Crisis Volunteering Nerds: Three Months After COVID-19 Hackathon #WirVsVirus

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ABSTRACT

The hackathon #WirVsVirus in March 2020 was one of the biggest hackathons in history. Under the patronage of the federal government of Germany, 28,361 participants worked together in 1,498 projects, finding innovative apps and solutions against the COVID-19 pandemic. Three months after the event, we present an exemplifying analysis of the topics, used technologies and remaining activity of these projects. Shedding light on this instance of citizen science allows to highlight the potential of hackathons and startup culture regarding socio-technological resilience. At the same time, it may be understood as an impulse for crisis informatics to consider new forms of volunteering in the course of crisis management.

CCS CONCEPTS

• **Software and its engineering** → *Software prototyping*; **Programming teams**.

KEYWORDS

crisis informatics; volunteers; hackathon; coronavirus; pandemic

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1 INTRODUCTION

In light of the current COVID-19 pandemic, the issue of socio-technical resilience has regained attention. This is not only part of a broader reaction to the spread of the coronavirus, but may also be due to the specific nature of the crisis. Focusing on the merit of mobile applications and ICT seems plausible when physical distancing is demanded and analog spheres of interaction are restricted in the context of an epidemic. As a discipline dedicated to the use of "personal information and communication technology to respond to disasters in creative ways" [12], *crisis informatics* has focused on complex situations of crisis management and potentials to use communication and collaboration technologies in this context [11, 13].

While in contemporary Europe, cooperation between emergency management organizations and individual citizens has comprised collaborative information gathering through social media, the delivery of goods, and relief activities [14], both digital and analog volunteers may now contribute by conducting other activities, potentially tackling the spread of the virus. As for all European countries, Germany's crisis management measures have been reactive to a relatively unknown crisis. Under this impression, the *#WirVsVirus* hackathon took place in March 2020, encouraging digital volunteers to contribute socio-technical resilience against the coronavirus.

A hackathon is a problem-focused computer programming event with a contest to pitch, program, and present instances of prototype digital innovation [2]. Focusing on this rather unconventional approach of governmental crisis management, one may be interested in answering the following question: *What projects have evolved in the hackathon and what do these instances of citizen science implicate for crisis informatics?*

2 RELATED WORK

Scholars of crisis informatics have focused on different kinds of disruptive situations like natural disasters or human-made crises [16]. Others have focused on health crises [9], including the recent coronavirus crisis, with a main interest in discussions on social media. Furthermore, works have been dedicated to both cooperation and collaboration among various types of actors in times of emergency [1, 4].

Many works concentrate on cooperation between authorities and individual volunteers [3, 15]. Volunteers may, when emergency services do not have sufficient capabilities, undertake crisis-related actions [21]. On social media, volunteers may both offer and seek help in times of crisis. Further, various works point out challenges of crisis volunteers like information overload or mistrust [14]. Van Gorp [20], categorizes *Volunteer and Technical Communities* (V&TCs) as "Software Platform Development Communities", "Mapping Collaborations", "Data Aggregators", and "Expert Networks", while the latter "bring together volunteers in camps to focus on (ad-hoc) problem solution through hackathons", mentioning "Random Hacks of Kindness" and "Geeks Without Bounds". Both focus on humanitarian-oriented activities, also including crisis reaction.

Literature on citizen science has focused on "the engagement of non-professionals in scientific investigations" [10]. Often, such participation is located on a rather passive level, entailing data collection or categorization [5]. Perceiving "citizens as sensors" [11], crisis informatics has been interested in information gathering

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by civilian crowds. Still, projects like the hackathon *#WirVsVirus* are seen as citizen science, with individuals being involved more actively in finding solutions [17]. While participants may have a professional background, they are still primarily characterized as citizens opposed to institutionally-backed up researchers [5]. In recent years, state actors have initiated hackathons as citizen science when facing challenges and crises like climate change or the US opioid crisis [6, 17, 22]. Thus, crisis informatics may consider not only digital volunteers' involvement of data accumulation or "crowdsourcing" [11] but also more creative forms of citizens' engagement in crisis management. Like other citizen science projects, quality of results of *#WirVsVirus* has tried to be assured by access to funding and experts' opinions [5].

Additionally, Tan et al. [18] have highlighted the role of mobile applications, distinguishing between general-purpose and specific emergency apps. They stress the relevance of mobile apps integrated into the various phases of disaster management as well as the critical part played by the public crowd. Kaufhold, Rupp et al. [7] present the design and evaluation of a mobile crisis app, allowing for bi-directional communication between citizens and authorities. Furthermore, Kaufhold, Haunschild et al. [8] have analyzed attitudes, expectations, and use of mobile crisis apps in Germany, stating that there is a need for health-related warnings among civilians. With respect to the hackathon *#WirVsVirus*, involved projects may reveal new insights into crisis-specific tasks as well as developments with regards to mobile crisis applications.

3 A HACKATHON AGAINST COVID-19

Under the patronage of the federal government of Germany, seven technology-oriented foundations and think tanks initiated a nationwide virtual hackathon to encourage civilian engagement with the COVID-19 pandemic. 28,361 participants created 1,498 ideas, in 48 categories, on the weekend of March 20-22, 2020. The hackathon *#WirVsVirus* in Germany was not the only coronavirus-related hackathon as the WHO, Facebook, Twitter, Microsoft, Slack and others initiated a worldwide hackathon "Build for Covid-19" with about 18,000 participants from 175 countries. Still, considering the remarkable number of participants, it appears that the *#WirVsVirus* hackathon is one of the biggest hackathons ever.

Twenty projects were awarded by a jury as winners. They were rated in three self-ascribed type categories "new development" (1,039 projects), "advancement of existing solutions" (196 projects), "commercial solutions" (50 projects) (213 did not self-ascribe) by five criteria: "added value to society", "degree of innovation", "scalability", "progress", "comprehensibility". Teams could apply for a long-term funding, with 130 out of 400 projects being chosen by a committee to be supported with funding of a volume of 1.6 million euros and expertise. Among these 130 projects are 16 out of the 20 projects that have won.

4 ANALYSIS

We created a Python-based webcrawler, gathering information about the 1,498 projects from the hackathon project website https://wirvsvirushackathon.devpost.com where each project has an own site. In addition, we used the git API to check the last programming activity regarding projects having mentioned a git repository which was still accessible and not private. We also gathered public information from the hackathon website https://wirvsvirus.org. The analysis was conducted on June 28, 2020, about three months after the event had taken place.

Across 1,498 projects, the number of members in each project was about seven (M = 6.776, SD = 7.510) while 289 consisted of only one member, meaning most of them did not start the sprint after brainstorming. The average number of likes was M = 10.411 (SD = 13.164) and the number of comments M = 3.256 (SD = 5.176). The five most active categories were "Local Firms", "Social Distancing", "Coronavirus Tracking", "E-learning", and "Mental Health" (see Table 1 and Figure 1), which mirrors the needs and problems of

Table 1: The 48 categories with name, numbered ID and the number of projects of the #WirVsVirus hackathon.

Category	Projects	Category	Projects	Category	Projects
1 - Groceries Matching	62	17 - Status Supermarkets	40	33 - Vital Services	18
2 - Exchange Platforms	8	18 - Mental Health	75	34 - Local Initiatives	45
3 - Distribution of Workers	28	19 - E-learning	76	35 - Social Questions	25
4 - Distribution of Volunteers	14	20 - Corona Testing	35	36 - Border Control	7
5 - Relief	23	21 - Crisis Communication	27	37 - Public Administration	10
6 - Medical Devices	25	22 - Creative Professions	9	38 - Data	71
7 - E-Child Care	24	23 - Genereal Communication	51	39 - Govermental Communication	23
8 - Coronavirus Tracking	96	24 - Hospitals	53	40 - Medical Personnel	24
9 - E-Application Forms	19	25 - E-Cultural Spaces	37	41 - Research	9
10 - Analog Support	33	26 - Home Office	27	42 - Judicial Questions	4
11 - Transmission of Infected Cases	23	27 - Exchange among Patients	5	43 - Medical Care	23
12 - Social Distancing	98	28 - Creative Health & Safety	24	44 - Flatten the Curve	19
13 - Reorganization Food Banks	6	29 - Farming	12	45 - Pets	6
14 - Vulnerable Groups	13	30 - Risk Groups	15	46 - Gamification	56
15 - E-Sports	13	31 - Digital Anamnesis	37	47 - Economic Impact	24
16 - Local Firms	103	32 - Crisis Management	14	48 - Financial Support	9
		Total 1,498			

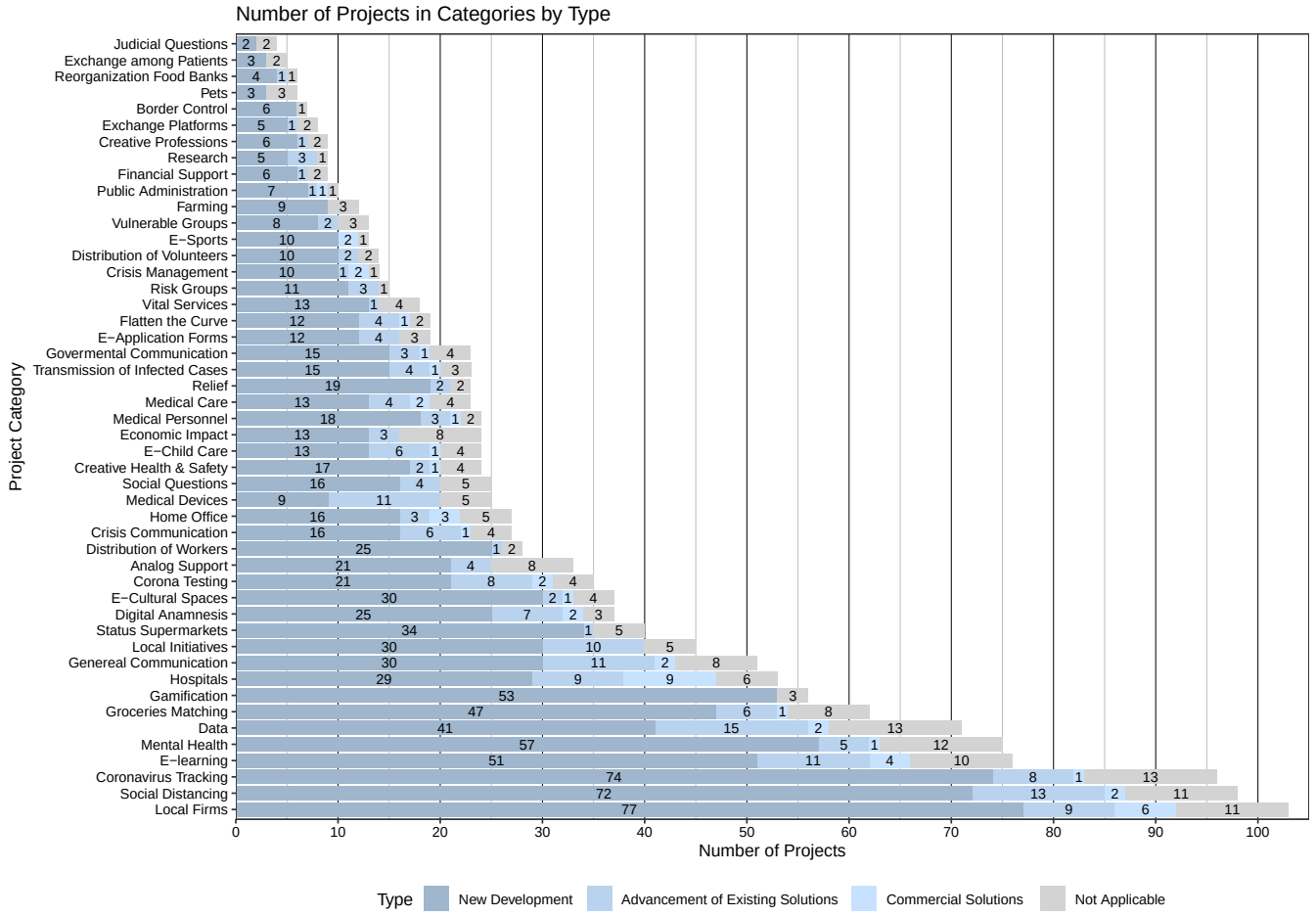

Figure 1: Projects of the #WirVsVirus hackathon ordered by number of projects in category. Within each category, one can see the distribution of self-labeled project types ("new development", "advancement of existing solutions", "commercial solutions").

the COVID-19 crisis. While categories like "Corona Testing" and "Transmission of Infected Cases" are relevant to pandemics only, other topics like "Governmental Communication" indicate independently of the kind of crisis good contributions to crisis informatics in general, giving the chance to identify new approaches.

Table 2: Top 10 used technologies and ranks of native Android and iOS apps.

Rank	Technology	Projects	Rank	Technology	Projects
1	javascript	282	8	aws	102
2	python	226	9	docker	99
3	react	159	10	css	94
4	node.js	152	...	...	...
5	java	132	21	android	51
6	angular.js	117	...	...	...
7	html	103	33	ios	34

Each project could mention a list of technologies used. Web technologies like Javascript, Python for general purpose and React for creating GUI were used most frequently (see Table 2). Native Andoid and iOS apps were mentioned only in 51 and 34 projects, respectively, stressing the focus on general web-based apps.

526 projects mention a github profile, repository, project, or organisation where 25 of them were not accessible, being private or deleted. Within the remaining 501 accessible projects, we found that 278 (55.5 %) were active after the day of the event (see Figure 2). One month later, 86 (17.2 %) were still active; after two months only 54 (10.8 %) and 13 (2.6 %) after three months. The 20 winning projects do vary a bit in project size with a few more members (M = 10.2) than average (M = 6.776). They have slightly more likes (M = 25.95) than average (M = 10.411) but were not the most favored projects. Eight winning projects had mentioned a git repository while only one was inactive on the day after the hackathon. As the winners were not granted any funding, it seems that winning had motivated the teams to move on.

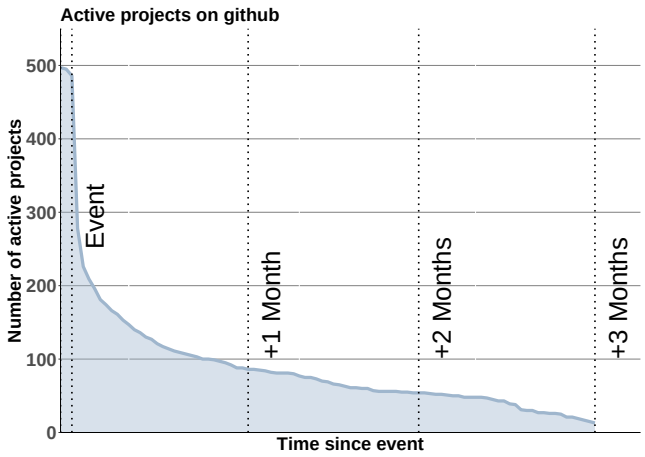

Figure 2: Active projects on github, based on the latest commit date. There were 448 projects having a commit until the last day of the event, with only 278 projects active directly after the event and a further decrease to 13 active projects 3 months after event.

5 DISCUSSION

Conceptualizing the *#WirVsVirus* hackathon as citizen science dedicated to the containment of the coronavirus opens up the possibility to shed light on societal actors' *agencies*, going beyond the rather passive participation like recording conditions or collecting digital data directed at further use by authorities. Programmers, computer scientists, and the startup culture can be seen as an important group of crisis volunteers. While *#WirVsVirus* was not initiated by an expert network [20], it was launched by the federal government of Germany with support of digital foundations.

Looking at frequencies of types of projects or fields of activity, one may assume results of the hackathon being situational or random. Still, general crisis-related topics were addressed which have already been prominent in discussions of the crisis informatics community like "Crisis Communication", "Crisis Management" or "Distribution of Volunteers" [11, 14]. As the projects mainly use web technologies or native app frameworks (see Table 2), most of them can be considered to be used as mobile apps on smartphones, adding new ideas to crisis informatics apart from conventional alert apps. Further, topic areas reflect issues like support of local businesses or social distancing which have been dominating the public discourse of COVID-19 measures, while paying special attention to technological solutions when focusing on tracking applications or e-application forms, accredited to the events' character and audience. These ideas may be focused upon in future research of crisis informatics.

Considering the development over time, it is indicated which projects and topics are more seriously uphold after the event. The perceivable low number of active projects after three months may be determined by three issues: (1) The number of participants was extremely high possibly comprising also inexperienced attendees who struggle organizing a project afterwards; (2) participants met only digitally, potentially having difficulties to manage the projects remotely, and (3) only the existing git-repositories mentioned in the phase of the hackathon were observed while activity might now be in different repositories. In the context of governmental crisis management, *#WirVsVirus* stands out, considering creativity of the crowd as an asset as well as the flexible, emergent nature of projects. Focusing on innovation instead of advancement of existing solutions found approval among participants, self-assigning their projects to the category of new development. Thus, descriptive analysis of bottom-up projects allows to gain insight into humans' self-positioning in relation to government measures and views on technology in times of crisis.

6 LIMITATIONS & OUTLOOK

As hackathons normally take place as an on-site event, topic and social factors like technical domain, community type, and expertise influence how attendees work together and build familiarity [19]. Even though we analyzed the projects, little is known about the social processes during this online event.

Further studies may reveal whether projects show added value as developed by people who are users themselves as well as how much creative impact can be derived from the Top 20 projects. Future analysis may also focus on the different types of societal actors, complementing works of crisis informatics that have mainly focused on individual citizens or users. Focusing on previously under-investigated cases of citizen science allows to gain insight into the contributions of technically versed volunteers in the context of crisis management.

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