Startup creation beyond hackathons – A survey on startup development and support

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Abstract. Hackathons are themed, fast-paced events where participants gather in teams to work on a project of their interest. Hackathons are often organized to drive entrepreneurial behavior, however, little is known about how they have supported startup creation. To address this issue, we conducted a cross-sectional survey among hackathon participants about their motivations for participating in a hackathon including creating a new startup product and advancing their careers. The survey also addressed their perceived hackathon benefits related to entrepreneurship, such as learning and networking, and how useful they were to their startups. Moreover, the survey included aspects of the hackathon setting that may have influenced startup creation, including winning awards. We obtained answers from participants who have attended 48-hour, in-person hackathons. We found motivations related to entrepreneurship that were related to startup creation, such as learning about the startup domain. Our findings show that participants with entrepreneurial motivations are more likely to create a startup after the hackathon. We also found that participants with startups in an early stage have attended hackathons motivated to build the initial version of their startup product, however, they have also worked on other projects unrelated to their startup. To support startup creation beyond hackathons, organizers should gain awareness of such hackathon participants who are motivated by entrepreneurship.

Keywords: Entrepreneurial process, Startups, Hackathons.

1 Introduction

Hackathons are time-bounded, themed events where participants gather in teams and engage in rapid product development [15, 34]. One area in which hackathons have gained popularity is entrepreneurship. During entrepreneurial hackathons[1], teams are provided with resources including mentorship and awards to encourage them to create startups from their projects [8]. During their early stage of development, startups are newly formed companies faced with immediate challenges regarding establishing a team [20], funding [21], product development [6, 10], and lack of resources [41]. To address these challenges, startup founders have attended incubators, contests, and

[1] We will continue to refer to entrepreneurial hackathons as hackathons.

hackathons [26] as an expression of entrepreneurial behavior. We understand entrepreneurial behavior as a collection of characteristics linked to new venture formation [3]. Prior work in the context of entrepreneurial behavior at hackathons has mainly focused on case studies of individual events which limits the possibility of developing an understanding of how participant motivations can affect startup creation beyond specific contexts [7, 37]. Moreover, preliminary results [30] indicate that some startup founders have attended hackathons after the foundation of their startups. Thus, founders may be motivated to attend hackathons based on the stage of development of their startup [27]. Conversely, participants may not want to create a new startup or develop an existing startup further at the hackathon and attend, instead, for reasons unrelated to startups, such as having fun [24] and free pizza [4]. Thus, we propose our first research question: **RQ1:** How are the motivations of hackathon participants connected to startups?

Developing the hackathon project into a startup project after the hackathon has ended is a main topic of interest in previous research [8]. However, little is known about other entrepreneurial benefits participants have perceived apart from creating a startup at the hackathon, particularly for those participants who already have startups. These benefits include developing the skills of an already existing startup team and getting feedback on an idea related to the startup [25]. We take a broader approach by addressing whether participants were able to create startups after the hackathon ended, and if startup founders with existing startups have brought their startup projects to work on them during the hackathon. Thus, we propose our second research question: **RQ2:** How are the perceived benefits of hackathon participants connected to startups?

Our findings contribute to existing knowledge about the relationship between hackathons and startups by expanding on the motivations and perceived benefits of participants that are related to entrepreneurial behavior and what hackathon aspects may influence startup creation after the hackathon ends.

2 Background

We base our work on findings from two fields: startup research and hackathon research. From the startup research field, we draw on the model of four stages of startup development [20] as it addresses previous frameworks and assigns inherent goals, challenges, and practices to each stage. During the first stage, the *inception* stage, the main goal for founders is to assemble a team to develop a startup product. After the startup product has entered the market, the *stabilization* stage begins, where customer input helps drive the product further. In the next stage, *growth*, the focus switches from product development to business growth, where the main aim is to achieve a significant market share to culminate in *maturity* [20]. Our work contributes to the understanding of how founders of startups in various stages perceive hackathons and their benefits by examining how the motivations (RQ1) and perceived benefits (RQ2) of hackathon participants are connected to startups.

From the hackathon research field, we refer to the motivations (RQ1) and perceived benefits (RQ2) of hackathon participants. Previous research has found that two

common motivations (RQ1) are learning and networking [4]. Additional motivations include working with friends who participate [7] and having fun [17, 35]. Little is known about the hackathon motivations of participants that are related to startups. Few studies indicate that they include learning and networking concerning an existing startup, advancing the skills of an already existing startup team [25], and creating a new startup [7, 24]. Our work expands on how these motivations may be connected to a certain startup stage of development. Common hackathon perceived benefits (RQ2) include learning [1, 12], creating technical artifacts [40], and winning awards [7]. In addition, those perceived benefits connected to startups include creating startups [33], learning and networking concerning the startup, and developing the skills of the startup team [25]. Our work contributes to the field of hackathon research by focusing on further perceived benefits related to startups.

2.1 Hypotheses

We propose eight hypotheses (H1-H8) based on our research questions regarding hackathon motivations (RQ1) and perceived benefits for hackathon participants (RQ2).

Hackathon participants commonly focus on developing a product that could become a startup after the hackathon ends [19], therefore, we expect that the most common participant motivations (RQ1) will be related to startup product development (H1). As the main challenge for startups during their *inception* is to build the first version of the product [10, 14, 20, 43], founders with startups at the *inception* stage may be motivated to attend a hackathon to build their startup product if they do not have one (H2). After the period of *stabilization*, when *growth* begins, the main challenge for startups is to achieve a desired growth rate [20], for which there is a need to acquire specialized knowledge and feedback. Thus, founders with startups at later stages may be motivated to attend a hackathon to acquire specialized knowledge and feedback to support their startups (H3).

In addition to the motivations, the creation of startups could be influenced by aspects of the hackathon setting. The quality of the projects developed at the hackathon has been influenced by team size [8], the connection with the stakeholders [13, 22, 32] and the hackathon duration [7, 44]. Learning and productivity have also been found to be influenced by duration [29]. Based on these findings from previous research, we propose that the duration will influence the creation of startups at hackathons (H4).

Prior work about hackathon perceived benefits (RQ2) indicated that founders often built the initial version of their startup product at hackathons [33]. Thus, we propose that founders with startups at the *inception* stage who do not have a startup product will develop it with their team at a hackathon (H5). Moreover, founders who have a startup product have attended a hackathon to learn about topics related to their startups [25]. Thus, we propose that entrepreneurs with startups in later stages will learn about topics related to their startup at a hackathon (H6). However, we do not expect that most hackathon participants have created a startup after a hackathon (H7), as there is little indication of startups being funded after hackathons [30]. Nevertheless, founders may find hackathons the most useful for their startups for product development (H8), as developing an idea into a product in teams is the focus of hackathons.

3 Research method

The purpose of this study is to identify the motivations of participants to attend hackathons (RQ1), and their perceived benefits (RQ2) to support startup creation at hackathons. As our research method, we used a cross-sectional survey[2]. We selected a survey as our research instrument as it allows for establishing connections and creating a broader overview beyond single events [11]. The survey consisted of various sections that addressed distinct aspects of the research questions (See Table 1). We collected information related to hackathon motivations, and how participants addressed aspects of the hackathon setting in our survey (H1-H4). Considering that some survey participants may have also been startup founders, we asked them if they had founded a startup before or after the hackathon and showed them questions related to their startups in a separate section (H5-H8). Finally, we asked for demographic information such as the age and gender of the participants.

Table 1. Overview of the main survey questions

Aspect	Example item	Based on
Hackathon motivations	"*Creating a new startup*" (Anchored between "*Not at all*" and "*Completely*")	[11, 25]
Setting (Duration)	(Open-ended)	[2, 8, 25]
Setting (Location)	"*A physically hosted hackathon*" (Single choice)	
Setting (Awards)	"*Opportunity to pitch to investors*" (Multiple choice)	
Project development	"*We analysed the problem we wanted to solve and defined the features to develop*" (Anchored between "*Strongly disagree*" and "*Strongly agree*". The scales below follow the same format.)	[39]
Learning outcomes	"*I learned about product development*"	[25]
Project satisfaction	"*My ideal outcome towards the hackathon was achieved*"	[36]
Hackathon satisfaction	"*My ideal outcome coming into my project achieved*"	[11]
Hackathon idea	"*Did you bring a startup idea to the hackathon?*" (Single choice)	[25]
Hackathon project	"*Yes, I worked on my startup project*" (Single choice)	[25]
Startup team	"*Yes, all the members of my startup team were at the hackathon*" (Single choice)	[25]
Startup domain	"*Software as a service (Saas)"* (Single choice)	[38]
Startup stages	"*The idea for the startup project was developed but a product had not yet been developed*" (Single choice)	[20]
Hackathon usefulness to the startup	"*The hackathon was useful to create a product for my startup*"	[25]

For our survey, we invited 6142 participants of various 48-hour hackathons from 2015 to 2019 in Eastern Europe organized by the same institution. In those hackathons, there was a kickoff at the beginning where participants pitched their ideas and gathered in teams based on the ideas for projects that interested them. They would subsequently

[2] https://t.ly/dSLn

work on their projects together while receiving feedback from mentors. In the end, they presented the products they developed at the hackathon, and some teams were awarded prizes, such as funding, to encourage them to continue working on their projects. We obtained 438 responses from the main variables that we submitted to data cleaning. The low number of responses reflects findings from previous research stating that often most survey invites are ignored [5].

3.1 Data analysis

We carried out a descriptive analysis to gain an understanding of the dataset. This analysis allowed us to determine if founders with startups at the inception stage that did not have a startup product developed it at a hackathon (H5) and whether most participants had created a startup after the hackathon or not (H7). We also created box plots to illustrate the distributions of the variables, such as the perceived hackathon usefulness to the startup (H8). We conducted an exploratory factor analysis using the hackathon motivations (H1) with the Eigenvalues as a reference for determining the number of factors and tested them for inter-item reliability using Cronbach's α. We chose this test as it measures internal consistency between items on a scale [42]. We also conducted a Mann-Whitney U-test to identify the motivations of startup founders (H2). We chose this test as it allows to find significant statistical differences between two independent variables [23]. Finally, we conducted a logistic regression to find the aspects of the hackathon setting that may have influenced the creation of a startup after the hackathon ended (H4). We did not obtain answers from founders with startups in the growth and maturity stages. Therefore, it is not possible to confirm H3 or H6.

4 Results

We received 438 survey responses of which 164 addressed the main variables used in the statistical analysis. From those 164 responses, we found that 20 respondents marked the *awards* question inaccurately, 3 respondents did not provide any information about the awards they won, 2 respondents marked they had a startup before the hackathon but did not offer any information about them, and 1 responded did not provide data about their startup project. We removed those incomplete responses from the dataset (138).

For the duration of the hackathons, there was a reported minimum of 4 hours and a maximum of 72 hours. The difference between the 48-hour duration and other durations did not allow us to make further statistical analysis with the duration as an aspect of the setting due to the high skewness (H4). Therefore, we conducted further statistical analysis with responses of 48-hour hackathons, also known as three-day hackathons (112). Regarding the hackathon setting, 105 (93.75%) respondents marked they attended a physically hosted hackathon, while other respondents marked they attended a hybrid or online hackathon. To avoid imbalance in the dataset we removed all responses from individuals that did not participate in a collocated hackathon. Regarding the demographic of our study participants, there were 68 (64.76%) males, 29 (27.61%) females, 1 (0.95%) non-binary, and 7 (6.66%) participants who abstained from disclosing their

gender. Most participants reported being between the ages of 25 to 34 (51.42%), with fewer participants between the ages of 35 to 44 (22.85%), followed by 18 to 24 (18.09%) and 45 to 54 (7.61%).

4.1 Perceived hackathon motivations related to startups (RQ1)

In this section, we address the hackathon motivations of participants, the factors constituted by different motivations, and the regression analysis.

Hackathon motivations. We found that *making something cool/working on an interesting project idea* (μ =4.14, SD=0.88) and *having fun* (μ =4.12, SD=1.01) were the two most frequent motivations for participants to attend a hackathon, while the least popular motivations were *working on my startup* (μ =2.06, SD=1.40) and *learning about the domain of my startup* (μ =2.21, SD=1.38) (see Figure 1). Thus, our findings do not confirm H1, which states that the most common participant motivations will be associated with startup product development.

Fig. 1. Motivations of hackathon participants

We found potential connections between the hackathon motivations using an exploratory factor analysis with varimax rotation. We first performed a Kaiser-Meyer-Okin test to check the suitability of the data, which resulted in a fitting 0,76 value. Based on Eigenvalues, we found five initial factors. We named the factor "*Entrepreneurial*", and it is constituted by the motivations of *creating a new startup, building the first version of a startup product, working on my startup, developing the skills of my startup team, learning about the domain of my startup* and *getting immediate feedback* (See Table 2). We tested the factor for inter-item reliability using Cronbach's α and found the value of 0.874 acceptable. The second factor, which we named "*Social*", is constituted by the motivations of *meeting new people* and *becoming part of a community*. We named the following factor "*Achievement*", it is constituted by the motivations of *winning awards, making something cool/working on an interesting project idea, advancing my career, and sharing your experience and expertise.* The following factor is constituted by the motivations of *learning new tools, skills, or topics*, thus, we named it the "*Learning*"

factor. Finally, we named the last factor "*Convivial*", it is constituted by the motivations of *Joining friends that participate* and *Having fun*. We tested these factors and obtained the following Cronbach's α values: *Social factor* (0.66), *Achievement* factor (0.57), *Learning* factor (n/a), and *Convivial* factor (0.45). As the Cronbach's α values were insufficient, the remaining factors consist of only one variable: the motivation that scored the highest value for that factor (see highlighted values in Table 2).

Table 2. Exploratory factor analysis. Only values higher than 0.3 for each factor are present.

Motivations and factors	Entrepreneurial	Social	Achievement	Learning	Convivial
Marking something cool/working on an interesting project idea			0.39384		
Learning new tools, skills, or topics				**0.94559**	
Meeting new people		**0.89258**			
Sharing your experience and expertise			0.47760		
Advancing my career			0.24662		
Becoming part of a community		0.52384			
Getting immediate feedback	0.49159				
Joining friends that participate					**0.74427**
Winning awards			**0.67955**		
Having fun					0.39587
Creating a new startup	0.76515				
Building the first version of a startup product	0.82695				
Working on my startup	0.7907				
Developing the skills of my startup team	0.65649				
Learning about the domain of my startup	0.67295				

Using a Mann-Whitney U-test, we found that the means of the participants who had founded a startup before or after the hackathon were higher (μ=2.90) than those who had not (μ=2.67) for the Entrepreneurial factor ($p < 0.005$). For the founders with a startup at the inception stage without a startup product (14), the Entrepreneurial factor had values of (μ=3.34, SD=0.41), with the motivation *of building the first version of a startup product* having values of (μ=3.78, SD=1.31). Thus, confirming H2.

In addition to the motivations, the awards, as an aspect of the hackathon setting, may have influenced startup creation, as they are meant to encourage and support those participants who would like to continue working on their projects. Most of the respondents (74, 70.47%) marked they won an award at the hackathon, while (31, 29.52%) marked they did not. Of the 74 respondents who marked they won an award, some participants reported having won one or more awards: 27 reported they won a team-building experience, 32 indicated that they won a mentoring program, 32 others reported that they

won tools and resources, 26 reported they won a cash award, 15 that they won an opportunity to pitch to investors, and 14 reported that they won an award of some other kind.

To identify the motivations or aspects of the hackathon setting that influenced startup creation after the hackathon we conducted a logistic regression (See Table 3). The outcome variable for the regression is *post-hackathon startup formation*, a categorical binary survey item where participants reported yes (1) or no (0) to having founded a startup after the hackathon.

Table 3. Logistic regression results.

Variables	Estimate	SE	OR	p-value
Requirements	0.073	0.423	1.075	0.863
Design	-0.500	0.307	0.607	0.104
Implementation	0.047	0.379	1.048	0.902
Testing	-0.310	0.290	0.734	0.286
Project satisfaction	0.717	0.497	2.048	0.149
Hackathon satisfaction	0.149	0.516	1.161	0.772
Entrepreneurial factor	0.515	0.262	1.674	**0.050**
Having a startup	0.624	0.795	1.866	0.433
Awards	1.443	0.876	4.232	0.100

Note. The reference category is the response "no" to startup formation. SE = standard error, OR = odds ratio. Requirements to Testing = the degrees of completion of the project.

For the predictors, we selected those addressed by previous research about the connection between hackathons and startup formation [25, 31]. They were the awards, the degree of completion of the project (from identifying requirements to testing), the entrepreneurial factor, the perceived hackathon satisfaction, and project satisfaction. We also included having a startup before the hackathon. Along with awards, having a startup is a binary item. The other predictors were survey items that were answered using a five-point Likert scale and later averaged for the regression. The model was statistically significant, χ^2 (95) = 17.01, p = .05, Cox & Snell [9] R^2 = 0.15, Nagelkerke [28] R^2 0.24 (indicating that 15.0 -24.0% of the variance was explained by the model). Sensitivity was 20.0%, and specificity was 98.8%. Out of the nine predictors, one was statistically significant. The entrepreneurial factor predicted startup formation (OR = 1.674, p = .05) – a higher entrepreneurial score increased the likelihood of startup formation. However, the confidence in the results is somewhat limited due to the unequal distribution of the dependent variable groups [18] (*startup formation*: 20 = *yes*; 85 = *no*). Nevertheless, the results give a preliminary idea about important predictors for startup formation.

4.2 Perceived hackathon benefits related to startups (RQ2)

In this section, we address the perceived benefits of participants related to startups, the perceived usefulness of the hackathon to the startup, project completion, learning outcomes, satisfaction with the project, and satisfaction with the hackathon.

Of the 105 responses, (92, 87.61%) participants marked they did not have a startup at the time of the hackathon they identified, while only (13, 12.38%) of them did. 29 (27.61%) respondents marked they created a startup before or after the hackathon, among those, 13 marked they created a startup before the hackathon, 20 that they created a startup after the hackathon, and 4 marked they had created a startup before and after the hackathon. Table 4 elaborates on the different startup stages participants reported.

Table 4. Reported startup stages of participants at the time of the hackathon

Startup stages of development	Participants
Inception stage: Startup idea without a startup product	14
Inception stage: With a startup product	4
Stabilization stage: Startup product on the market	1
Other stage	1
No startup idea at the time of the hackathon	9

Most respondents (63, 60%) reported they did not bring a startup idea to the hackathon, while (42, 40%) of them did. Of those 63 participants who did not bring a startup idea to the hackathon, 11 marked they created a startup after the hackathon ended. Of the 42 participants who brought a startup idea to the hackathon, 9 marked they created a startup after the hackathon ended. Only 20 respondents of 105 (19.04%) reported that they created a startup. Thus, supporting H7, as most participants did not create a startup after the hackathon ended. Of the participants that had created a startup before or after the hackathon they attended (29, 27.61%), 12 marked they worked on their startup project after the hackathon, 10 marked they worked on a project that was unrelated to their startup, 5 marked they worked on a project of the same domain of their startup, and 2 marked they worked on other projects.

Of the participants who mentioned that their startup was at the inception stage without a developed product (14, 13.33%), 5 mentioned that they worked on their startup product, other 5 mentioned they worked on a project of their startup domain, and 4 worked on a project unrelated to their startup. Therefore, there is no evidence that confirms H5, as most founders in the inception stage without a startup product did not work on their startup project at the hackathon.

Of the (29, 27.61%) participants who reported they created a startup before or after the hackathon, the most popular startup domain category was *Software as a service* (10), followed by *Others* (8), a Mobile application (4), a Two-sided marketplace (2), E-commerce (3) and media sites (2). Regarding the startup team members, 12 participants marked that there were members of their team at the hackathon, 9 participants that there were no members of their startup team at the hackathon, and 8 reported that all members of the startup team were at the hackathon.

Perceived usefulness of the hackathon to the startup. For the scale of the perceived usefulness of the hackathon to the startup, we analyzed each item individually. The lowest level of agreement was for the statement that the hackathon was useful to create

a product for the startup, pointing toward learning and networking being more useful to startup founders than developing a product at the hackathon (see Figure 2), thus, rejecting H8.

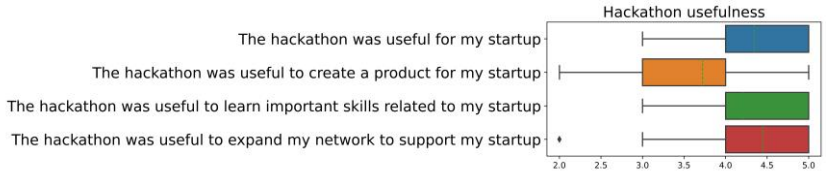

Fig. 2. Perceived hackathon usefulness to the startup

Perceived project completion. For this scale, we assigned a description to each of the five stages of the waterfall model (Requirements, design, implementation, verification, and maintenance) [39]. Most participants indicated a high agreement with the first levels of project completion. However, the testing and maintenance processes do not seem to have been conducted as much, with the latter presenting the highest standard deviation (see Fig. 3).

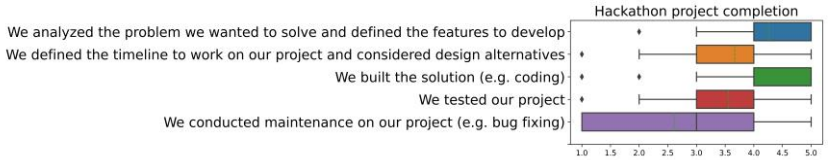

Fig. 3. Perceived degree of project completion

Perceived hackathon learning outcomes. Most participants reported that they learned about product development (μ=3.94, SD=0.93) and pitching (μ=3.85, SD=1.10), while the lowest levels of agreement were for learning about the startup domain (μ=3.12, SD=1.20) and learning how to monetize a product (μ=2.81, SD=1.16).

Perceived satisfaction with the hackathon, and the project. We tested the scales for *perceived satisfaction with the project* and the *hackathon* for inter-item reliability using Cronbach's α. We found their levels of (0.86) and (0.87) respectively, acceptable to continue to analyze them as one item. Participants indicated an agreement with their perceived satisfaction with the project (μ=3.79, SD=0.88) and a higher agreement with their perceived hackathon satisfaction (μ=4.12, SD=0.85).

5 Discussion

We aimed to determine the motivations (RQ1) and perceived benefits (RQ2) of hackathon participants that are related to startups. Table 5 provides an overview of our

findings on this relation, including the supported (H2, H7), non-supported (H1, H5, H8), and undetermined (H3, H4, H6) hypotheses.

Table 5. Summary of the hypotheses

Hypotheses	Results
The most common participant motivations will be related to startup product development (H1)	Not supported
Founders with startups at the *inception* stage may be motivated to attend a hackathon to build their startup product if they do not have one (H2)	Supported
Founders with startups at later stages may be motivated to attend a hackathon to acquire specialized knowledge and feedback to support their startups (H3)	Undetermined
The hackathon duration will influence the creation of startups at hackathons (H4)	Undetermined
Founders with startups at the *inception* stage that do not have a startup product will develop it at a hackathon (H5)	Not supported
Entrepreneurs with startups in later stages will learn about topics related to their startup at a hackathon (H6)	Undetermined
Most hackathon participants have not created a startup after a hackathon (H7)	Supported
Founders may find hackathons the most useful for their startups for product development (H8)	Not supported

We elaborate on our results from two fields: hackathon research and startup research. Regarding hackathon research, we found that about half of our study participants brought a startup idea to the hackathon, but only a few founded a startup afterward (H7). These findings match those of previous research that reports on challenges that participants face when creating a startup after the hackathon [8, 17]. Thus, it is necessary for hackathon organizers to be aware of those participants who bring startup ideas to the hackathon and to provide them with guidance on what can be done to support their startups after the hackathon ends. We did not obtain answers from founders with startups in later stages (H3, H6). This may suggest that if a founder has a team and a startup product, they may not be interested in engaging in a new project or taking their existing project to a hackathon. Further research may focus on those hackathon aspects that could be useful to founders with startups at later stages.

We also found that the most frequent hackathon motivations (RQ1) are not directly associated with startup product development (H1). The most popular hackathon motivations were, instead, *making something cool/working on an interesting project idea* (*achievement* factor) and *having fun* (*convivial* factor). These findings partially match previous research where *having fun* [17] was found to be a frequent hackathon motivation. We did, however, find motivations related to entrepreneurship that constituted the *entrepreneurial factor* and reflected diverse aspects of startup development, such as "*Developing the skills of my startup team*" and "*Learning about the domain of my startup*". Thus, it may seem that participants motivated to create a startup at hackathons are looking forward to addressing multiple challenges of their startup. The *entrepreneurial factor* was also a predictor for startup creation (H4). This finding matches with those from previous research that states that entrepreneurial intention may drive

entrepreneurial behavior [16, 19]. Future research about entrepreneurial intention may focus on how to help entrepreneurs stay motivated during the different startup stages and what aspects or challenges of their entrepreneurial journey have demotivated them.

Regarding hackathon perceived learning outcomes (RQ2), we found that participants indicated high levels of learning for pitching and product development, but less so for learning how to monetize a product, and the domain of their startup. These findings match those of previous research where pitching was reported amongst the most popular topics addressed at the hackathon [25] and where participants learned within their teams "*from doing*" in situ [12].

Regarding the startup research field, we found that although some startup founders have attended hackathons motivated to work on the first version of their startup product (H2), and some have developed their startup products, or projects related to its domain (H5), the least perceived usefulness to the startup was in creating the startup product at the hackathon (H8). This finding points toward participants not perceiving the project developed at the hackathon to be necessarily suitable for their startup.

Previous research has also pointed toward participants not developing their startup product at the hackathon [25]. This finding may be related to the fact that our study participants reported low levels of agreement with the testing and maintenance of their projects (RQ2). They may not be motivated to use the hackathon project as their startup project, as it may lack maturity. Conversely, the reported low levels of agreement with the testing and maintenance of the projects may also be related to the duration [44] or the lack of previously developed projects at the hackathon. Valuing other benefits over the development of a project is also supported by the high level of agreement with the satisfaction with the hackathon compared to the satisfaction with the project (RQ2).

5.1 Limitations

Our research was based on an online survey that addressed the individual experiences of hackathon participants with a focus on their perceptions and opinions. However, certain aspects of the hackathon setting that may have influenced the perceived benefits were unobserved. For the process of working in teams, such aspects include goal clarity, the match between skills and tasks, and satisfaction with the team process. We could not observe these aspects as the study participants attended different hackathons, thus we focused on individual perceptions instead. Moreover, it is unknown if the 105 survey participants are a representative cross-section of the overall hackathon population, as we studied events in a specific geographic context organized by the same institution. We accepted this limitation because studying similar events allowed us to assume similar settings in which they were obtained. Our findings are limited to the setting and participants we studied and future research in a different context may yield different results. We also created questionnaire items ourselves that may pose a threat to reliability and validity, we did, however, not use them for any statistical analysis as combined scales.

6 Conclusion

Our findings suggest that many hackathon participants brought a startup idea to a hackathon, and some of them also had motivations related to startup creation that are part of the *entrepreneurial factor*, a predictor for startup creation. Thus, startup creation can be supported at hackathons when organizers are aware of the entrepreneurial motivations of the participants [24]. This awareness can begin when participants report to the organizers their motivations as they register for the hackathon. The motivation of participants could potentially influence how they work together in teams, as teams where participants have different motivations could have more difficulties aligning their goals. During the planning of a hackathon, organizers should consider the motivations and needs that the participants express, including those apart from collaborative product development, such as learning and networking.

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