



C3SA

Cybersecurity Capacity Centre for Southern Africa

Reviewing cybersecurity capacity in a COVID-19 environment

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Introduction

The launch and setup in early 2020 of the new [Cybersecurity Capacity Centre for Southern Africa \(C3SA\)](#) at the University of Cape Town, the latest member of the Constellation of Cybersecurity Capacity Research Centres, coincided with the beginning of the Coronavirus pandemic. For C3SA and the Oxford-based [Global Cyber Security Capacity Centre \(GCSCC\)](#), which intended to train and mentor the C3SA researchers from March 2020 onwards, the travel restrictions imposed by several governments impacted all planned activities including training activities and C3SA's first deployment of the [Cybersecurity Capacity Maturity Model for Nations \(CMM\)](#) in Uganda.

The CMM review in Uganda had been scheduled for early April 2020. The [National Information Technology Authority-Uganda \(NITA\)](#) ('the host') had invited the GCSCC and C3SA six months earlier to conduct a [CMM re-assessment](#). The aim was to identify maturity developments and areas for further capacity building since the [first CMM review by the GCSCC in 2015](#)¹. In light of the unknown timescale of the pandemic and its impact on travelling, the partner centres proposed an adapted online CMM review to ensure the on-time delivery of the CMM report. Due to the commitment of NITA, and its previous experience with a CMM review, the proposal was accepted.

This short paper describes our experience navigating the challenges and opportunities of the pandemic, and what we learnt from this real disruptive global threat. We make recommendations to move forward to reap the benefits of virtual team meetings, research processes, and methodologies, while still striving to maintain the high standards and quality for which GCSCC and its partners are recognised.

1. The Cybersecurity Capacity Maturity Model for Nations

The CMM was developed by GCSCC in 2014 and refined in 2017 and 2020 using a multi-stakeholder approach, involving consultations with cybersecurity experts from the private sector, public sector and civil society.²

The CMM takes a holistic view of national cybersecurity through five Dimensions: (1) Cybersecurity Policy and Strategy; (2) Cyber Culture and Society; (3) Cybersecurity Education, Training and Skills; (4) Legal and Regulatory Frameworks; and (5) Standards, Organisations, and Technologies.³ The model has been deployed over 110 times in [more than 80 countries across the globe](#)⁴ to review national

¹ GCSCC (2016). 'Cybersecurity Capacity Review of the Republic of Uganda'. Available from: <https://gcsc.ox.ac.uk/files/ugandacmmpdf> [accessed 5 October 2020].

² GCSCC. (2016). 'Cybersecurity Capacity Maturity Model for Nations (CMM): Revised Edition'. Available from: <https://gcsc.ox.ac.uk/the-cmm> (accessed 5 October 2020).

³ GCSCC. (2016).

⁴ GCSCC. (2020). 'CMM Reviews around the World'. Available from: <https://gcsc.ox.ac.uk/cmm-reviews> (accessed 5 October 2020).



cybersecurity capacity and provide the recommendations to build capacity and cyber resilience. The CMM continues to be improved through formal revision cycles, using multi-stakeholder feedback, including international organisations and countries who are using it.

In February 2020 an independent evaluation of a sample of CMM deployments with representatives of the countries taking part in CMM reviews was conducted. The evaluation found that:

- The CMM is driving increased cybersecurity awareness and capacity building
- The CMM is contributing to greater collaboration within government
- Countries cited the CMM as foundational to their strategy and policy development
- Bringing together the right stakeholders to participate in the CMM Review process is key to the overall success of the CMM
- Trust is fundamental to focus group success and credibility of the CMM process
- A CMM review enhanced internal credibility of the cybersecurity agenda within governments
- Recommendations in CMM reports helped define roles and responsibilities within governments
- Subsequent to reviews funding for cybersecurity capacity building was often increased
- CMM Reviews help enable networking and collaboration with business and wider society

The Constellation comprising three leading cybersecurity capacity research centres coordinate the global and regional deployment of the CMM: GCSCC at the University of Oxford; the [Oceania Cyber Security Centre \(OCSC\)](#) in Melbourne, Australia; and C3SA at the University of Cape Town, South Africa.

2. The CMM methodology

A [CMM review consists of three core elements](#)⁵: desktop research; in-country modified focus groups; and a CMM review report including recommendations. The data is gathered through ten or more in-country modified focus-group discussions over three or four days with key stakeholders. Those are invited by the host government to contribute to this assessment which takes place in a large conference room in a horseshoe or roundtable setting. The desktop research before and afterwards aims to gather evidence to inform the modified focus groups and to confirm evidence afterwards.

The stakeholders who participate in a review are sorted in different clusters⁶. Each cluster consists of a group of stakeholders from sectors including academia, civil society, criminal justice and law enforcement representatives, ministries, legislators, critical national infrastructure owners, representatives from the private sectors and international partner organisations.

⁵ GCSCC. (2020). 'CMM Review Process'. Available from <https://gcsc.ox.ac.uk/cmm-review-process> (accessed 5 October 2020).

⁶ GCSCC (2020).



Each session of a CMM review focuses on around two Dimensions of the CMM, depending on the area of expertise of the participants. The researcher, who takes the role of a moderator, uses semi-structured questions to facilitate discussions among the participants. Rather than posing questions to every interviewee, the aim is to encourage stakeholders to adopt, defend or criticise different perspectives which are provided by other participants^{7 8 9}. The benefit of this methodology is that it allows diverse viewpoints and conceptions can emerge during data collecting. Compared to other qualitative research data collection methods, this interaction and tension make it possible for participants to either reach a level of consensus on the stage of maturity or to explicitly identify differing viewpoints. It also facilitates a better understanding of cybersecurity practices and capacities to be obtained¹⁰, and overall promises a richer set of data compared to other qualitative approaches^{11 12 13}.

The review is conducted under *Chatham House Rule* meaning that “participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed”¹⁴. Each session is recorded by the research team with the prior consent of participants and the resulting data is anonymised for analysis.

Once the data is collected from the desktop research and modified focus groups, a detailed CMM report is produced by the researchers. This report describes the in-country cybersecurity context, summarises the findings for each Factor and Aspect of the CMM, outlines the stages of cybersecurity capacity maturity and provides recommendations that enable the country to enhance its cybersecurity capacity. The report is peer-reviewed by the GCSCC Technical Board and submitted to the government for comment. It is at the discretion of the government to publish the report and share it with a broader audience.

During the CMM review in Uganda, the researchers also utilised the Structured Field Coding (SFC) Tool which was first piloted by the GCSCC in 2019 and complements the use of the modified focus groups for the field research. The tool allows the researchers to enter and code the answers from desktop research and the modified focus groups and enables them to validate indicators at each stage of the process.

⁷ J. Kitzinger. “The methodology of focus groups: the importance of interaction between research participants.” *Sociology of Health & Illness*, 16(1):103–121, 1994.

⁸ J. Kitzinger. “Qualitative research: introducing focus groups”. *British Medical Journal*, 311(7000):299–302, 1995.

⁹ E.F. Fern. “The use of focus groups for idea generation: the effects of group size, acquaintanceship, and moderator on response quantity and quality”. *Journal of Marketing Research*, Vol. 19, No. 1, pages 1–13, 1982.

¹⁰ J. Kitzinger. “Qualitative research: introducing focus groups”. *British Medical Journal*, 311(7000):299–302, 1995.

¹¹ Williams, M. (2003). *Making sense of social research*. London: Sage Publications Ltd. doi: 10.4135/9781849209434

¹² Knodel, J. (1993). “The design and analysis of focus group studies: a practical approach”. In Morgan, D. L. *SAGE Focus Editions: Successful focus groups: Advancing the state of the art* (pp. 35–50). Thousand Oaks, CA: SAGE Publications Ltd. doi: 10.4135/9781483349008

¹³ Krueger, R.A. and Casey, M.A. (2009). *Focus group: A practical guide for applied research*. London: Sage Publications LTD.

¹⁴ Chatham House (2020). ‘Chatham House Rule’ Available from: <https://www.chathamhouse.org/chatham-house-rule> (accessed 5 October 2020).



3. Disruption from COVID-19

The World Health Organisation announced the COVID-19 pandemic in March 2020.¹⁵ The health and economic impact of the pandemic has been significant. It is unknown when the pandemic may end, though it is clear that the impact will continue to be felt by the global community for an extended period once the pandemic has passed. The global response and recovery effort has to date relied heavily on a rapid increase in demand for digital technology and Internet access to support various activities. These include: exchange of information between governments, medical professionals and other emergency workers to assist response and recovery; dissemination of information to inform the public of rapidly changing conditions; provision of e-health, e-learning, remote work, social connection and entertainment.^{16 17 18 19 20}

In terms of cybersecurity, the risks to the confidentiality, integrity or availability of information stored or processed has been increased. Examples include:

1. increased dependency on digital technologies that require Internet access, makes the capacity, resilience and protection of the national Internet infrastructure a priority;
2. when responding at pace, organisations may not have sufficient time to identify and manage risks effectively, especially when adopting technology they have not used before;
3. users are unfamiliar with new technology, unaware of the risks of using it and how to protect information; and
4. malicious cyber actors, including cybercriminals and Advanced Persistent Threats (APTs), see opportunities and respond through increased targeted and themed attacks to steal information and infiltrate systems.^{21 22}

¹⁵ World Health Organization. (2020). 'WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020'. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> (accessed 24 March 2020).

¹⁶ Ting, D.S.W., Carin, L., Dzau, V. and Wong, T.Y. (2020). 'Digital technology and COVID-19'. *Nature Medicine*, pp.1-3.

¹⁷ World Health Organization. (2020b). 'Digital technology for COVID-19 response'. Available from: <https://www.who.int/news-room/detail/03-04-2020-digital-technology-for-covid-19-response> (accessed 27 April 2020).

¹⁸ Newman. (2020). 'Digital Transformation For Good Shines As We Fight COVID-19'. Available from: <https://www.forbes.com/sites/danielnewman/2020/04/10/digital-transformation-for-good-shines-as-we-fight-covid-19/> (accessed 27 April 2020).

¹⁹ Beech. (2020). 'COVID-19 Pushes Up Internet Use 70% And Streaming More Than 12%, First Figures Reveal'. Available from: <https://www.forbes.com/sites/markbeech/2020/03/25/covid-19-pushes-up-internet-use-70-streaming-more-than-12-first-figures-reveal/> (accessed 27 April 2020).

²⁰ Alba and Kang. (2020). 'So We're Working From Home. Can the Internet Handle It?'. Available from: <https://www.nytimes.com/2020/03/16/technology/coronavirus-working-from-home-internet.html> (accessed 27 April 2020).

²¹ US CERT. (2020). 'Alert (AA20-099A): COVID-19 Exploited by Malicious Cyber Actors'. Available from: <https://www.us-cert.gov/ncas/alerts/aa20-099a> (accessed 27 April 2020).

²² ACSC. (2020). 'COVID-19 cyber security advice'. Available from: <https://www.cyber.gov.au/COVID-19> (accessed 27 April 2020).



The US and UK governments describe detected COVID-19-themed and targeted malicious cyber-activity as including:²³

1. email and SMS Phishing *“using the subject of coronavirus or COVID-19 as a lure... encouraging the victim to visit a website that malicious cyber actors use for stealing valuable data, such as usernames and passwords, credit card information, and other personal information.”*;
2. email Phishing with COVID-19 themes to distribute malware via encouraging users to open an attachment or visit a malicious website and download malware infected files;
3. *“Registration of new domain names containing wording related to coronavirus or COVID-19”* to assist Phishing attacks or distribute malware; and
4. increased *“attacks against newly—and often rapidly—deployed remote access and teleworking infrastructure”* that several organisations have deployed in response to the pandemic.

While it is unclear when the COVID-19 pandemic will end, it is clear that with increasing demand for Internet access and digital technology that cybersecurity will become an increasing priority for governments, organisations and individuals across the world. Therefore, there is an increased and long-term need for countries to evaluate their current national cybersecurity maturity. They need to identify gaps and inform capacity building efforts to strengthen resilience. Undertaking a CMM review is a proven process to achieve these goals and the Constellation are committed to continuing to support countries on this journey, towards a safer and more secure cyberspace for all.

It is important that future CMM reviews consider both ethical and logistical concerns of face-to-face modified focus groups during a pandemic. Thus, the Constellation has piloted a potentially alternative approach to deploying the CMM.

4. Adapting the CMM methodology to an online environment

To conduct a cybersecurity capacity maturity assessment, all elements of the CMM review methodology, as described in section 2, were essential to gain an understanding of the existing capacities and gaps in the country. In particular, the consultations with cybersecurity experts in a country were key and had to be underpinned by evidence collected during the desktop research. Therefore, the GCSCC and C3SA decided to adapt the methodology in two ways for the CMM review in Uganda:

Firstly, the desktop research was extended as the centres anticipated that they would gather less data through this modified online focus groups²⁴. Therefore, a detailed desktop research report prior the

²³ US CERT. (2020). ‘Alert (AA20-099A): COVID-19 Exploited by Malicious Cyber Actors’. Available from: <https://www.us-cert.gov/ncas/alerts/aa20-099a> (accessed 27 April 2020).

²⁴ Kite J and Phongsavan P. Insights for conducting real-time focus groups online using a web conferencing service [version 2; peer review: 2 approved]. *F1000Research* 2017, 6:122 (<https://doi.org/10.12688/f1000research.10427.2>)



online session was produced to complement the data set. For that, the researchers reviewed existing literature and official documents and summarised the evidence – if available – for each factor of the CMM

Secondly, the modified focus-group discussions were undertaken entirely online. Online groups have been utilised in academic research for a long time. Their benefits are that they allow geographically dispersed participants (and in this case also the research team) simultaneously contributing from different sites^{25 26 27}. To translate the benefits of the original CMM review methodology, a synchronous (real-time) approach was chosen to create the same level of trust between the research team, the participants and the host (who participated as an observer) as in a normal CMM review. It also enabled the same active interactions and debate which are the central element of the CMM review focus groups (see section 2).

As in the offline approach, each CMM Dimension would be covered at least twice²⁸ during each session. However, for the online format, the stakeholders per [cluster as described above](#) were adapted in the following way: to reduce the number of participants per session from between 10-15 to around five invitations were sent out to have at least two representatives from different organisations and/or different sectors for each stakeholder cluster present in the focus groups. The smaller groups helped to prevent chaotic discussions and simultaneous conversational threads developing which can be observed in online focus groups²⁹. It should also ensure that each participant would be able to contribute as much as possible. The overall slimmer approach to the sessions should give researchers also the opportunity to ask additional questions arising from the extended desktop research. The sessions which were scheduled over three weeks instead of three days to allow the research team to reflect and consolidate notes between sessions. The length of each session (90 min) was maintained.

5. Lessons Learnt and Experiences of the Research Team Deploying the CMM

To inform upcoming CMM reviews, both offline and online, several lessons learnt can be taken from this first online CMM. Among them are the venue, the communication, and the report writing phase.

²⁵ Stewart K and Williams M (2005) Researching online populations: the use of online focus groups for social research". In *Qualitative Research*. SAGE Publications (London, Thousand Oaks, CA and New Delhi) vol. 5(4): 395-416. doi: 10.1177/146879410505691

²⁶ Kite J and Phongsavan P (2017) Insights for conducting real-time focus groups online using a web conferencing service [version 2; peer review: 2 approved]. *F1000Research* 2017, 6:122 (<https://doi.org/10.12688/f1000research.10427.2>)

²⁷ Moore T, McKee K and McLoughlin P (2015) Online focus groups and qualitative research in the social sciences: their merits and limitations in a study of housing and youth. *People, Place and Policy* (2015): 9/1, pp. 17-28. DOI: 10.3351/ppp.0009.0001.0002

²⁸ GCSCC (2020). 'CMM Review Process. Available from <https://gcsc.ox.ac.uk/cmm-review-process> [accessed 5 October 2020].

²⁹ Stewart, K. and Williams, M. (2005). "Researching online populations: the use of online focus groups for social research". In *Qualitative Research*. SAGE Publications (London, Thousand Oaks, CA and New Delhi) vol. 5(4): 395-416. doi: 10.1177/146879410505691



During normal CMM reviews (as described in section 2), the sessions take place in a large conference room where participants sit around a table facing each other. This physical set-up enables the interaction between all participants and the researcher, who moderates the discussion, by giving the floor to different participants as and when appropriate. During online modified focus-group discussions, it was observed that the interaction was not always as smooth as the moderator would not always see a raised hand.

Attendance was lower than expected. One reason was the fact that people had to connect from their homes. However, in Uganda, most homes do not have Internet access. The country has an Internet penetration of 14% and, as with most African countries, Internet-enabled devices are not affordable³⁰. The problem of limited Internet access was confirmed during follow-up discussions with the host. It was also observed that people struggled to connect on time as they were using the platform for the first time. It was not always possible to start a session without all participants being online because all participants are considered key informants of the session. This caused the sessions to be interrupted or to take longer than the allocated time. Furthermore, some participants experience poor, expensive, or no connection at all, which would make it impossible for them to take part in the online modified focus-group discussions.

Physical CMM reviews provide opportunities for communication not possible online. One limitation with the online sessions was the inability to have informal conversations and side meetings with participants during breaks or between and after sessions. So it was also not possible to network with the participants, and be able to properly identify them to the host in order for follow-up questions.

While modified focus-group discussions in a physical setting provide opportunities for communication that are not available online, there are advantages to the online approach when compared to the physical setting. One advantage of online is that both the research team and the participants do not need to travel and they can connect from a location of their convenience. Further, the online CMM review offers the use of the *chat* feature on the meeting platform which enriches the experience with additional options for communication. The chat feature can be used to share information and links to documents during the meeting or to exchange private messages between the organisers. For instance, during the CMM review in Uganda the researchers send the link to the introductory slides via the chat function to the participants; vice versa, participants shared information such as links to websites and documents quickly during the discussions.

The online CMM has been affected by two interrelated issues: the quality of the network connection and whether video was on or off. Due to the poor network quality, we resorted to switching off the video connection, at times only the person speaking had the video on. When the quality of the connection was good, even without video, the discussion flowed. However, when the quality of the

³⁰ Gillwald, A., Mothobi, O., Tusubira, F., & Ndiwalana, A. (2019). The State of ICT in Uganda (Policy Paper No. 8; Series 5: After Access – Assessing Digital Inequality in Africa). Research ICT Africa. https://researchictafrica.net/wp/wp-content/uploads/2019/05/2019_After-Access-The-State-of-ICT-in-Uganda.pdf [accessed 5 October 2020].



connection was low, communicating was a challenge and people were either not heard or they had to repeat themselves several times. Important information may have been missed that way. In spite of the connectivity challenges, all our participants were patient and overlooked connection breakdown, background noise or impromptu interruptions: They were enthusiastic to contribute to discussions.

At times it was difficult to moderate the online modified focus-group discussions, particularly when the video was off. When the CMM review is conducted in a physical meeting room, or when the video is turned on for the moderator and the participant, there is face-to-face interaction. In this way, the moderator is able to pick cues from facial expressions, gestures and posture and can then direct the discussion as required. This is possible with video to a limited extent, but not at all when video is turned off. The only cue for the moderator is when there is no answer to her/his question. In this case, s/he has to rephrase or change the question in the hope of breaking the silence. But there may be other reasons for silence that may not be obvious unless all people are in a face-to-face setting.

Meetings were recorded using external, encrypted audio recorders to ensure the security of the collected information. While many online conferencing systems allow recording, there are issues of confidentiality of the video recordings so they can be used for the CMM because of the requirement to there is a need to keep the identity of participants in the focus-group discussion confidential. The selection of the system used for the online CMM review is therefore critical as it must meet the security and legal requirements for protecting the data being collected from participants.

Based on our observations, one can conclude that an online CMM review is possible; however, the experience might be enriched by more preparation, including allowing participants more time to familiarise themselves with the platform to be used and download the application which some of them had not done when the meeting started. While connectivity problems are not easy to solve, having participants enable video should be encouraged whenever possible. The low attendance has resulted in data gaps that required follow-ups with the host. This delayed the completion of the project.

In summary, the terms of advantages and disadvantages of online CMM reviews are:

Advantages

- **Possible in spite of COVID-19 restrictions;** CMM review activities become possible without the risk of spreading the virus.
- **No need to travel;** it saves on time, and costs the impact of travel on the environment.

Disadvantages

- **Less social interaction;** It is more difficult to build a trust basis between researchers and participants.
- **Different character of focus groups;** Online focus groups are more difficult to moderate and side-discussions by participants during the focus group session can change the outcome.



- **Flexible scheduling of sessions;** it is possible to carry out focus group discussions over a week or two instead of three days and still keep costs down;
- **Ease of sharing documents;** communication is enhanced by the ease of sharing information by posting it on the meeting platform chat; for instance, to share documents or links to sites for all participants.
- **High-speed internet access;** online CMM requires each participant to have a high-speed and reliable internet connection in order to take advantage of the richness of video communication; this is not always possible.
- **Requires a back-up plan in case the internet fails;** transitioning from an online platform to the telephone could be complicated.
- **Requires participants to have digital skills or technical support;** if participants attend from their home or individual offices, the online CMM requires participants to know how to use the meeting platform, or to have help readily available if they struggle. The high level of support required forces the client to have personnel on standby to provide the required support.
- **Video conferencing facilities required in the host country;** If focus groups participate from a meeting room, video conferencing equipment with suitable microphones and camera is required, which is not always available.

6. Future research

The limitation of this article is that the data is taken from only one CMM review and the host country had previously undertaken a CMM review. Both the host and the participants were already familiar with the process and it was therefore easier to adapt to the new situation. However, this first experience with facilitating modified focus groups online was essential and provided useful lessons learnt for online focus groups in general.

Despite the pandemic there is continued demand for CMM reviews from countries and implementation partners. The Centres will therefore continue to refine the adapted approach to conducting CMM



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reviews online, enabling the collection of high-quality data to inform CMM reports and related research to build capacity and strengthen cyber resilience. As more online CMM reviews are deployed, more will be known and what works well and what doesn't.

Based on the described lessons learnt the following elements may become integrated into the revised methodology: SFC tool application throughout the process; kick-off presentations, briefings and webinars about the CMM for stakeholders in the host country; additional expert interviews, and validation workshop(s) (e.g. online or physical).

A future focus of our research will include working with the private sector, public sector and civil society across nations with different levels of digital transformation and cybersecurity maturity, examining what factors may assist in pandemic response. Furthermore, solutions that extend remote meetings to support spontaneous side meetings or networking during breaks could reduce some of the disadvantages of online CMM reviews. However, such solutions are currently not available and require additional research.