Supply chain solutions for essential medicine availability during COVID-19 pandemic

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Abstract

Purpose – This study aims to document students' supply chain solutions developed through the internship hackathon program. The study profiled innovative solutions developed by university students in Kenya to solve health supply chain logistics challenges during and beyond COVID-19. This is done by exploring students' experience in developing sustainable logistics and supply chain management capacity-building programs in a low-middle-income country (LMIC).

Design/methodology/approach – This study used a qualitative approach to explore the experiences and perceptions of students and mentors who participated in a hackathon program. The study followed a cross-sectional descriptive survey design, collecting data from the participants through online questionnaires. The data were analyzed and presented using thematic analysis and narrative techniques.

Findings – Findings provide preliminary evidence for narrowing the gap between theory and practice through a hackathon internship blended with a mentorship program. Assessment of this program provides evidence for developing solutions toward ensuring the availability of essential medicine in LMICs during a pandemic such as COVID-19 by students. The profiled solutions demonstrate a broader perspective of innovative solutions of university students, mentors and potential opportunities for a triple helix approach to innovation for health supply chain system strengthening.

Research limitations/implications – This original study provides evidence for advancing contribution to developing innovative solutions through partnerships between investors, universities and industry practitioners interested in mentoring students in the health-care supply chain during COVID-19 in LMICs. Specifically, contingency factors that affect the implementation of innovative programs during and beyond global pandemics such as COVID-19 by students' innovators are identified, and implications for policy action are discussed based on the praxis of sensemaking.

Practical implications – This study examines a novel approach that combines internship, mentorship and hackathon projects for logistics and supply chain students in LMICs. The approach aims to bridge the gap between theory and practice and to create innovative solutions for essential medicines during and after COVID-19. The study urges more resources for supporting such programs, as they benefit both academia and industry. The study also argues that hackathon internship programs can help the logistics and supply chain industry adapt to the post-pandemic era. The study offers insights for investors, universities and practitioners in the health-care industry.

Originality/value – This study shows how to develop innovative solutions for the health-care supply chain during COVID-19 in an LMIC through partnerships between investors, universities and industry practitioners who mentor students. The study identifies the contingency factors that influence the success of such programs during and beyond global pandemics such as COVID-19 and discusses the policy implications based on the sensemaking praxis of the student innovators.

Keywords Students hackathon, Internship, Supply chain ideation, Essential medicine availability

Paper type Research paper

Introduction and background

Although health-care systems worldwide have worked under enormous stress for a long, the present pandemic, COVID-19 uncovered the existing weaknesses of health-care supplies management. The top health-care supply chain challenges include inventory management, temperature control, lack of coordination, expiration and warehouse management (Pisa and McCurdy, 2019; Privett and Gonsalvez, 2014). Sub-Saharan Africa's challenges are also overwhelming, including a lack of clear policies, transportation, sound supervision systems, inventory management and inadequate budgeting (Babatunde *et al.*, 2020;

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International Association of Public Health Logisticians, IAPHL, 2013; Streit-Juotsa and Haasis, 2018). These issues have contributed to the shortage of essential medical supplies during the COVID-19 pandemic. East Africa, and Kenya to be specific, faces similar challenges, including corruption, inadequate deliveries, ineffective logistics systems and wastage of medical supplies, among other issues (Oduma and Shale, 2019). Together with the COVID-19 disruption, these challenges have necessitated robust logistics and supply chain and logistics management for innovative health-care solutions.

Hackathons traditionally have been attributed to technology solutions where ideas of working software are translated into solutions (Nandi and Mandernach, 2016). Similarly, Porras *et al.* (2018) assert that the terminology hackathons are diverse but have commonalities and differences. Hackathons in the perspective of Komssi *et al.* (2015) are viewed as quick ways of executing ideas to market to overcome turbulent business environments. Hackathons have become one approach that can bring about interdisciplinary collaboration between the industry and students (Happonen *et al.*, 2020; Warner and Guo, 2017). Hackathon has become a growing area of interest for many health-care institutions, as it provides individuals with hands-on experience in innovation (Shino, 2018).

Hackathon is increasingly becoming popular, as it involves individuals or small groups coming together to solve challenges, for instance, in the health sector. Hackathons previously focused on the technology field; however, the emerging role of technology in health-care functions such as logistics and supply chain management has seen increased documentation of hackathons in the medical field (Walker and Ko, 2016). A recent study concluded that hackathons effectively develop health-care innovation that is more cost-effective and time-efficient (Poncette *et al.*, 2020). Findings further suggested that hackathons are essential in forging digital health-care solutions currently needed to solve the growing challenges of COVID-19. For example, health monitoring intelligent tools to monitor and identify health-care inefficiencies and innovative health-care website development may enhance end-user experiences like health information systems (Happonen and Minashkina, 2018).

Though some hackathons may be competitive, they generally prioritize peer-to-peer learning or skills improvement as an outcome among participants. Previous studies report that hackathons develop students' positive attitudes and experience (Szymanska *et al.*, 2020) and evaluating effectively design, implement and evaluate innovative and innovative and technological health-care solutions (Walker and Ko, 2016). On this basis, the hackathon is receiving much focus as a step toward managing the COVID-19 health-care challenges. In this regard, hackathon fosters diversity and improves cross-regional collaboration, which is increasingly needed to address global health-care challenges (Braune *et al.*, 2021). Although studies on hackathon exist in the medical field, the experience among students regarding such programs in health-care settings still needs more research, more so in the Sub-Saharan African context.

COVID-19 pandemic points to the need for effective mentorship programs that can instill adequate experience and knowledge to the students (Perry and Parikh, 2021). Mentorship programs such as hackathons for health-care students are evidence-based practices focusing on innovative strategies to address health-care challenges. Mentorship is also suitable for students, as it seeks to build learners' confidence, level of trust, professional respect and other competencies developed, foundational to developing innovative solutions to current and future challenges. Mentorship moves the innovation focus from individual skills to a holistic intervention approach – industry-based innovation solutions (Schwerdtle *et al.*, 2017). Health care remains a critical global issue, and the pandemic has accelerated the need to address its logistics and supply chain solutions through mentorship programs (von Harbou *et al.*, 2020).

Because of the complexities involved in every logistics and supply chain activity, internships through hackathon mentorship programs are emerging as better approaches to equip managers and individuals with the necessary skills and knowledge. Before the COVID-19 pandemic, Zapico *et al.* (2013) documented the extent to which hackathons can be broadened with a focus on green sustainability. To demonstrate how universities and companies can collaborate in developing sustainable solutions, Happonen *et al.* (2020) investigated the extent to which hackathons used as a tool to demonstrate collaboration. This case, however, did not include an internship component. In Europe, Bertello *et al.* (2021) demonstrated the novelty of collective and collaborative efforts in response to the grand challenges of COVD-19 with such initiatives as hackathons by connecting civil societies, innovators, partners and investors but not university students that this current study focused on. Alternatively, from the perspective of sustainable development goals around social work environment involving students, Sanjana (2020a) demonstrates how higher education institutions can contribute to sustainable development goals. Thus, a similar study must show collaborative relationships as innovative solutions to health-care supply chain practices. This current study builds on the development of literature on implementing student hackathon programs integrated with internships to provide solutions during a global health-care pandemic in low-middle-income country (LMIC), such as Kenya.

A key element of public health policy is the availability of essential medicine for world populations. This global concern calls for an integrated response promoting access to essential medicines through effective logistics and supply chains. While sustainable supply operations management is a common topical area (Sarkis, 2020), the current global situation of COVID-19 has been extensively disruptive. Irrespective of the fact that countries have made strides in adopting lean in implementing health-care supply chain systems, the current pandemic has exposed the vulnerability of health supply chain systems. This situation calls for developing innovative mechanisms such as hackathons to bridge the existing gaps to build resilient supply chain management systems to respond to the challenges of the current pandemic (Remko, 2020).

With the COVID-19 pandemic, many health-care institutions and individuals across the industry have been greatly affected and are developing responsive solutions. However, there needs to be more research on students' experience with a hackathon to create innovative solutions. A recent report revealed that a hackathon is a transformative

pathway that causes a shift in the value systems (International University of Applied Sciences, 2021); however, this report did not focus on health-care logistics and supply chain solutions. Other recent reviews explored hackathons as a stepping stone in health-care innovations (Poncette *et al.*, 2020) and as an interdisciplinary mechanism to respond to the pandemic (Braune *et al.*, 2021). While the reviews gave essential insights, they could have specifically demonstrated how hackathon mentorship programs can improve health-care supply chain solutions for global pandemics. As the first of its kind in LMICs, this study examined the supply chain solution developed and students who participated in this internship hackathon.

Hackathons encourage increased university–industry collaboration, which assists students in leveraging the growing technological developments to provide health solutions with limited resources (Angelidis *et al.*, 2016). Developing innovative solutions during the global pandemic through student hackathon mentorship programs is critical since the health products supply chain in developing countries has been a challenge, as demonstrated by (Yadav, 2015). The following four research questions guided the study:

RQ1. What are the characteristics and impacts of the innovative solutions developed by students for supply chain logistics during COVID-19 in Kenya?

RQ2. How do students perceive and evaluate their experience participating in the university–industry hackathon internships program during and beyond COVID-19 pandemic?

RQ3. How do mentors perceive and evaluate their experience guiding university students in developing innovative solutions during and beyond COVID-19 pandemic?

RQ4. What are the best practices and challenges for developing sustainable health supply chain capacity-building programs in an LMIC?

This pioneering study on student hackathon internships documented in the health-care supply chain field contributes to developing literature on this subject from LMIC countries. Hackathons are essential in building innovative solutions like digital health services and health monitoring tools that address growing health-care challenges. As far as the authors are concerned, this is the first study that addresses the experience of students and mentors regarding their perception of the internship hackathon program in LMICs. The study places internships through hackathon as a university-industry collaborative initiative that provides a learning opportunity and prepares health supply chain leaders for tomorrow. It provides problem-solving skills and knowledge about contemporary logistics and supply chain health-care solutions.

The subsequent sections of this paper are organized as follows: discussions of the theoretical underpinning (where sensemaking theory is discussed in light of the stated research questions), followed by a brief review of literature related to the research questions, then the study methodology, findings and finally the conclusions and recommendations.

Review of literature

Sensemaking theory

Sensemaking theory, associated with Karl E. Weick, refers to how individuals respond to the emerging idea or change in their experience: this can be at the organizational or individual level (Maitlis and Sonenshein, 2010; Weick, 1995). The process starts with disrupting the normal routine (Purworini and Santoso, 2019; Weick *et al.*, 2005), for instance, the COVID-19 disruption of usual logistics and supply chain management practices. It also involves the emergence of a new idea or policy or a change resulting from existing experience. During this process, people interpret what is happening (making sense of the disruption) and construct meaning by developing frameworks to understand the happenings. The sensemaking theory offers individuals insights into diagnosing a disruption with subsequent development of assumptions and expectations that shape the direction to be taken (Weick *et al.*, 2005).

The unprecedented technological and COVID-19 challenges have caused uncertainty, from how people do their businesses to their interactions (Hopper, 2020). The COVID-19 challenges have also presented an opportunity for companies and individuals to learn new ways of doing things. It has allowed individuals to evaluate the current, dynamic business environment and make sense of it (Kervinen, 2021). During this COVID-19 time, individuals have had to make sense of working remotely and conducting most training and organizational conference online. Thus, such emerging activities force individuals to develop cues and find possible information to answer such cues (Christianson and Barton, 2021).

The global public health pandemic has exposed gaps in health supply chain systems (Mollenkopf *et al.*, 2020). Policymakers have had to find ways to develop possible logistics and supply chain health-care solutions during and post-pandemic. One such avenue has been an internship through hackathon, where mentors and their mentees come together to discuss and develop solutions (knowledge) to solve emerging challenges (Szymanska *et al.*, 2020). Sensemaking provides a clear framework for why health-care student internship through hackathons is necessary during this pandemic (Christianson and Barton, 2021).

Some studies (Wang *et al.*, 2019; Kumar, 2020; Kieran *et al.*, 2022) have adopted sensemaking theory to argue for dynamic challenges organizations and individuals face. For instance, Genius and Bronstein (2017), Christianson and Barton (2021) used sensemaking to study blockchain before COVID-19 and supply chain health-care disruption during COVID-19, respectively. In this current study, sensemaking theory has been used to explain how internships through hackathon initiatives can assist students in gaining the necessary knowledge and experience to address emerging challenges.

In this study, sensemaking theory has been used to explain the students' process in developing supply chain solutions by embracing the moment of uncertainty caused by the COVID-19 pandemic. Students were expected to use their skills to come up with strategic solutions that could be put in use (Benjamin, 2007). To develop the capacity of the students, the training model of Define, Measure, Analyze, Improve and Control (DMAIC) was used (Sokovic *et al.*, 2010). Sensemaking

theory was integral in developing problem-solving capabilities for making strategic decisions. Therefore, this study presents the application of design principles from a theoretical basis as used by the students to make sense of the problem and provide solutions attributed to quality management philosophies (Fredriksson and Isaksson, 2018). Sense making perspectives is adopted in the methodology along the key variables that included defining the problem and scope of the project, developing of the measures of impact, analyzing the performance of the proposed solution compared to the gaps identified, developing the innovative solution and providing sustainable mechanisms for implementation.

Internship through hackathon

Hackathon is a form of collaboration that has existed over time. For some individuals, it is a well-known initiative in open innovation. It can be an event focusing on university-industry partnerships and government-industry collaboration among other players. As an internship program, individuals with a similar belief are invited to collaborate and generate ideas that can solve emerging world challenges through experiential learning (Zukin and Papadantonakis, 2017). The programs can be open to the public or privately organized through universities as a source of knowledge with technology and research capabilities. Organizations and governments partner with universities to provide participants with skills and expertise (Kienzler and Fontanesi, 2017).

The goal is to gain hands-on experience in solving complex processes. Through this process, universities gain high reputation and recognition locally, regionally and globally (Nasr and Fisk, 2019). Hackathons play a key role in providing the necessary skills and knowledge in a fiercely competitive environment characterized by emerging challenges like COVID-19 pandemic. Also, organizations may have only some of the essential assets and ability to achieve sustainability. Because of this, organizations seek for other external innovations to complement their capabilities to become competitive (Sakamoto and Tamanyu, 2014; Cappelli, 2015).

There are several studies around a hackathon. Closely related to this study are marketing models (Calco and Veeck, 2015), educational sustainable development goals (Sanjana, 2020b) and innovative global mHealth solutions (Pantelis *et al.*, 2016) among others. Emerging businesses should operate with universities to establish sustainability beyond incubation and acceleration (Jirapong *et al.*, 2021). Short intensive hands-on experience programs such as hackathons increase an individual's self-efficacy. It assists mentors and mentees in integrating practice and theoretical applications from the knowledge acquired through training to develop innovative solutions (Szymanska *et al.*, 2020). Internships through hackathon are associated with positive knowledge acquisition in some settings and sharpens critical thinking and problem-solving skills. Besides, student internships through hackathons offer experiential learning beyond old-style instructor-centered forms of industry training because such programs are focused on solving real-life problems (Garnjosta and Brown, 2016).

Health-care innovative solutions

Innovative solutions are necessary for health-care settings as this involves complex systems to treat and prevent emerging diseases such as the current COVID-19 pandemic (Mustaffa and Potter, 2009). Thus, the challenge witnessed during this pandemic regards how to manage treatments while simultaneously providing excellent health-care services. As such, for sustainability to be achieved, innovation is essential to the health sector just like other organizations (Lee *et al.*, 2011). Health-care innovation is essential to design new operational strategies, providing quality care and reducing costs (Stundza, 2009).

The three types of innovation needed for better functioning of health systems include patient-focused, technology-based and integrator-based (Bokhour *et al.*, 2018; Herzlinger, 2006). Patient-focused innovation addresses reduced patient waiting time, medical expenses and costs. In contrast, technology-based ones focus on better delivery of health services, including quality care, treatment and using information technology to solve health-care challenges. Integrator-based innovation focuses on health-care efficiency and building an integrated network of health services to improve logistics and supply chains.

Thus, hospitals should classify logistics and supply chain practices to standardize essential materials through lean logistics practices that provide the highest quality care at reduced costs (Lee *et al.*, 2011). Moreover, designing effective lean logistics and supply chain streamlines the entire health-care processes, for instance, from ordering to delivering health-care services (Kumar *et al.*, 2008). Besides, service design innovation can improve the health-care system for institutional development change approaches (Patrício *et al.*, 2019). Decision-making focuses on technology-enabled innovations. Sensemaking focuses on designing human resources for health while institutional change focuses on making health system practices patient-centered. However, limited empirical evidence suggests how service design innovation can improve health-care logistics and supply chain.

A review of other studies suggests that health-care organizations face various obstacles related to logistics and supply chain innovations (Engelseth and Kritchanchai, 2018). Information systems of many hospitals need to be better designed and allow patients to receive better services within the recommended time. Even in countries with better health-care services, evidence indicates long treatment time as a factor that needs executives to develop innovative solutions (Kritchanchai, 2014). In other instances, inventory management of health services is a challenge (Kitchanchai and Suwandechochai, 2010), suggesting that available health-care logistics and supply chain innovation solutions require redesigning to improve performance.

Improving health-care logistics and supply chain to provide quality care at reduced costs is essential. The need to enhance logistics and supply chain innovations aims to make possible long-term health-care planning (Kwon *et al.*, 2016). Implementing innovations associated with logistics and supply chain management activities could assist the health-care industry to derive effective agile lean practices (Elmuti *et al.*, 2014). This could reduce annual costs, improve the quality of care and limit treatment cycle time.

Likewise, logistics and supply chain innovation processes encompass three significant units – the foundation, the drivers and the outcomes. The outcome of logistics and supply chain innovation depends on how effectively the innovation drivers are connected with objectives and implemented

(Kwon and Kim, 2018). For instance, there is a need for innovative solutions between inventory management and transportation. This is to ensure no shortages and excess inventory. As such, a collaborative relationship could be a better innovative way to achieve a value proposition (Kwon *et al.*, 2017).

Sustainable supply chain management capacity building programs

All institutions across different sectors are directed towards sustainability in logistics or other business operations. Regarding the day-to-day patient requirements in the health-care sector, supply chain system stands out as a responsible program for interactions within the institution (Bag *et al.*, 2020). For instance, ordering quality health-care products, transportation process and end-user experience. In other words, building sustainable logistics and supply chain systems depends on the ability to address optimization programs. For example, organizational planning and effective utilization of health-care resources can be achieved using technical programs such as Big Data Analytics.

Because of the continuous emerging business challenges, businesses must adapt and design lean practices using big data capabilities. This provides strategic capabilities. Also, the green product development innovation program determines supply chain performance, further determined by management support (Gunasekaran *et al.*, 2017). Big data analytics as a management capability results in the innovation of green product development programs. This enhances sustainable logistics and supply chain outcomes (Azadegan and Dooley, 2010; Bag *et al.*, 2020). However, there is limited evidence to connect such programs to sustainable health-care supplies and commodity system.

Organizations need simplified and localized logistics and supply chain practices that integrate local communities in value creation. The idea is to develop local capabilities, adopt localization logistics practices and cooperate with local stakeholders to achieve sustainability (Bendul *et al.*, 2017). Organizations should build sustainable supply chain models by involving suppliers and the community. This is possible through structural collaborations and information exchange as intrinsically and extrinsically motivated supply chain programs, respectively (Morais and Silverstre, 2018). Thus, a similar study is necessary to demonstrate how such initiatives can enhance sustainable practices in the health care.

A recent study proposed the Triple Bottom Line framework as a sustainable health-care logistics and supply chain management strategy (Scavarda *et al.*, 2019). The study reported that through this framework, health-care institutions should implement educational programs, design corporate social responsibility and community interaction programs to achieve sustainability. Additionally, institutions should engage suppliers, end-users and other stakeholders through collaborative engagement to achieve sustainable supply chain management (Dahlmann and Roehrich, 2019).

Logistics and supply chain management emerging issues for health care

Learning about better supply chain management is possible by building knowledge of logistics and supply chain practices in individuals. Knowledge links information demand and supply through learning (Curado and Bontis, 2011). Therefore, to design better logistics and supply chain management processes, management must acquire knowledge through exploration and exploitation processes (Schniederjans *et al.*, 2020). Exploration is all about developing new routines and solutions within the company (Yin and Ran, 2021). On the other hand, exploitation is about taking advantage of emerging opportunities and ideas to redesign solutions and preexisting knowledge (Schniederjans *et al.*, 2020). For instance, health-care organizations can attain sustainable logistics and supply chain management solutions through these processes.

Generally, management uses knowledge of supply chain management to develop tools necessary to manage logistics and supply chain operations (Bin Dost and Rehman, 2016). The lesson as knowledge gained, develops managerial on logistics and supply chain processes from sourcing, logistics, production and delivery to the consumers. The knowledge assists managers in managing logistics and supply chain practices or operations from information systems management such as data analytics (Olson, 2018).

Knowledge is also vital for digitizing the health-care supply chain. Digitization, which entails artificial intelligence, enables organizations to gather, use and share data for logistics and supply chain decision-making (Feng and Shanthikumar, 2018). Technologies like cloud computing augmented reality and blockchain are massively used to disseminate essential data in transportation, warehousing and distribution management. These initiatives minimize logistics and supply chain challenges, including network design, risk and inventory management. The application of technological advancement helps ensure better reconfiguration supply chain processes that bring about potential savings in lead time and costs (Schniederjans *et al.*, 2020).

Moreover, the knowledge management domains of supplies and logistics transverse organizational management theories: meaning that such knowledge allows institutions to respond to various stakeholder needs (Schniederjans *et al.*, 2020). The role of knowledge management remains fully covered in terms of how it relates to mentorship experience regarding logistics and supply chain in health-care is yet to be thoroughly studied.

Methods

Study design

A qualitative design integrated with multiple case studies was adopted (Yin, 2016)Similarly, a case study on hackathons by (Bertello *et al.*, 2021) that used a small sample size contended on the generalization of the findings with an argument on the opportunity for further research. The primary data developed empirical evidence from investigating issues from implementing a four-month internship hackathon program. The first data collection phase involved online interviews to collect qualitative data from mentees and students engaged in the program. A series of simple semi-structured surveys followed this to obtain their views and experiences. Phase 2 of the data collection also involved semi-structured surveys and online interviews to collect information from the mentors.

Population and sample

The study was a survey involving all the students who participated in the hackathon internship program and all the

mentors who facilitated the program. The population for this study was students and mentors from Strathmore University, which was determined through pragmatic consideration. The pragmatic review characterized the population and sampling design based on active participation in the program and confirmation of the accepted sample size for qualitative studies (Vasileiou *et al.*, 2018; Henninka and Kaiserb, 2022). Student participants in this study were recruited from the Supply and Logistics program in Strathmore University.

The sample size technique was purposive. The study involved all the population that participated in the hackathon program. The total sample size was 20 respondents was distributed in two strata of 12 students and 8 mentors was deemed to be adequate since the inclusion criteria was participation in the program through a qualitative study (Boddy, 2016) They were majorly fourth-year students in their final year of study, third-year students and master's students. Therefore, 12 students were recruited to participate in the hackathon program participated in this study through a survey. The same was applied to all the eight mentors.

Data collection techniques

Qualitative data was obtained using interviews and survey questionnaires from both participants – mentees and mentors. While surveys provide little room for bias from respondents (Bryman, 2012), interviews allow researchers to interrogate further the participants on their responses (Kvale, 2007). For students, 12 online interviews were conducted to gain their opinion about the program and their experiences. A similar process was conducted with the mentors. Additionally, semi-structured surveys were conducted to capture essential information about the participants and other issues to answer the research questions. Survey questionnaires and in-depth interviews data collection methods helped to enrich the study, as argued by Creswell (2015).

Data analysis and presentation

The qualitative data from the online interviews on both sets of participants were analyzed using NVIVO. The information was analyzed inductively and coded and grouped based on themes identified from the analysis. Primary data is presented based on the study's research questions.

Ethical consideration

Research ethics and protocols were adhered to per the ethics and review board of Strathmore university. Informed consent was sought and obtained from the respondents under the hackathon program before the study commenced.

Findings and discussion

This section presents the findings and the resultant discussion. The current study findings are discussed in the purview of related empirical literature to argue developing theoretical perspectives on supply chain solution and hackathon programs. This section is organized along the development of research questions for this study.

Background information

The hackathon project was implemented in collaboration with Kuhne Foundation LEEDs Program, HELP – Logistics, Africa Resource Centre in partnership with Strathmore University Institute of Healthcare. Twelve student projects were selected, representing 43% of the population, which is sufficient for exploratory qualitative studies (Kothari, 2018). The 12 projects developed by students were taken through the program to develop their innovative ideas through a mentorship program. This study is from an LMIC cognizance of the response rate to participate in hackathon programs as it is observed that in Philippines a crowdsourcing hackathon program for health-care solutions development has attracted over 100 students (Ulitin *et al.*, 2022). To argue the sample size, Warner and Guo (2017) investigated factors that discourage students from participating in hackathons: discomfort, competition and fair on not having experience. The profile of the students is as presented in Table 1.

Table 1 shows that most participants were female (75%) in their final year of study (fourth year), constituting 58%. It was also worth noting that, out of the 12 students selected to participate in the hackathon were one first-year student and one postgraduate student. The first-year student is studying bachelor's degree in supply chain and operation management, whereas the graduate student was undertaking a Master of Business Administration in Healthcare Management. Most of the students were students of the Bachelor of Commerce Operations Management option. Linking this with empirical data, Bertello *et al.* (2021) also found out that in the first experience of hackathon, most solutions suggested by students already existed or had been developed. Consequently, this current study documented original solutions developed purposely for response to COVID-19.

Profile of supply chain solutions

Whereas all industries were affected by the pandemic, Happonen *et al.* (2020) demonstrated that collaboration between the educational institution and industry companies can leverage on hackathons to find innovative solutions. Similarly, Porras *et al.* (2018) affirmed that hackathons are hot topics in education settings and show more success. The supply chain creative solution for the essential medicine availability program involved 12 students. Of these, 10 completed the programme while 2 students still needed to. The students' areas of focus were diverse with a variety of cross-cutting themes that included: health workers' motivation during the pandemic, the influence of collaboration and enhancing performance with an implication on supply chain management practices that affect the attainment of univeral health coverage in Kenya, improved access to medication through the post office partnership with the medical agency, health-care systems evolution, research and development funding and local manufacturing on the Medical Supplies Chain in Kenya, causes of operation management distress in manufacturing firms, among others. While for this particular hackathon, each student worked on their solutions paired with a mentor.

Similarly, Poncette *et al.* (2020) provided a different model for tackling health-care problems through hackathons but involving health-care workers and patients, which led to the development of systematic recommendations for future

Table 1 Background information on gender distribution and year of study

Level of study	Undergraduate				Masters	
Year of study	First	Second	Third	Fourth	Second	Total
Male	0	0	1 (8.4%)	2 (28.5%)	0	3 (25%)
Female	1 (8%)	0	2 (16.6%)	5 (41.6%)	1 (8%)	9 (75%)
Total	1 (8%)	0	3 (25%)	7 (58%)	1 (8%)	12 (100%)

Source: Table created by author

hackathons. This current study documents various solutions developed by the students from humanitarian logistics and the supply chain in health care to ensure service delivery during a global pandemic. In contrast, a study done in Philippines regarding an open call to participate in an online hackathon on social innovation attracted 113 responses in various domains, including mental health (Ulitin *et al.*, 2022). These are summarized in Table 2.

Case studies profile of the best innovative solution

The innovative winning solution was "Health Care Systems Evolution" (Muigai, 2021). The project focused on the Kenya Medical Supplies Agency (KEMSA) and how the organization can improve their systems to increase the efficiency and effectiveness of its procurement system, to increase the availability of essential medicines. KEMSA's current tender process has slightly been automated, but a large percentage is still paper-based. Tenderers apply under specific categories of a particular bid and submit their proposals physically at the KEMSA offices or online on the Public Procurement Information Portal website. After submitting bids, tenderers usually attend an open hall meeting, where offers and prices are verified, and latest tenders are awarded to qualifying bidders. The project's focus was to redesign the current concept of the KEMSA E-Mobile App and turn it into a well-developed sourcing and procurement suite application that is readily available to KEMSA (Muigai, 2021).

The application is to automate KEMSA's order and tender process to provide stakeholders access to information and data regarding how resources are distributed, and its operations are managed, improving the efficiency of its supply chain processes and accountability. The application creates a centralized system, providing transparency and visibility of its operations. One of the main changes the application brings to KEMSA's tender process is the automation of the bidder prequalification process. The system will be able to assess and maintain a record of the contractor's performance on procurement contracts.

The system will have an in-built criterion to; assess if a bidder meets the required contractual standards, the supplier's compliance with tax payments, the supplier's business authentication, the timeliness of project completion and project business relations. This information will be readily available in a contract file and KEMSA's system. The list of contracts in the system will be downloaded and assessed electronically by KEMSA's source team. This will provide KEMSA and the Ministry of Health with a reference system, providing the necessary information to evaluate the supplier's past performance. The contractors/clients in another end of the system/application can comment on the ratings as they were prepared and on the proposed bids. This improves the prequalification system and makes it more streamlined.

The project's impact aims to deliver a central procurement platform that provides transparency and visibility. The application will provide complete visibility across the entire procurement process and allow the electronic exchange of documents and messages with existing and potential suppliers. It will also provide real-time reviews and approvals of documents. The immediate benefits from the impact are as follows: automated and streamlined entire procurement process; KEMSA's clients get access to information for direct purchases to authorized suppliers; improved supplier management; direct assessment of potential suppliers' capabilities, viability and compliance; suppliers' prequalification and update of background information with updates becoming available pertinent information affecting the suppliers' qualification, capabilities and change in their risk profile; improved spending by reducing supplier risk; development of an in-built cloud-based database, which will provide a richer consumer-like user experience. However, the following risks have been identified from mitigation measures: technical applicability, technical vulnerabilities, financial risks and compliance risks.

Students' perceptions and experience

The respondents who participated in the hackathon were asked to share their experiences.

Mentees' learning experience

The majority of the mentees found the hackathon training and mentorship process to be enlightening and captivating as they worked on their projects. Through this, they were able to learn and gain new knowledge to solve real-life problems. This perspective of motivation to undertake hackathons had also been profiled by (Warner and Guo, 2017), who examined how college hackathons are perceived. Supporting these sentiments were indicators from the respondents such as:

> [. . .] i enjoyed [. . .] the daily classes were in an area I always assumed. But I now appreciate how Pharma supply chain is vital in delivering Safe and Effective Health services. (Student 3).

Similarly, the respondents enjoyed their engagements with the facilitators. Similarly, in a European study, the students reported positive engagement with mentors (Bertello *et al.*, 2021). Examples of positive experiences captured as:

> Our facilitator [. . .] provided clear and proper training throughout the PSM and DMAIC sessions, which made the concepts easy to understand and apply. The creativity course platform was also very interactive, making learning concepts fun and interesting. (Student 7).

A positive experience was created through the interactive nature of the program. Wang *et al.* (2018) demonstrated how much medical students can benefit in a collaborative

Table 2 Profile of supply chain ideation – creative solutions for essential medicine availability

Innovative solutions	Solution description
Introduction of "Telepharmacy" or Remote Pharmacy to Marginalized Communities in rural Kenya	• Accessibility to professional health-care assistance without the physical need of a pharmacist in rural areas in Kenya • Increasing supply chain collaboration with various supply chain actors to reduce complexity in health supply chains
Improving the access of HIV/AIDS Medication during COVID-19 Pandemic	• Positive action for treatment access (PATA) • Virtual consultation and Automatic pharmaceutical dispensaries, much like ATMs • Effectively design an integrated multi-stakeholder model for HIV/AIDs medication access based on a public-private partnership
Operation PONA NA POSTA distribution of medicines by KEMSA through POSTA	• Mapping all post offices in the country is linked to KEMSA branches with a distance matrix between the post offices and the nearest health facilities • Greater availability and accessibility of medicines reducing instances of slow-moving stock • Possibility of having a public–private partnership with different organizations to improve access to medicines
Medempath motivation of health workers in a pandemic	• Availability of PPE'S for health workers • Data and design for training for health workers • Provision of digital information on health workers wellness
R&D financing mechanism for local manufacturing on medical supply chain in Kenya	• Devolving Kenya Medical Research Institute (KEMRI) with a focus on specific diseases and the development of medicines based on the country's disease status • Developing a systematic funding framework that encourages private sector businesses to fund R&D projects • Policy mechanism for providing private sector pharmaceuticals with incentives of subsidies through research on manufacturing opportunities for medicines
Redistribution as a means to supply chain resilience	• Development of an Optimal Redistribution Strategy Software • Developing a model for ensuring resilience in the pharmaceutical supply chain • Modification of downstream pharmaceutical supply chain process to ensure resilience
Health-care systems evolution	• Provision of full visibility for transparency across the entire procurement process and allow electronic exchange of documents and messages with existing and potential suppliers • Provide improved supplier management by assessing potential suppliers' capabilities, viability and compliance • Develop an in-built cloud-based database, which will provide a richer consumer-like user experience
Collaboration on supply chain performance: lessons for local pharmaceutical manufacturers	• Establish a collaborative framework for information sharing and joint decision-making for manufacturing firms • Establish the influence of joint decision-making on supply chain performance within manufacturing firms
Operation management distress in manufacturing firms	• Develop a framework for pharma manufacturing companies to identify the root causes of operations distress and their effect on operations and processes • Provide information on how companies can address these causes of distress in operations

Source: Table created by author

hackathon. The participants believed that the interaction and networking across the team increased their learning experience. This experience can be attributed to the theme of teamwork. Key to this was evident from the responses like:

> During the Hackathon internship, my learning would be described as trying out ideas, Networking, and Working with Teams. (Student 2).

The respondent's sentiment about trying out ideas forms the fundamental basis of sensemaking. A study by Gioia and Chittipeddi (1991) on sensemaking and giving sense in initiating strategic change identified four levels as envisioning, which in this case was concept development; signaling, which in this case was pitching the ideas; re-visioning, which in this case included training and development, and; energizing which in this case was coaching and mentorship. Through this Hackathon program, the participants encountered these levels of sensemaking towards the development of their solutions

Learning outcomes

The participants were taken through various concepts throughout the training sessions. Cold chain and logistic process and its role of the supply chain emerged as critical areas of learning interest. The training enabled students to make sense of their project proposals and develop innovative solutions. The significant implication of the training provides the theoretical underpinning on sensemaking. The practical guidelines of DMAIC process for selecting appropriate improvement programs had been narratives from the respondents attributed to this were:

> Kenya and other countries in East Africa need to have contingency plans set in place. This is if we face another situation like COVID-19. (Student 5).

The second key learning outcome was practical learning, research and critical thinking. This is considered an essential domain for sensemaking, as it formed the basis upon which the

central concepts and important theoretical domains were adopted to create solutions (Gioia and Chittipeddi, 1991). This is linked to the theme of experimental learning through qualitative data analysis. Supporting evidence was from the responses like:

> Learning how to practically apply the material we were taught throughout the program to come up with such great innovative concepts helped develop and upgrade the design projects (Student 1).

The third key learning outcome identified was associated with creativity and fun. This is attributed to the theme of innovative thinking and its applications, as illustrated by the sentiment:

> We need to be innovative [. . .] to develop innovative ideas to solve daily issues in all areas of our lives. (Student 3).

Level of preparedness and ability to perform in hackathon

On level of preparedness, most of the students felt well prepared as indicated by 70% of the respondents, whereas 10% indicated they were unprepared.

This study evaluated students' ability to perform in the hackathon after the project. The first theme drawn from the students' experience was of "a difference". The experience was perceived to be unique being it was the first of its kind. Key to this was the element of international and industry exposure as one of the respondents is captured to have commented as:

> Based on the training offered and research involved [. . .] My perspective was broadened to the operations of an international supply chain (Student 9).

Under the desire to perform in the hackathon, majority of the respondents felt that they were more confident and interested, which was depicted as:

> A big improvement! I may not be a Pharma supply chain management expert, but I can confidently discuss issues in that sector. The way the Health sector is diversified, it is an area I would be interested in (Student 12).

On the contrary, some respondents felt that their ability to perform was improved over time while undertaking the hackathon and that their perception changed. On this aspect, Warner and Guo (2017) concluded the discussions about making college hackathons more welcoming:

> Before the hackathon, my perception of my ability to perform was a bit intense but now I am more confidant, and my perception of my ability to perform has greatly improved (Student 2).

As well as*:*

> At the beginning of the program, I would not have imagined that I would be the winner of the Hackathon, especially because I had never worked on a project. Right now, I am working on actualizing my idea and hopefully being one of the people to change and revolutionize how the supply chain is done in Kenya. (Student 10).

Another perspective off this was captured under the theme of a "perfectly timed program" that developed their inspiration in the program from the illustration:

> I think the Hackathon came at a good time. Despite some time, issues, it was perfectly timed. I would love to participate in the Hackathon by physically attending classes and going into the field since that will give me more hands-on experience. If such an opportunity arose, I'd perform a lot better now than the first time (Student 4).

Effectiveness of the role played by mentors in developing hackathon project

The mentees described their understanding of the role played by the mentors. This was depicted under the themes of knowledge sharing, where the respondent indicated the following:

> She is experienced in her field, and I am just a rookie who is learning. Through her guidance, I better understood some concepts taught during the Hackathon. I do not think my project proposal would be what it is if it wasn't for her. She helped me fine-tune it and make it presentable. Were there some kinks in the project? Nothing is ever perfect. I look forward to furthering engagement with her on the same soon since I believe my project if implemented, will be very beneficial to many (Student 11).

This finding resonated with Braune *et al.* (2021) recent empirical data that provides positive affirmation with a high level of confidence in scaling up research ventures post-hackathon program. A majority of mentees felt that mentors were very experienced, as demonstrated by the sentiment:

> My final take on this is that every session that will be conducted that is similar to this Hackathon should have experienced mentors who will be able to guide the participants. Without that, the session won't be as effective (Student 6).

The sentiments further qualified this that the mentors provided adequate guidance as exemplified in the comments like*:*

> My mentor gave insights and made necessary corrections during my project. Through the insights, I gained new ideas also (Student 3).

Alternatively, the respondents were asked to comment on whether the mentorship provided practical and adequate preparation needed for students. On this front, three perspectives emerged: guidance, knowledge sharing and motivation. These could be depicted in sentiments like:

> I do believe it does. This is because I believe in the power of mentorship, I learnt a lot during the Hackathon [. . .] some of the key concepts in supply chain management, and I believe that I have a lot more to offer employers and businesses compared to someone who hasn't got the same training and experience. As it is said that experience is the best teacher, and I can confirm that saying is completely accurate (Student 7).

> They come from a place of knowledge and wisdom and thus will help a student achieve their goals faster (due to timelines) (Student 9).

> the mentorship enhanced my professional socialization and personal development skills to facilitate learning for graduate students and beyond. Thus, quality mentoring greatly enhances students' chances for success. Mentorship develops leadership and management skills in current and future managers (Student 3).

Mentors' experience and lessons

The mentors were also asked to share their experience in assisting and guiding students under their care to grow professionally in supply chain and logistics. In different contexts across countries Braune *et al.* (2021) reported on mentors' experiences in hackathon projects through participants' observation and noted that giving new insights and feedback was key in building participant confidence. Most mentors felt that the program was engaging, interesting, rewarding and eye-opening as they also learned through the process. This is evident from the sentiments such as:

> The experience was engaging, interesting and eye-opening (Mentor 4).

> The engagement was quite beneficial to me as a mentor, I learned a lot about the supply chain and challenges faced before in different pandemics. This was also an opportunity to influence the next generation of healthcare and supply chain managers to participate in scanning for challenges and opportunities towards providing sustainable solutions in quality healthcare provision in our context. (Mentor 1).

> Working with my mentee also enabled me to be open-minded, patient, accommodating and I found myself researching and learning more (Mentor 8).

> The program was well planned although the mentoring was not well thought out, I felt it was an afterthought (Mentor 2).

> A rewarding experience (Mentor 5).

Level of preparedness and lessons learnt by the mentors

The study further explored the level of mentors' preparedness. This was found to be distributed equitably between well-prepared and prepared.

The findings on the level of preparedness resonate with (Rys, 2022) observation on the determining characteristic in the development of hackathons that include preparation. Some of the mentors' lessons were from what worked well and what did not work well. A broad array of areas here included: the design of the program, frequent communication with the mentees, use of online platforms, accountability, the conduct and behaviors of the mentees and openness to learning. These are illustrated by the sentiments as follows:

> Regular calls; an open discursive process, adding technical data and details.

> The Hackathon program design enabled us to schedule and re-schedule the mentor meeting in case of time conflicts (Mentor 2).

> Online mentorship meetings were a great enabler because some meetings happened on Zoom outside working hours (Mentor 5).

> The weekly mentors and mentees encouraged accountability, peer learning and joint decision-making (Mentor 3).

> The mentees' eagerness and willingness to be guided: Also, they looked up to me as an expert (Mentor 8).

> Resilience and hard work from my mentees [. . .] The push to make a difference in the supply chain through our youth (Mentor 6).

The hackathon provided mentors and mentees with an enriching experience as they worked on different projects. In their study, Szymanska *et al.* (2020) concluded that hackathons provide students with positive learning experiences and attitudes, which are helpful for their professional lives. Partly, the rapport that the mentors built with their mentees was instrumental in developing positive experiences in the hackathon, as this created room for interactivity that enhanced learning. This mentorship has been fronted as a holistic approach to industry challenges (Schwerdtle *et al.*, 2017). It is more relevant for the logistics and supply chain industry in the Sub-Saharan context. However, a European experience is reported by Brereton (2020) in a case study of mentors' perspectives during hackathons. This study revealed their experience was unique, given the new aspects of remote working. From the findings, students also learnt practical and hands-on experience developing innovative solutions for the logistics and supply chain process, which is a plus for universities across the globe (Nasr and Fisk, 2019). Therefore, the hackathon offered numerous essential lessons to mentors and mentees concerning their professional work and the logistics and supply chain field. Insights on how online hackathons can contribute to solving societal challenges similarly are affirmed by Braune *et al.* (2021); Brereton (2020).

Lesson learnt for improving future innovative programs

Challenges encountered during the implementation of HSC

The participants indicated that several challenges provided grounds for lessons learnt. One of the significant challenges was stakeholder buying in as the students had to work with various stakeholders. This is evident in such sentiments like:

> Buy-in from different stakeholders who were involved in the area of the project was a challenge (Student 7).

Given that this project took place in 2021 at the heart of the pandemic, the health policy protocols posed considerable challenges. This included social distance policy and restriction of movement in Kenya, which aimed to curb the spread of the virus:

> Most of my research was desktop as I feared physically collecting data from local pharmaceuticals (COVID) (Student 3).

However, balancing studies and working on a hackathon project was another major challenge. A similar occurrence is reported in a hackathon project conducted in Europe (Brereton, 2020). Key to the sentiments in this respect were:

> My biggest challenge was balancing my schoolwork and working on my project [. . .]. "The main issue was to balance schoolwork and the HSC because both were online, which required a lot of screen time that can be exhausting (Student 5).

And

The only challenge I encountered was balancing my classes and the hackathon sessions". and "[. . .] the pandemic made things the harder to execute (Student 11).

Other related challenges were the access and availability of information and communication technologies for student use. This was pointed out as:

> Timely communication with the mentor and internet connectivity challenges (Student 2).

The mentors similarly faced challenges such as:

Competing priorities and time constraints for both the mentors and mentees

The mentors had competing priorities against their everyday work and other responsibilities. Some of the mentors would mention:

> Competing priorities on the mentee's side was a challenge; they had to balance class time, exams and also work on their Hackathon project (Mentor 1).

> Commitment from one of my mentees, who ended up dropping towards the end (Mentor 9).

Despite this, Campbell (2016, p. 5) found that internship design can be redefined by establishing factors that determine the creation of valuable experience for the student, supervisor or faculty member, including the presence of mentoring relationships and levels of satisfaction. This perspective is found to confirm the need to address the identified constraints. Constraints identified in other online hackathon programs included limited resources for internet connectivity for students (Ulitin *et al.*, 2022). Time and resource constrain were also mentioned as one of the challenges as evidenced from the sentiments from the respondents:

> Time was a challenge since I was engaged during the day, same with my mentor, pushing us to do our meetings late at night (Mentor 12).

Operating environment of COVID-19

While this would be too obvious given the circumstances under which the program was executed, this challenge was referred to by both the mentees and the mentors. A hackathon challenge across Europe identified numerous challenges, including matching mentors to mentees, remote working and movement restrictions (Bertello *et al.*, 2021). In this regard, emerging studies have pointed to redefining mentorship in a crisis-era (Lasater *et al.*, 2011). The operating environment was not unique to others experienced in other hackathon programs are echoed in the case study on interdisciplinary hackathons (Braune *et al.*, 2021). Sentiments are depicted from the finding as:

> The COVID-19 pandemic was a major barrier, especially data collection, due to social distancing (Mentor 8).

One of the challenges of the program was operating under the COVID-19 pandemic. With increased infections globally, the nature of doing business globally had to change. For example, as social distancing became enforced in the initial years to reduce infections globally, most businesses preferred online rather than physical engagements (Fairlie, 2020). As evidenced in this study, mentors and mainly mentees had a challenge concerning the execution of their projects owing to the social COVID-19 rules in the country. Similarly, the hackathon highlighted work–life balance and competing interests among mentors and mentees as a challenge. These challenges are generalized from similar hackathons done in other parts of the world (Brereton, 2020; Ulitin *et al.*, 2022). Although the work–life balance was a subject of discussion before the pandemic, COVID-19 complicated the working system and environments, which had additional challenges to individuals such as students and academic staff (Hjálmsdóttir and Bjarnadóttir, 2021). Therefore, individuals must find practical ways to adjust to working during the pandemic and post-pandemic season.

Recommendation to improve the program

The road to sustainability as depicted by Jirapong *et al.* (2021) points out that research and innovation provide organizations with opportunities to partner with universities to incubate innovative ideas. The participants recommended developing sustainable logistics and supply chain management capacity-building programs. Key themes emerged: the importance of this form of internships, the use of local case studies during training and the need to develop solutions from local talents in the university. These broad areas of recommendation are seen to be supported by sentiments such as:

> Great program as it is. . .allows students' internships so they can learn on the. job [. . .] maybe like six months on the ground with certification (Mentor 4).

> Such programs should be adapted to the local realities using case studies from those countries which will help learners apply almost immediately what they have learned. (Mentor 2).

> Develop networks in those communities, engage and educate them on the matters supply chain. This way they can provide labour instead of bringing in expatriates (Mentor 5).

> My final take on this is that every session that will be conducted that is similar to this Hackathon should have experienced mentors who will be able to guide the participants. Without that, the session won't be as effective (Mentor 11).

From the perspectives of the mentors, recommendations for developing sustainable logistics and supply chain management capacity-building programs in LMICs were depicted from the perspectives of Industry linkages, time to recruit the students in the program, training of the mentors, team projects, affordability of the projects and partnership with other institutions. A further justification of this is related to the works of (Braune *et al.*, 2021) that provided empirical evidence on the preparation and organization of online hackathons. Comments like: justified these:

> Linkages to industry and practical experience are critical (Mentor 4).

> The Mentees should be recruited at an earlier stage after joining the university and mentored throughout the four years (Mentor 12).

> The mentors' seminars should be conducted yearly to facilitate peer to peer learning (Mentor 6).

> Team projects should be encouraged instead of only individual project (Mentor 1).

> More funding in developing programs and faculty members (Mentor 5).

> Have more of the Internships through hackathon research projects (Mentor 7).

> Partner with more educational institutions to offer similar programs in the subject matter (Mentor 2).

These findings resonated with Angelidis *et al.* (2016) recommendations on similar events in countries in Latin America. The empirical evidence from these countries validated the recommendations on a framework to create homegrown health-care solutions in the developing world. Therefore, the hackathon project conducted in Kenya provides new frontiers in similar initiatives. Further, as Perry and Parikh (2021) argued, there is a need for effective mentorship (through hackathons) that can help strengthen the programs. This is also one effective way of ensuring the sustainability of university programs (Bag *et al.*, 2020). By and large Ulitin *et al.* (2022) recommended government health strategies and policies to incorporate solutions developed for interventions.

Based on the findings, five recommendations towards developing a sustainable logistics and supply chain management capacity building were provided in the following perspectives:

- introducing of internship with certification;
- adapting the local realities using local case studies;
- building local talent capacities;
- developing networks with local communities, engaging and educating them on matters supply chain; and
- initiating linkages to industry and practical experience as an integral part of these internships.

On the contrary, the mentors also recommended seminars that should be conducted yearly to facilitate peer-to-peer learning. The mentors also recommended encouraging team projects instead of only individual ones. This recommendation also augments that of the International University of Applied Sciences (2021) whose postulation was on the viable pathway

for transformation that provides a radical shift in the value system for creating innovative solutions.

Theoretical implication

Sensemaking theory is a valuable framework to understand how health-care students develop supply chain solutions during the COVID-19 pandemic. Sensemaking theory explains how people give meaning to their collective experiences, especially when they face uncertainty, disruption or change. In this paper, we use sensemaking theory to examine how students participate in an internship through hackathon initiatives, where they collaborate with mentors and peers to identify and solve emerging challenges in health-care supply chain management. The hackathon initiatives provide a context for students to engage in sensemaking processes, such as defining the problem, developing measures of impact, analyzing the performance of the proposed solution and implementing the innovative solution. We also propose that sensemaking theory can inform the design and evaluation of such initiatives and develop students' problem-solving and decision-making skills. Our paper contributes to the literature on sensemaking theory by applying it to a novel set of health-care student internship during a global pandemic. We also extend the literature on health-care supply chain management by highlighting the role of sensemaking in addressing the gaps and challenges exposed by COVID-19. Furthermore, we offer practical implications for educators and practitioners who want to use hackathon initiatives as a pedagogical tool for health-care students.

Practical implication

The COVID-19 pandemic has posed unprecedented challenges for the logistics and supply chain of essential medicines in LMICs. To address these challenges, this study explores the potential of a novel approach that combines internship, mentorship and hackathon projects for logistics and supply chain students. The aim is to narrow the gap between theory and practice and to develop innovative solutions for ensuring the availability of essential medicines during and after the pandemic. The study recommends that more resources should be mobilized to support more students and mentors in participating in such programs, as they significantly benefit the academic and industry sectors. The study also suggests that hackathon internship programs can be a viable avenue for adapting to the changing needs and demands of the logistics and supply chain industry in the post-pandemic era. The study provides insights for investors, universities and practitioners interested in mentoring young professionals for logistics and supply chains in the health-care industry.

Conclusions

This study during the COVID- 19 provides initial evidence for narrowing the gap between theory and practice through internship blended with mentorship and hackathon projects for logistics and supply chain students. This intends to develop practical solutions for ensuring the availability of essential medicine in LMICs during and after COVID-19 pandemic. The 12 projects profiled in this study demonstrate a broader perspective of innovative solutions of university students to challenges during and beyond COVID-19. Therefore, support the industry must support further such initiatives for sustaining the development of logistics and supply chain chains for health care. Students who participated in this first hackathon in an LMIC, Kenya, have demonstrated positive experiences.

Based on the limited number of students in this study (constrained by the available resources) this study recommends mobilization of more resources to support more students in developing capacity for the supply chain industry. Notably, the mentors who participated in this program volunteered. Based on this study's significant findings, it is necessary to develop an ecosystem that builds the capacity of the mentors working with students to develop their innovative ideas. This will, in turn, enhance their capacity as job-ready graduates. For practical implications, this paper provides insights for investors, universities and practitioners interested in mentoring young professionals for logistics and supply chain in the health-care industry. This specifically focuses on the benefits of implementing hackathon internship programs by identifying contingency factors affecting implementation such programs for health care during and beyond a pandemic.

In line with sensemaking theory (Weick *et al.*, 2005), this study demonstrates the importance of individuals and organizations adjusting how they work and their organizational processes to succeed. As exemplified by Christianson and Barton (2021), the health-care industry (and, in this study, logistic and supply chain) need to adjust its operations in the post-pandemic era. Hackathon, from this study, has proved to be one viable avenue that institutions and health-care industries can explore in this regard.

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