	4.00	4	Accepted
PH11	3.89	4.00	4	Accepted
PH12	3.82	4.00	4	Accepted
PH13	3.80	4.00	4	Accepted
PH14	3.73	4.00	4	Accepted
PH15	3.85	4.00	4	Accepted
PH16	3.72	4.00	4	Accepted
PH17	3.95	4.00	4	Accepted
PH18	4.07	4.00	4	Accepted
PH19	3.84	4.00	4	Accepted

Table VII shows that five of the hypotheses “phrases” have been rejected (PH2, PH4, PH5, PH6 and PH7). These challenges were not considered significant based on the median value. The other 14 hypotheses were accepted and are summarized as shown in the table below; they will be discussed in the discussion section. The challenges have been ranked based on their importance according to the degree of agreement on the part of the study’s participants and each phrase’s mean value, as show in Table VIII.

TABLE VIII. HYPOTHESES RANK

Challenge number	Phrase number	Hypotheses
CH1	PH18	There is lack of information and transparency about the software market in Saudi Arabia
CH2	PH17	Providing products with competitive prices is a challenge.
CH3	PH11	Provide high quality software is a challenge regarding the development team's capabilities.
CH4	PH15	Government regulations could challenge software companies
CH5	PH19	Customers are not aware of how software could add value to their business
CH6	PH12	There is lack of providing initial funding
CH7	PH13	There are barriers to access the market
CH8	PH14	Some customers like to work with big software companies.
CH9	PH16	Software projects have issues with building a sufficient business model.
CH10	PH10	There is lack of talent in the software industry in KSA.
CH11	PH9	Customers sometimes do not have a clear idea for their requirement.
CH12	PH1	There is a lack of communication and collaboration during all the development stages.
CH13	PH8	The visibility level of the development progress is low.
CH14	PH3	There is a lack of communication between the developers and the product owners.

D. Qualitative results

The results of the thematic analysis indicated eight main challenges, as described below:

1) A1- Lack of funding and financial support:

Finding sufficient financial support was considered to be one of the main issues for software startups in the KSA. Company A stated, “Providing the needed funding was one of our main concerns, you need to make sure you have enough cash flow.” Company B reported that “one of our main challenges was to have enough funds to start our project. We made many meetings with investors and investment companies but, unfortunately, we could not have any financial collaboration with them. In addition, the government’s financial support programmes were not sufficient and not available in many cases.” Companies C and D both agreed that the funding challenge was one of the main challenges for their projects.

2) A2- Difficulty of gaining customers’ trust and access to the market:

Company B, which was an online store, reported that “gaining customers’ trust was one of the main challenges; first, it is a challenge to have people sell their product using our on-line store and secondly, it is also a challenge to have people buy from our on-line store.” Company C stated, “It is a big challenge to access the market; we had our biggest challenge when we tried to sell our product.” Company D also reported that signing the first contract was the biggest challenge. Company E mentioned that it had experienced tremendous competition with social media stores and that it was difficult to compete with them in terms of cost.

3) A3- Making a product that suited the market:

Company A said that one difficulty was creating a product that did not suit the current market. The company cited the example of having had a product “website” that worked on meta search technologies and failing to sell it to the market because the market was not ready to use this technology to compare hotel prices at the time. Thus, their product was too far ahead of the current market. A few years later, a different company developed and launched an almost identical product and experienced a huge success.

4) A4- Lack of transparency and market information:

Company C reported that access to information and data were also major obstacles, citing difficulty when developing a business model due to the lack of transparency in the software market.

5) A5- Government barriers:

Company E reported issues with the government’s regulations because many steps and complicated processes are required in order to open a software startup.

6) A6- Access to talent:

According to Company C, graduates with degrees in software were not qualified to be professionals in the software market, and there was a lack of Saudi talent in the market. Company D’s CEO, who is also a professor at one of the larger universities in the Kingdom within the software field, reported a need to create partnerships between colleges and software companies to improve the quality of colleges’ graduate student outcomes. Company E reported a lack of

expert graduates in the field of software development management and that no courses covering the concepts of “lean” or “agile” were offered in academic programs.

Company B used outsourced teams due to the lack of software developers in Saudi Arabia, which created other barriers in terms of language and cultural differences.

7) *A7- Lack of clear ideas about customer requirements:*

According to Company C, people do not have sufficient understanding regarding what software could do for their businesses. In addition, customers sometimes did not have a clear idea of their requirements. For example, many customers asked the company to compare their competitors’ websites and make better websites for their companies without providing a clear idea of their requirements.

## V. DISCUSSION

This section will combine the results of the descriptive analysis (quantitative results) and the results of the thematic analysis (qualitative results). It will provide a general discussion about the challenges in light of previous studies. The challenges will be classified into two main groups. Table IX shows the links between the study’s results. It also organizes the challenges into two main groups. The first group contains challenges related to finance and market access, and the second is for software quality challenges.

TABLE IX. STUDY RESULTS

Group	Challenge	Related results
<b>Funding and market access</b>	<i>Lack of transparency</i>	CH1, A4
	<i>lack of funding and financial support</i>	CH6, A1
	<i>Government regulations</i>	CH4, A5
	<i>Obstacles of market access</i>	CH2, CH 7, CH8, A2, A3
<b>Software quality and awareness</b>	<i>Lack of software quality and talent</i>	CH3, CH9, CH10, A6
	<i>Lacking of clear idea about customer requirement</i>	CH1, CH5, A7
	<i>Lack of communication and visibility</i>	CH12, CH13, CH14

### A. Funding and transparency

#### 1) *Lack of transparency*

The quantitative results revealed the lack of information and transparency in the software market in Saudi Arabia (CH1) as one of the main challenges within the market. Startups need information and transparency in order to build their business models and develop strategies. The qualitative data supported this: (A4) “Lack of transparency and market information.”

#### 2) *Lack of funding and financial support*

The first challenge that software startups face is finding funding resources. This barrier was revealed to be one of the main issues according to the quantitative results (CH6), and

it was also revealed to be the main concern in the qualitative results. An investigation about the startup industry in Australia reported that around 67% of startups needed financial support to survive until their second year of business, and about 41% of the startups investigated had difficulty with funding [29]. Gilardino et al. [16] reported the challenge of not having initial funding for startups.

#### 3) *Government regulations*

The government’s regulations were reported as a challenge for software startups (CH4 and A5). When establishing a new company, there are many regulations that make the task difficult for startups. Gilardino et al. [16] reported the same issue and agreed that government regulations need to be addressed during software startups’ development phases.

#### 4) *Obstacles of market access*

Accessing the market is the second phase for startups. There are barriers to accessing the market (CH7). Startups will experience challenges in gaining customers’ trust (A2). They have no history and not enough experience. Customers usually prefer to work with big software names rather than with small, newly established software companies (CH8). In addition, due to a lack of experience, the software startups could have difficulty providing a product that suits the market (A3). Finally, providing products at competitive prices is a challenge (CH2). Gilardino et al. [16] referred to acquiring the first paying client as one of the main obstacles for software startups. Klonowski et al. [19] mentioned that identifying the available opportunities in the software market was not an easy task due to changes in the clients’ requirements and technological uncertainty. Furthermore, the market should be accessed in a time-efficient way [19].

### B. Software quality and awareness

#### 1) *Lack of quality software and talent*

Providing high-quality software was a challenge due to the development team’s capabilities (CH3). The startups had limited resources, which decreased their development capabilities. They usually had problems with building a sufficient business model (CH9). Furthermore, access to talent was a major challenge due to the lack of talent in the software industry in Saudi Arabia (CH10 and A6). Gilardino et al. [16] identified the general lack of resources as one of the main features of startups. Software startups use external solutions to address the limitations of their resources, such as outsourcing and open-source software [18]. The use of new concepts in software, such as agile methods, is poor, which could reflect on the quality of the software developed [2].

#### 2) *Lack of clear idea about customer requirements*

Software startups are challenged by the lack of software awareness on the part of their customers (A7). Customers are not aware of how software could add value to their businesses (CH5). They are uncertain about paying for a software service because they are not sure how this service could improve their businesses. Furthermore, customers often lack a clear idea of their requirements.

### 3) Lack of communication and visibility

The results from the quantitative data showed the lack of communication and collaboration during all stages of development (CH12). The visibility level of the development progress was low (CH13). Moreover, there was a lack of communication between the developers and the product owners (CH14). The quantitative data revealed that about 88% of software projects had outsourced or offshore teams. The distance among teams affects the visibility level of development. The lack of communication could create barriers for customers when attempting to follow the progress of development and could make it difficult for developers to communicate with customers. Therefore, this could decrease the visibility of development [26]. Providing a high-quality communication channel could be expensive and add substantial costs to the project. Sometimes the development teams, particularly those offshore, experienced technical issues such as poor Internet connection or poor infrastructure. As a result, the cost of communication could be increased [35].

## VI. CONCLUSION

The software startup industry in Saudi Arabia was investigated in this study. This paper applied a mixed-method approach to collect both quantitative and qualitative data. The lack of transparency and funding can be considered to be the biggest concern. There is a lack of available information about the IT industry, including the size of the market and the existing companies in the market. In addition, the government's regulations limited the startups and created serious difficulties in terms of their business models and plans. The second major difficulty experienced by software startups was access to the market. For a company with no history, gaining customers' trust was considered a major challenge. Customers also lack software awareness and are not aware of how the software can help them to grow their businesses. Furthermore, there is a lack of quality software and talent. Accessing talented people in software development in Saudi Arabia is one of the main issues for the startups. This has an impact on the software's quality and leads many startups to outsource development or to develop software offshore, which is a common practice in software development. However, this could create a lack of communication and decrease the visibility level of development.

In summary, this study reported on the main challenges experienced by software startups in Saudi Arabia, and provided a general investigation into the software industry in order to provide a better understanding of the phenomenon of software startups. This information could be useful for the Saudi government to improve their regulations to support software development industry. The first recommendation of this study is to establish funding channels, either by the government or the private sector. The current regulations need to be updated to attract more investments to the industry. Moreover, it is important to update the current software curricula in universities and computer colleges to provide more qualified developers to the community.

Future work will investigate the relationship between the challenges described and other factors affecting success in the software industry (such as cost, quality and time) in order to identify the factors for success in the Saudi software industry.

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