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University Involvement in COVID-19 Pandemic R&D and Innovation Efforts

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Abstract

Universities served as important research centres in the effort to contain the COVID-19 epidemic. The extent and nature of research, development, and innovation (RDI) at universities in eight Central-Eastern European (CEE) nations were examined in this study in light of the pandemic and its associated demands. Using pandemic-related keywords, relevant postings from all Facebook posts between March 2020 and June 2021 were further retrieved, coded, and evaluated [1]. Our data showed that the universities' RDI efforts throughout the epidemic differed significantly from one another. When compared to the rest of the CEE sample universities, Austrian universities showed higher levels of inter-institutional research and commercial collaborations [2]. The pandemic brought on urgent needs. Understanding the RDI potential of the region and the importance of developing inter-institutional and commercial cooperation networks at national and international levels is one of the study's major achievements [3]. According to the report, during the pandemic universities exhibited strong RDI potential to respond promptly to urgent demands, provided open innovations and open licencing, shown collaborative skills, and made efficient use of their academic and student resources [4].

Introduction

The present pandemic, which has resulted in 249 million infections and more than 5 million fatalities as of mid-November 2021 (Johns Hopkins University, 2021), is the turning point in our history since it has fundamentally altered both our way of life and the state of the world economy [5]. The initial pandemic waves brought forth new daily-life adjustments like the need for masks, social withdrawal, self-tracking via smartphone applications, and self-isolation. Universities and research organisations also play a crucial role in determining which measures the population must adhere to in order to mitigate the effects of a pandemic, even though political leaders play a key role in this decision-making process addressing the pandemic's fundamental nature. Even if these chances might not always be conducive to fast commercialization, this crisis, like past ones, will generate fresh opportunities for innovation and growth for specific industries. RDI activities are booming during the pandemic thanks to the expertise, experience, and background of academics, businesses, governments, and non-profits [6]. Despite the emergency's numerous unfavourable repercussions. The way society is handling the crisis has a lot of positive features. In this regard, the strength of civil society has been demonstrated by the innumerable volunteers at hospitals, the people who sew masks at home, and the numerous ideas that are currently being created, prototyped, and developed [7].

First line responders and other secondary areas touched by the epidemic have benefited from technological advances around the globe [8]. Three-dimensionally printed ventilator multipliers, open-source portable ventilators, and face masks made from recycled materials are a few examples of economical inventions.Given that universities are one of the key forces driving innovation efforts and that innovations will be crucial to recovering from the effects of the coronavirus it is important to identify and describe the extent of RDI efforts at Central-Eastern European (CEE) universities and explain their function [9].

Subjective Heading

The original language versions of every post made on the official Facebook pages of the chosen universities between January 1, 2020, and June 30, 2021, were gathered. 16,693 posts were initially acquired, however 16,627 posts were left when the non-communicative posts (such as status changes, university logos, or timelines) were removed. 1892 of the entries in this pool contained the keywords "COVID," "korona," "corona," "vrus," "virus," and "wirus."The number of posts comprising the relevant keywords [10].

Contrasted with an economic crisis like the world financial crisis of 2008, which was primarily influenced by market dynamics, the current COVID-19 pandemic catastrophe is very distinct from other economic crises. Instead of being a result of the crisis itself, the recession that followed led to business and economic disruptions (Mandel & Veetil, 2020). The COVID-19 epidemic, on the other hand, has already had an acute impact on people's physical health and the entire socioeconomic system [11]. Crises put a tremendous amount of strain on technological advancements, user behaviour, application, infrastructure, industry structure, legislation, and techno-scientific knowledge [12].

The disruptive developments that previously revolutionised other industries like banking, retail, and manufacturing have mostly had little impact on clinical care and education. The COVID-19 pandemic appears to be the driving force behind the rapid disruption of clinical care and educational systems woolliscroft [13]. Investors are emphasising investments in biopharmaceutical businesses that innovated during the COVID-19 crisis since the health crisis created a demand to develop new medications and vaccines (Pieiro-Chousa, López-Cabarcos, Quioá According to preliminary COVID-19 study,

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innovative start-ups pivot and seek to take advantage of new business prospects [14,15].

Discussion

The selection of higher education institutions is based on the Times Higher Education ("THE") ranking and the knowledge transfer score, in addition to the regional and historical consistency of the sample countries. Both the QS World University Rankings and the Academic Ranking of World Universities (ARWU) are well-known. The universities in the sample have comparable rankings across these we choose to base our choice on their measurements because the "THE" rankings are exclusively based on research or research-related variables. The knowledge transfer score represents the degree to which academic innovation efforts are able to provide innovations, inventions, and consulting to the business world. The indicator scales data to reflect how much money universities receive for their research from industry. The sample's knowledge transfer score spans from for CEE post-communist countries, and from 57.8 to 86.9 for Austria. The sample consists of five medical schools, twelve general-focus institutions with an emphasis on engineering, technical sciences, physical sciences, social sciences, business, and economics, and thirteen technical universities. Clearly outperforming the other universities in the sample in terms of rankings and knowledge transfer scores are Austrian universities. Table 1 lists the chosen universities, the quantity of communications focused on pandemics, the overall "THE" ranking, and the knowledge transfer score.

Inter-rater reliability evaluation, also known as inter-rater agreement, offers a technique to measure the level of agreement between two or more coders who independently score the characteristics of a group of subjects. IRR analysis seeks to quantify the proportion of the observed score variance that is attributable to the true score variance after adjusting for measurement error amongst coders. A number of coding-related issues were predetermined. The IRR analysis was then performed on a subset of 200 posts that were chosen at random. After then, the IRR for the smaller group of individuals was applied to the entire sample The total During the shift to distant learning during the lockdowns, academically oriented communications of non-RDI efforts primarily focused on protocols and rules for staff and students. In addition, a lot of correspondence discussed volunteer options for academics and students as well as socially responsible actions and professional perspectives. Additionally, all nations except Austria reported that a sizable number of contacts discussed the development of protective tools and aids at a low cost or by do-it-yourself (DIY) methods. Most colleges were active in the production of masks, protective shields, and disinfectants for medical experts and front-line hospital staff during the first few months of the pandemic, when these aids and resources were insufficient for the general people. The development of RDI activities specifically relevant to COVID-19 treatment was made possible by the knowledge, technology, and people resources offered by these universities.

RDI efforts were discussed in one-fourth (21%) of the blogs with a pandemic focus. The share of RDI communications varies significantly across universities and countries. In terms of RDI communication share, the Czech Republic came in second (4.2%). The remaining countries' percentage shares of RDI communications ranged from 1.2% for Slovakia to 1.9% for Poland. In comparison to the other universities, the Medical University of Innsbruck and the Czech Technical University in Prague have much higher levels of RDI communications.

During the transition to remote learning during the lockdowns, protocol and recommendations for students and staff were a major focus of pandemic-oriented messaging of non-RDI initiatives. In addition, a lot of correspondence discussed volunteer options for academics and students as well as socially responsible actions and professional perspectives. Additionally, all nations except Austria reported that a sizable number of contacts discussed the development of protective tools and aids at a low cost or by do-it-yourself (DIY) methods. Most colleges were active in the production of masks, protective shields, and disinfectants for medical experts and front-line hospital staff during the first few months of the pandemic, when these aids and resources were insufficient for the general people. The development of RDI activities specifically relevant to COVID-19 treatment was made possible by the knowledge, technology, and people resources offered by these universities.

One-fourth (21%) of the blogs with a pandemic focus discussed RDI activities. Table 4 shows how the share of RDI communications varies greatly between universities and nations. Following Austria in terms of RDI communication share was the Czech Republic (4.2%). The percentage share of RDI communications for the remaining nations ranged from 1.2% for Slovakia to 1.9% for Poland. The Medical University of Innsbruck and the Czech Technical University in Prague have significantly greater levels of RDI communications than the other universities.

Due to a lack of such devices in those nations at the start of the pandemic, all other than Austria, scientific advancements concentrated on patenting and certifying protective medical equipment. As the epidemic spread, countries' efforts switched to focus on developing testing capacities as well as preventive procedures in hospitals including taking newcomers' body temperatures and decontaminating the atmosphere. Later, the focus switched to information systems that track a variety of citizen behaviours, including data collection for contact tracing, infection risk assessment, and adherence to laws. Universities frequently pioneer these innovations worked with regional and state administration entities (e.g. Hygiene Station in the Czech Republic), or already established cooperation with businesses such as the collaboration between VSB-TUO and T-Mobile in the Czech Republic.

Regarding education and information sharing, communications covered a wide range of pandemic prevention strategies, such as how to act in public transit networks, the urgent sterilisation of respirators, or online training programmes for medical professionals. There were also numerous online conferences, seminars, and lectures organised. At the various institutions, there were a number of innovation hackathons.

Finally, many institutions held donation drives, crowdsourcing events, and occasions where they offered free services or goods. A number of contests and campaigns were also launched to fight the pandemic. For instance, the Smart Triage web application was developed as a part of the student online hackathon "Hack the Crisis." In a similar incident, WUST students launched the "StopFakeNews" campaign to combat false information regarding COVID-19, and MeUW joined the global group "Fight the Fakes" to increase drug awareness counterfeit COVID-19 medicines, vaccinations, and treatments. Universities also took part in national (Slovak National Technology Transfer Competition) or European anti-COVID-19 programmes. According to our findings, RDI operations were mentioned in one-fourth of the communications focused on the pandemic. Below is a discussion of the findings that address our study topics.

Based on the data analysis, we adjusted innovation typology to include research and development activities as well. We found three

clusters for the R&D efforts. The sub-themes for the medical cluster were pharmacological research, COVID-19 therapies, and epidemiological investigations. Studies in the disciplines of socioeconomics and the environment make up the other two groupings.

When it comes to innovation activities, we identified four overarching clusters and nine different areas that encompass a variety of advances from medical equipment to apps for vaccination registration. Medical equipment and protective gear are both included in Cluster 1 Adaptations. Digital Innovations, the second cluster, includes the fields of High Technology, Diagnostics and Monitoring, and Mobile and Web applications. Online Platforms, the third cluster, includes the areas of Virtual Learning and Information Sharing. Solidarity, the fourth cluster, includes the pro-bono/donations and open innovation domains.

Conclusion

The most RDI communications focusing on joint cooperation and inter-institutional collaboration at a national level, utilisation of spin-offs, and private research funding were generally found at the selected Austrian institutions. The rapid development of protective equipment (ventilators, masks) made available to the public through patents with open access and collaboration with enterprises was highlighted in the RDI communications in the Czech Republic. Institutions in Poland and Hungary mainly disseminated free-of-charge (without patenting) research therapy outcomes. Additionally, details about national screening studies and campaigns to give other products, such as plasma and material goods, were also shared. Finally, although their RDI communications were primarily focused on research initiatives and innovations, Croatian, Serbian, Slovak, and Slovenian institutions' total RDI communications lagged behind the others. The study's findings also show that innovations emerged in a wide range of formats and frequently informally in all but Austria. Additionally, a lot of these breakthroughs were low-cost or do-it-yourself creations of assistance and protective equipment. Most colleges were involved in their manufacture during the early stages of the epidemic, when these aids and resources were insufficient for the general public. The most RDI communications focusing on joint cooperation and inter-institutional collaboration at a national level, utilisation of spin-offs, and private research funding were generally found at the selected Austrian institutions. The rapid development of protective equipment (ventilators, masks) made available to the public through patents with open access and collaboration with enterprises was highlighted in the RDI communications in the Czech Republic. Institutions in Poland and Hungary mainly disseminated free-of-charge (without patenting) research therapy outcomes. Additionally, details about national screening studies and campaigns to give other products, such as plasma and material goods, were also shared. Finally, although their RDI communications were primarily focused on research initiatives and innovations, Croatian, Serbian, Slovak, and Slovenian institutions' total RDI communications lagged behind the others. The study's findings also show that innovations emerged in a wide range of formats and frequently informally in all but Austria. Additionally, a lot of these breakthroughs were low-cost or do-it-yourself creations of assistance and protective equipment. Most colleges were involved in their manufacture during the first several months of the pandemic, when they were insufficient for the general population.

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Conflict of Interest

The authors declare that there are no conflict of interest.

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