Material Supply Strategy in a Crisis

PART 2

An international study on the public procurement preparedness for future crises - learnings from Covid-19

This research is funded by ZonMw as part of the COVID-19 Programme

ZonMw

This research is a collaboration between:

PPRC PUBLIC PROCUREMENT RESEARCH CENTRE

UNIVERSITY OF TWENTE.

Erasmus University Rotterdam

IRSPP
International Research Study of Public Procurement

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February 2022

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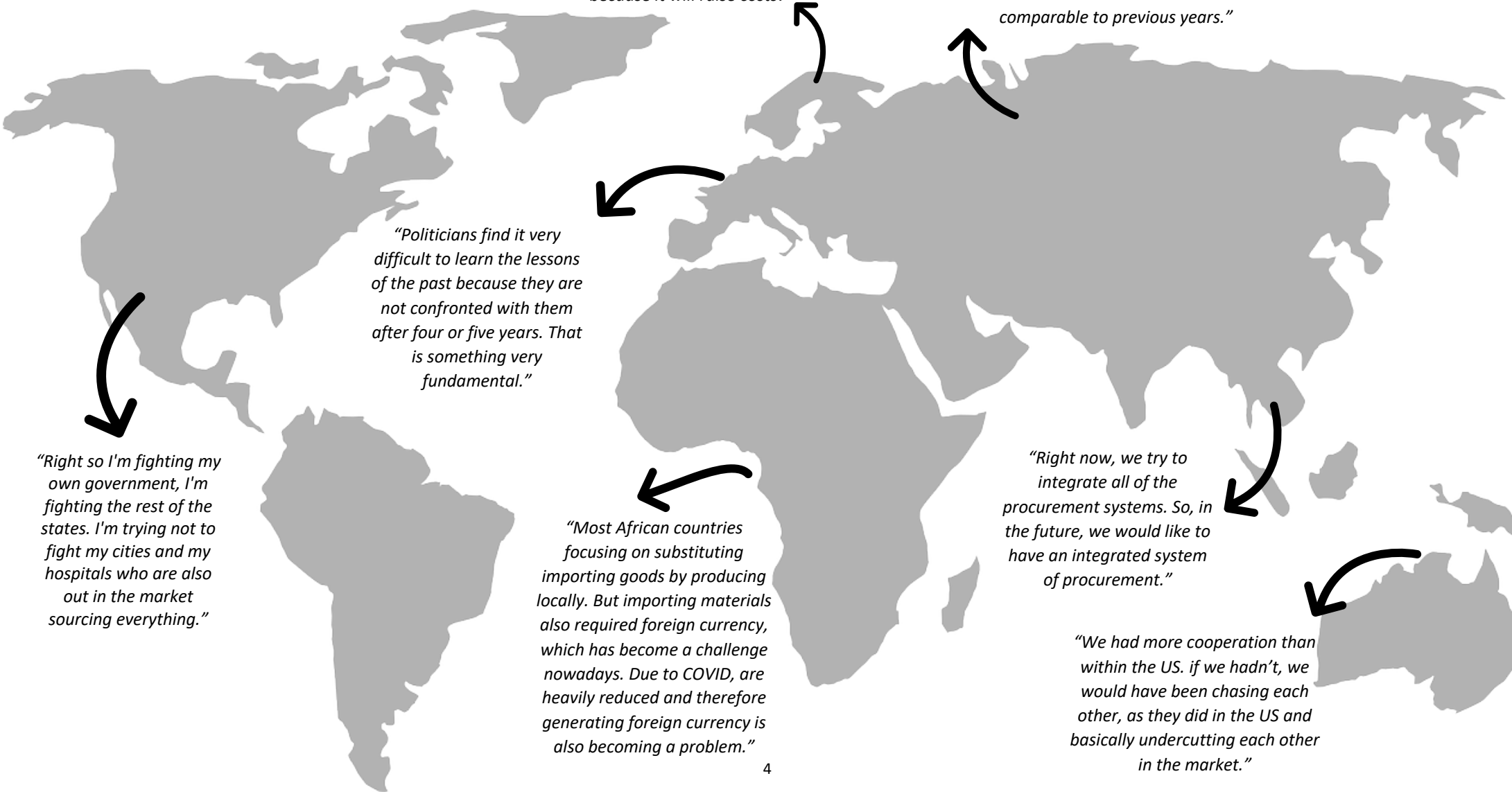
"As procurement professionals, we are trained to have the cost focus, everything we do is based to lower the cost. So the question of redundancy is, I think, a political question, because it will raise costs."

"For Germans, yes, it is emergency. But for Russia, yes last year was difficult, but many years before as well. So, of course, it was not good, but this year in some sense was more or less comparable to previous years."



"Politicians find it very difficult to learn the lessons of the past because they are not confronted with them after four or five years. That is something very fundamental."

"Right so I'm fighting my own government, I'm fighting the rest of the states. I'm trying not to fight my cities and my hospitals who are also out in the market sourcing everything."

"Most African countries focusing on substituting importing goods by producing locally. But importing materials also required foreign currency, which has become a challenge nowadays. Due to COVID, are heavily reduced and therefore generating foreign currency is also becoming a problem."

"Right now, we try to integrate all of the procurement systems. So, in the future, we would like to have an integrated system of procurement."

"We had more cooperation than within the US. if we hadn't, we would have been chasing each other, as they did in the US and basically undercutting each other in the market."

Chapter 1: Introduction

1.1 Rationale for this research

The COVID-19 pandemic has caused unprecedented peaks in demand for personal protective equipment (PPE), intensive care unit (ICU) equipment, and other medical materials, while supply chains have become severely disrupted because of suspended production owing to worldwide lockdowns, export bans, and travel limitations. Under normal circumstances, medical materials such as face masks, gloves, hand sanitizer, medical coats, and aprons are routine procurements for healthcare providers. The supply of these materials in healthcare is an operational activity, with an emphasis on cost efficiency.[1]

In the wake of the COVID-19 pandemic, the supply of materials has proved to be an essential function of the healthcare chain.[2] The capacity of healthcare systems worldwide is bound by the availability of PPE and respiratory equipment, such as ICU ventilators and related equipment. Strategies of governments to fight the spread of COVID-19, to minimize the risk for frontline workers, and to minimize the impact on economies have become directly tied to the availability of PPE, ventilators, testing equipment, and—in due course—vaccines. To summarize, the availability of medical equipment went from an being operational routine matter to a matter of strategic importance, with an impact on the overall strategy to fight COVID-19 and minimize its societal impact.

Traditional procurement strategies for these medical materials have proved to be ineffective during the COVID-19 crises. Hospitals, care providers, and soon to follow, local and national governments were forced to improvise to gain sufficient volumes of adequate medical materials and to get these materials to the right place at the right time.

Learning from COVID-19 regarding supply strategies could save lives and reduce the overall impact on economies and societies worldwide in the future. As established in Part I of this research, Dutch evidence suggests that there is much to gain from nations being prepared for a crisis that leads to shortages of critical (medical or other) materials. Therefore, this second part of the research focuses on future preparedness for crises from a procurement perspective.

1.2 Research aim

The research project “Material Supply Strategies in a Crisis” (MaSSC) was divided into two parts. In part I of the research, the focus was on understanding supply strategies in light of the context (i.e., the national healthcare system), the problems faced during the first wave of COVID-19, and the challenges encountered in effectuating supply strategies. Part I of the study focused exclusively on the Netherlands.

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[1] Livingston, E., Desai, A., & Berkwits, M. (2020). Sourcing personal protective equipment during the COVID-19 pandemic. *Jama*, *323*(19), 1912-1914.

[2] Bhattacharya, S., Hossain, M. M., & Singh, A. (2020). Addressing the shortage of personal protective equipment during the COVID-19 pandemic in India-A public health perspective. *AIMS Public Health*, *7*(2), 223.

Having identified the relevant themes and areas where challenges arose in a detailed analysis of one country, this study focuses on other countries' perspectives on future preparedness. Having learned from COVID-19, what are the countries planning to do to prevent the problems similar to those encountered in the early phase of COVID-19 when a new (health) crisis emerges? From a professional purchasing and supply management perspective, acknowledging the evidence from research on COVID-19, what *should* countries do to be better prepared?

In part II, we complement the in-depth perspective on the case of the Netherlands with an overview of supply strategies, lessons learned, and insights into preparedness for future health crises from 45 experts from 33 countries around the world. This study addresses two main research questions concerning the procurement and supply of products that are scarce in a crisis.

- What *are* the countries doing to prepare for a future crisis from a supply management and procurement perspective?
- From an informed expert point of view, what *should* countries do to prepare for future crises?

While the lessons learned in this research are borne out of the COVID-19 pandemic, we aim to look beyond the scope of a future pandemic and address future crisis preparedness from a supply management and procurement perspective in general.

The remainder of this report is organized as follows. Section 2 introduces the study's research design. The research builds on a prior study that identified five themes of supply chain and procurement challenges during the COVID-19 pandemic.[3] We used these five themes to organize the responses of the interviewed experts in Chapter 3. Chapter 4 organizes the countries included in this study into clusters according to their main procurement challenges and preparedness focus. These different clusters relate to the extent to which countries faced procurement and supply issues (and what issues were perceived as predominant), as well as the countries' crisis preparedness before COVID-19. The extent to which countries faced issues should not be perceived as a "performance measure" or preparedness maturity level per se, because external factors (e.g., the level of isolation) influence the degree to which countries are affected by COVID-19. Chapter 5 addresses such external factors based on the five clusters. Finally, Chapter 6 draws conclusions with respect to the analyses presented in Chapters 3 to 5.

[3] The five themes are Governance, Regulations and procedures, Supply side issues, Skills and competences, and Information systems. Reference: Harland, C.M., Knight, L., Patrucco, A.S., Lynch, J., Telgen, J., Peters, E., Tátrai, T. and Ferk, P. (2021), "Practitioners' learning about healthcare supply chain management in the COVID-19 pandemic: a public procurement perspective", International Journal of Operations & Production Management, Vol. 41 No. 13, pp. 178-189. https://doi.org/10.1108/IJOPM-05-2021-0348

Chapter 2: Research design

2.1 Research strategy

The aim of this research was to provide actionable, evidence-based insights into the lessons learned by public procurement experts from various cultural and institutional backgrounds worldwide. Interviews with professionals were the primary method for data collection. Evaluative questions elicit knowledge and opinions on procurement preparedness for future emergencies. Through the data collected using interviews, this research process fosters learning and accommodates the varied perspectives and experiences of all the interviewees. Understanding this diversity and its ramifications is critical for developing public procurement objectives for medical equipment in the future. The perspectives of the interviewees are often aligned; however, it is also common for interviewees' responses to differ significantly. This variety was recognized and valued in our research and reporting of the findings. As this is not an audit, we will not be able to reconcile all points of view and provide precise recommendations. Rather, the goal of this research is to gather and combine a variety of viewpoints and insights into a coherent narrative of what experts learned from their experiences during the highly dynamic and uncertain times of COVID-19.

2.2 Scope of the research

This study focuses on medical materials that became scarce because of the increased demand and disrupted supply chains during the first wave of COVID-19. This includes the supply (procurement and/or production, supply, and distribution) of materials for care: face masks (FFP2), surgical face masks, gloves, coats, hand alcohol, ICU equipment (respiratory equipment and pumps), and testing materials (nose swabs). While we recognize that this includes a variety of different medical products, each with its own supply challenges during COVID-19, we do not differentiate the supply strategies and consequences in our study. When facts and findings are only relevant to a certain type of product, we specifically address them in the report.

2.3 Data collection

Using the existing network from the International Research Study on Public Procurement (IRSPP),[4] we included 33 countries across the world, varying in terms of the healthcare system, level of development, and relative success in fighting COVID-19. For each of these countries, we interviewed one or multiple senior procurement practitioners or senior procurement researchers with adequate knowledge of the subject matter in their country. We conducted interviews with 45 participants between June and October 2021. Table 1 summarizes the variety of the interviews. While the variety of countries and experts is valuable, it is not a perfectly structured sample, which reflects how difficult it was for interviewees to find the time to talk while simultaneously dealing with COVID-19.

[4] IRSPP is an international network of public procurement scholars that organizes a biannual research workshop for government CPO's and public procurement practitioners with attendees from over 50 countries, worldwide. (https://irspp.org/)

Table 1: Overview of interviewed experts

Geographic locations*	Number of countries	Countries	Number of experts
Africa	5	Ethiopia, Rwanda, South Africa, Uganda, Zimbabwe	7
Asia	3	Bhutan, India, Indonesia	4
Eastern Europe	5	Bulgaria, Hungary, Poland, Romania, Russia	5
Northern America	2	Canada, United States	5
Northern Europe	7	Finland, Iceland, Ireland, Norway, Sweden, Scotland, Wales	8
Oceania	2	Australia, New Zealand	3
Southern Europe	6	Croatia, Italy, Portugal, Serbia, Slovenia, Spain	6
Western Europe	3	Belgium, France, Germany	7
Total	**33**		**45**

** Divided based on United Nations geographic locations*[5]

The interviews consisted of four main questions, each with sub-questions (see Appendix 1) aimed at soliciting the interviewee's motivation, and a detailed explanation of the answers provided.

1. Having learned from Covid-19, what does public procurement preparedness for a future health crisis look like in your country/state?
    - What actions or preparations **are now** being made in your country to be better prepared for the next global crisis?
    - Which actions or preparations **should be** taken by your country to be better prepared for the next global crisis?
2. How should the ideal procurement system work in the next crisis in relation to the five themes that arose in a prior study?
3. How is the procurement system organized in normal circumstances? What kind of healthcare system does your country have?
4. Closing question: Did we miss anything?

This study complies fully with the academic and ZonMw standards for research ethics and open science. The ethical approval and data management processes were managed by the University of Twente. The interviews were recorded and fully transcribed. The transcripts were systematically coded in Atlas.ti to support the systematic data analysis. More details on the research design, such as the methods for data processing and data management can be found in Appendix 1.

[5] https://unstats.un.org/unsd/methodology/m49/

2.4 Analysis of the interview data

Early in the summer of 2020, an exploratory international study inventoried the procurement challenges during the early phase of COVID-19. This study captured five themes based on the challenges: governance, regulations and procedures, supply side issues, skills and competences, and information systems. We used these themes in our interviews (see interview question 2) to identify what countries are doing, or should be doing according to expert opinions, in relation to these themes. Therefore, in this report, we categorized the findings according to these themes in Chapter 3.

Simultaneously, it became apparent that certain clusters of countries dealt with similar challenges and obstacles. To better understand future preparedness and identify similarities and differences between groups of countries, we identified five clusters of countries in which each cluster demonstrated a certain degree of similar main challenges, and consequently, similar focus areas for improving future preparedness for new crises. Chapter 4 introduces these clusters and the main challenges and strategies for improving the countries within each cluster. For each chapter, a more detailed methodology, specifically focused on that chapter, is provided at the beginning.

2.5 Analysis of external influences

The clusters mentioned in the previous paragraph were established based on the similarities in the challenges and (subsequent) focus areas for preparedness, as found in the interview data. However, we acknowledge that the challenges should be considered in light of certain external factors that influence (1) countries' abilities to deal with pandemics such as COVID-19 and (2) countries' bottlenecks or abilities to improve future preparedness for a new (health) crisis. Two external influences are discussed in Chapter 5: the level of wealth of countries and country geography – more precisely, the level of isolation. Wealth relates to both, an existing level of procurement maturity prior to COVID-19 as well as opportunities to invest in improving preparedness. Wealthy countries may have a better starting position – in terms of necessary conditions – both to deal with a pandemic now and to improve their preparedness for a future crisis. Besides the wealth of a country, its geography determines the difficulties faced in battling a pandemic – where very isolated countries such as islands are better positioned to control a virus compared to very "connected" countries. Chapter 5 addresses the impact of these factors on the clusters introduced in Chapter 4. Finally, Chapter 6 combines the findings of this study.

Chapter 3: Identification of five themes

Method

In the early summer of 2020, an exploratory international study inventoried the procurement challenges in the beginning of COVID-19. This study captured five themes based on practitioners' learnings of procurement and supply challenges in the pandemic[1]:

1. *Governance*: coordination and rivalry; organization and maturity
2. *Regulations and procedures*: procurement laws and existing crisis procedures
3. *Supply-side issues*: vulnerabilities and commitments to the supply base
4. *Skills and Competences*: individual professionalism; supply chain management
5. *Information systems*: digitalization; data management

In the preliminary round of coding of our data (*see appendix 2*), we identified the main message(s) per expert and found that these main messages of our interviewees were corresponding to the five themes (*see appendix 3*). Hence, our insights were coded according to these five themes and our findings in this chapter are reported using the five themes as a categorization.

3.1 Governance

The governance of medical equipment during the pandemic is a focal point of discussion, as experts have an in-depth understanding of the implications of governance. Not only the differences between decentralized and centralized approaches in times of crisis, but also the challenges with regard to collaboration and fair distribution are often debated. In this section, we discuss the seven important aspects of governance identified by the interviewees. First, we discuss the differences between centralized and decentralized approaches based on the experiences of our experts. Second, we discuss two extreme cases: one in which collaboration worked well, and one in which rivalry took the upper hand. The discussion on which factors were most likely to cause differences between the two approaches is important. The following sections discuss local empowerment, calling on the private sector, the relationship between knowledge and power, fair distribution challenges, and international collaboration.

3.1.1 Differences between the centralized and decentralized approach

The difference between centralized and decentralized purchasing regarding the supply of medical equipment is highly debated. In Appendix 4, we provide different perspectives of experts who worked either in a decentralized or a centralized approach during COVID. Interestingly, even though these discussions on what works better are very popular, our interviews with experts show that these perspectives vary greatly. One expert, for example, experienced a centralized approach, which, according to him, led to high (ineffective) bureaucracy. However, another expert, who also experienced a centralized approach, was very happy with their results, arguing that centralization increased professionalization and

resource pooling. A similar pattern is visible in countries with decentralized structures. On the one hand, decentralization leads to difficulties in communication and high variability in professionalization and practices, which makes centralization desirable. On the other hand, decentralized governance worked well because of cooperation at the national level, which translated to the state level. Overall, the preliminary conclusions are that the decentralization versus centralization debate cannot be easily answered and is dependent on many factors, which will be elaborated upon in the following sections.

3.1.2 Two extreme cases of cooperation and collaboration

Difficulties in collaboration, communication, and cooperation were mentioned by our interviewees as the main challenges of governance, which are often linked to a decentralized approach. In our dataset, we identified two extreme cases: on the one hand, experts from one country who were very satisfied with their collaborative approach, and on the other hand, experts from another country that were highly dissatisfied with their collaborative approach. The former country is Australia and the latter is the United States. Interestingly, both countries were governed by a decentralized healthcare approach, albeit with a different degree of decentralization. As such, we attempted to unravel the different factors that could have impacted the degree of collaboration and cooperation, which can be found in Appendix 4.

In doing so, we cautiously conclude that cooperation and collaboration are a product of 1) structural complexity (the depth of decentralization embedded in the system) and 2) the willingness to collaborate and the level of trust throughout the system. Comparing the United States with Australia, we see that the structural complexity of the United States (i.e., the high degree of decentralization, which is deeply rooted in American culture) makes it very difficult to collaborate and coordinate. However, interviewees (sometimes directly, sometimes indirectly) argued that the complexity of cooperation goes deeper than that. This highly fragmented approach is intensified by a lack of trust and resistance, which increases internal rivalry. However, in Australia, structural complexity was less of an issue for successful collaboration, as can be seen by quotes on the formation of a national cabinet (Appendix 4). The Australian government was leading by example with respect to coordination. This translated to other stakeholders doing the same, which requires both willingness and trust throughout the system.

In summary, issues such as resistance, trust, willingness, and the degree of centralization are all factors that should be considered for better future preparedness with regard to network governance. High trust and willingness in Australia ensured that a switch towards a more collaborative approach in times of crisis was possible, whereas this was not the case in the United States.

3.1.3 The local empowerment tradeoff

One factor influencing the decentralization versus centralization debate is the power of the municipalities and states. On the one hand, experts recognize the importance of engaging local leaders with respect to capabilities and networks, but on the other hand, decision-making is slow when many decision-makers are included in the process. For example, one expert explained how he thought the decentralized approach of China worked well, where the Hubei province held local power to contain the COVID crisis as soon as possible, whereas another argued that it was too time consuming. Appendix 4 provides an overview of the different perspectives (including quotes) of the interviewees.

3.1.4 Disconnect between knowledge and power: expertise not within central purchasing body

The debate on centralization is centered around the need for expertise in the right places. However, experts have indicated a disconnect between knowledge and power. One expert argued for a central decision structure within the Ministry of Defense (MOD). His argument is that the medical equipment specialists are a part of the ministry in his country; as such, the central decision-making should be at the Ministry of Defense. Other experts have argued that the same applies to different departments. However, in all cases, these departments were not responsible for decision making due to a disconnect between knowledge and power. This disconnect is a consequence of the government intuitions' need for control, or, as another argument, it is a product of a lack of trust. An overview of other experts' perspectives, who argue for a shift in central control, is provided in Appendix 4.

3.1.5 A perceived lack of fair allocation of scarce materials

Centralized buying is only effective if it is followed by a fair allocation among dependent health organizations of scarce materials. Even though this makes intuitive sense, many experts indicated that this was a difficult task, which often caused tensions between different healthcare sectors, such as care and cure institutions. Care institutions (i.e., hospitals) are often prioritized over cure institutions (i.e., nursing homes). These difficulties mainly stem from two reasons: the first is that the allocation is based on past allocations, as exemplified by a North American expert: "*What we found out here is that the governance structure was very flawed. It basically did allocation in ways that did not have rules and did it on the basis of past allocations, not anything that really related to what was occurring during COVID.*" Second, prioritizing and allocation schemes were not considered before COVID-19, such as in the example of an expert from Oceania: *"there was inadequate PPE procured to cover nursing homes, aged care homes and facilities, and housing people with profound disabilities. That was really a federal government responsibility to make PPE available and to support the states in obtaining it. However, the federal government was very poor at distributing it."*

3.1.6 Calling on the (expertise of the) private sector

Room for improvement with respect to the governance of medical supplies lies within learning from and collaborating with the private sector: "I think that there should be some kind of national level center, that is already working with the private sector, if something like this happens again. So, there should be, I would not say an organization, but more like a virtual organization of the best purchasers. They know that in China, we can get this and this material, and from Vietnam, we can get this and this material. So, I think that the national government should take care of that and somehow involve the companies who have good purchasing channels and good purchases already, before the same kind of situation hits us again" (Northern European experts). These collaborations can enhance knowledge, enlarge networks, and provide available infrastructure. At the same time, according to an Eastern European expert, a combination of private and public healthcare institutions allows for stronger hospitals and more financial resources. However, an Asian expert sees a perceived barrier to these private advantages, which is the fear of loss of control.

3.1.7 Transcending national collaboration to reach international collaboration

Experts have pointed out that national network governance is not sufficient to overcome the challenges regarding the rivalry of medical equipment. Especially, southern European experts argue for more collaboration within the European Union: *"Europe should have shown for once that we are coordinated among all the States. All procurement techniques should have been coordinated. It made no sense for the Spanish government to compete with the French government or the Italian government for respirators or for purchasing material. We should have foreseen this situation and coordinated the entire purchasing policy and coordinated the necessary purchasing mechanisms throughout the European Union."*

Highlights of governance

Opting a centralized or decentralized approach for the supply of medical equipment is often debated. However, our findings show that many different factors influence what we consider good or bad network governance. These factors include trust, willingness, structural complexity, resistance, degree of local empowerment, the (mis)match between power and knowledge, the equality of distribution, inclusion of private sector, and collaboration outside of national governments.

Based on experiences, examples, and evaluations of interviewees, we summarized the positive and negative features of adopting a centralized and decentralized approach in the table below. Whereas international collaboration and private sector inclusion are not influenced by the type of approach, interviewees did emphasize their importance. Private sector collaboration can enhance knowledge, enlarge networks, and increase infrastructure.

	Positive features	Negative features
Centralized	• Increased professionalization (abilities) and resource pooling (3.1.1)	• High focus on bureaucracy & control (3.1.1) • Lack of trust in regional institutions (3.1.3) • Lack of local expertise (3.1.3) • Mismatch between power and knowledge (3.1.4) • No equal distribution mechanisms (3.1.5)
Decentralized	▪ Semi-complex decentralized structures, trust & willingness, leading by example can lead to collaboration and cooperation in times of crisis (example from Australia) (3.1.2) ▪ Power in local decision making (example from Hubei) (3.1.3) ▪ Engaging capabilities and networks of local leaders (3.1.3)	▪ High variability in professionalization, low integration (3.1.1) ▪ Resistance and highly decentralized structures hinder cooperation (example from the US) (3.1.2) ▪ Slow decision making due to local inclusion (3.1.3)

3.2 Regulations and procedures

Managing ongoing procedures and ensuring that they run smoothly have been challenging for many countries. Whether a stable, rigid system was in place or a more lenient system was explored, regardless of the infrastructure, all governments and institutions felt the pressure that came with the pandemic. This pressure led them in two different directions: some stayed close to existing policies, whereas others steered away from strictly adhering to regulations. These directions highlight how each country reflects upon its systems and what each expert believes their country needs to look forward to. In this section, both trajectories are explored and combined to establish future interests.

3.2.1 Staying close to legislation

Whether or not a country stayed close to its own regulations and procedures, and for how long, says a lot about a nation, its policy practices, and the amount of freedom the varying sectors were given. When the COVID-19 peak subsided, experts were given the space to evaluate their internal and external processes. During this time, it became apparent that experts belonging to a system in which regulations had been strictly followed felt that it was either essential (as proper guidelines had not been set for crisis situations within smaller organizations) or restrictive (as guidelines limited actions and slowed down buying processes in times of crisis). In countries where rules and regulations were highly appreciated, centralized approaches were often desired because there was no existing strong legislative administration, and procurement was not mature enough to stand alone. However, this did not mean that their procurement trajectory during the pandemic was less successful, and it still left room for experts to share that, even in these instances, some level of flexibility was desired. In countries where legislation constricted its players, experts stated that the systems they were working with were making big leaps and that the restrictive mentality was embedded in the fact that legislation could not keep up. This made procurers "*very limited in terms of a spectrum of available procedures*," meaning that procurers could not stray from the norm to reach material faster, through differing routes, using new procedures, or surpassing superiors (Eastern European Expert). These countries were often unable to pave their own way because of their historical or political backgrounds or simply because of their low professionalization.

3.2.2 Steering away from legislation

Where regulations had not been religiously followed, regulation changes were called for to be integrated into legislation. This may be because experts felt that the grey area created during the pandemic was successfully utilized in times of crisis and should therefore be integrated into normal procurement processes. Reasons to steer away from regulations include confrontation with unforeseen factors such as extra costs, incalculable delivery times, unregulated product qualities, time pressures, and the difficulty of obtaining approvals. These factors led to the experts taking charge of their own internal commands. While this has made health procurement divisions more independent and has shown how flexibility can lead to necessary outcomes at a fast pace, it also has consequences. When the decision was made to stray rules and guidelines, organizations became more prone to buying substandard products and receiving forged certificates. This caused chaos. While this also occurred in countries where regulations were carefully followed, in those instances, this was not a big enough issue to become a large part of the discussion.

What experts always attained throughout their decisions on surpassing rules was a certain level of resourcefulness, for which many Northern and Western European countries were praised. However, this also leaves room for corruption. Still, within multiple discussions surrounding legislation, experts mentioned that there is a definite point in which "*the formalities [go] too far and that [people] continue to think too much in terms of the governmental frameworks,*" which, according to one expert, was seen as a "*certain failure*" (Western European Expert). It is interesting to note here that countries that utilized this grey area for their benefit are also some of the countries that have mentioned their desire for transparency in the buying process and supply chain activities. However, this desired transparency conflicted with how decisions were made, as well as the consequent uncertainties (e.g., costs, quality, delivery schedules, and certification).

3.2.3 Balancing the Procurement Environment

The COVID-19 pandemic has created a fundamentally new and constantly changing purchasing environment. To keep up with these changes, effective adaptations within the system must be embedded into procurement procedures. As stated by a Scottish expert, "*when you are making changes during a crisis, it is important to think if this has a longer-term application beyond the crisis – if it does then embed it permanently."* The two principal themes that the experts shared that needed to be highlighted were flexibility and transparency. Actively discussing these topics within a procurement environment context helps strengthen the procedures. Many countries shared that the answer may not always be legislative but rather that it has to do with culture and practice, as the "*reliance on procedures is too little too late in terms of procurement strategy*" (Australian expert). Procurement sectors during these times of crises often assessed their own risks and steered their own teams. In doing so, the procurement teams became their own experts. This was based on prioritizing their practices. During this time, speed and determination connected many procurement teams with appropriate networks, capturing their resilience and cooperative qualities. It was often perceived necessary to prioritize getting materials as fast as possible rather than following every legislative rule. Notably, this was mostly the case for countries with high structural stability, as "*structure needs to predate a crisis, as it is very difficult to establish structures quickly and make them effective*" (Irish expert).

Countries without a stable foundation did not steer away from legislative mandates. Priorities are distributed differently in countries without high structural stability. Instead of prioritizing speed and disregarding regulatory bodies, they prioritized understanding what guidelines had been made, how to utilize them appropriately, and how to put the right people in charge. However, one is not superior to the other. There have been success stories in all the scenarios. The consensus may be that legislative rules are not flexible enough and that regulations should be adjusted because of this. How much flexibility should the procurement environment be given? Even the most secure procurement systems may have no real strategy in a crisis and could therefore benefit from structured rules and guidelines. Experts may ask for flexibility and room for creativity, but it should be kept in mind that there may be a couple of other steps that should be taken before this can be achieved. Redesigning supply chain processes and achieving high levels of transparency within a supply chain system is a high priority. Through constant monitoring and evaluation of a system's process, experts may slowly come to understand what balance is right for each individual circumstance.

Highlights of rules and regulations

Based on the experiences of the interviewed experts, there are numerous factors that contribute to the different approaches to COVID-19. From the data, it is clear that one of these factors is related to how close a country stayed true to legislation. After closely analyzing the reasons for either steering away from legislation or staying close to legislation, the consequences and benefits of such approaches were highlighted. What each approach has in common is successfully assessing risks and alleviating unrest by prioritizing needs, while exploring the limits to disregarding the rule of law. However, some disregarded the rule of law more than others. Both approaches are explored in the table below.

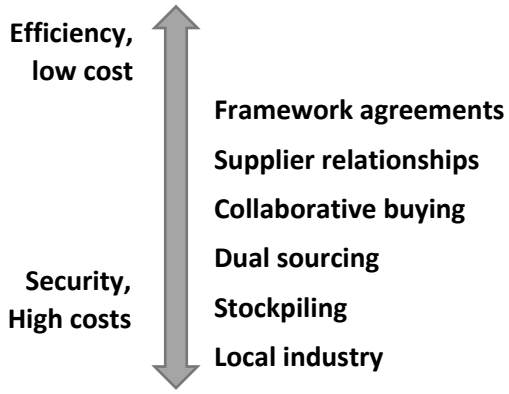
	Reasons	Consequences	Benefits
Steering away from legislation	• Responses not quick enough • Hindering process approvals • Keeping up with surrounding organizations • The crisis led to more chaos	• More chaos • Lack of transparency • Corruption • Forged certificates • Substandard products • Confusion among internal teams	• Reaching material faster • Creation of independent mindset • Feelings that this crisis mode can make changes to legislation
Staying close to legislation	• No existing legislative backbone • Low professionalization • Nationwide historical, social, or political circumstances	• No room for creative thinking • Slow bureaucratic processes • Feeling two steps behind	• More regulated working conditions • Low levels of chaos • Legislative backbone • Little room for corruption

More attention should be given to deliberating how close one should stay to the law and when it is appropriate to surpass it. Data show how important strengthening the public sector can be, as nobody can work without it. Thus, without this deliberation, supply chain transparency (a high-level concern, as mentioned by the majority of experts), may not be achieved.

3.3 Supply side issues

Out of the five themes[6] the only theme that directly influences the supply of medical equipment is the theme centered around supply side issues. Of course, the "simplest" solution in ensuring that shortages do not arise, is ensuring enough supply through high peaks of demand. However, many contradictions must be considered. First, healthcare expenditure was already extremely high before COVID-19. Many countries (including the Netherlands, Germany, France, Finland, and Australia) spent around ten percent of their GDP on healthcare in 2018.[7] With ever-increasing healthcare expenditures, governments feel the increasing pressure to limit their growing expenditures, such as in the Netherlands.[8] At the same time—again taking the Netherlands as an example—1.5 billion Euros have been spent on PPE in 2020,[9] with over 100 million masks and 600 million gloves currently in stock.[10]

In essence, supply side issues and opportunities are paradoxical, and six different measures have been proposed by interviewees, ranging from efficiency (low cost) to security (high cost). In the sections below, each measure is explained, providing the perspectives of experts in favor of and against the measure.



3.3.1 Framework agreements

"Pre-existing solutions (framework agreements) gave us speed, which meant we had already done the market engagement, etc. – we have a lot of national frameworks that serve multiple markets" (Northern European expert).

Pre-existing framework agreements, which could be relied upon, provided a safety net, according to the three interviewees. They allowed for security, speed, efficiency, and volume guarantees. While this holds true for those three experts, many other experts indicated the unreliability of framework agreements in times of crisis, especially if such framework agreements included wholesalers. Many countries had framework agreements in place before the pandemic; however, these framework agreements could not deliver products from the framework agreement at all or could not deliver more products than the equivalent of stable demand. This holds true, especially for framework agreements with wholesalers within a country. The contractors were not aware that wholesalers obtained their products

[6] Harland, C.M., Knight, L., Patrucco, A.S., Lynch, J., Telgen, J., Peters, E., Tátrai, T. and Ferk, P. (2021), "Practitioners' learning about healthcare supply chain management in the COVID-19 pandemic: a public procurement perspective", International Journal of Operations & Production Management, Vol. 41 No. 13, pp. 178

[7] https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS?name_desc=false

[8] https://www.nrc.nl/nieuws/2021/12/16/bezuiniging-van-5-miljard-op-de-zorg-dat-is-te-kort-door-de-bocht-a4069274

[9] https://www.parool.nl/nederland/mondkapjes-vaccins-en-tests-kosten-nederland-miljarden-euro-s~b871f67e/

[10] https://www.lchulpmiddelen.nl/beschermingsmiddelen-en-medische-hulpmiddelen/actuele-voorraden-voor-de-zorg

from Asia and were, therefore, dependent on Asian manufacturers. As such, many experts argue that framework agreements alone are insufficient for high peaks in demand.

3.3.2 Relationships and networks

The importance of adequate networks and relationships has been described by many experts. These relationships and network connections range from tight relationships with suppliers, manufacturers, intermediaries, or contacts in East Asia. Obvious advantages of relationships, networks, and connections are access to (new) suppliers or being a "preferred customer" over others. However, besides these advantages, other upsides of these networks included intel on quality or being able to order directly from the manufacturer, skipping intermediaries. Hence, the larger the network and relationships, the more flexibility governments have in their processes. Nevertheless, there are disadvantages to these networks and relationships. As one expert argued that "*They all believed they had great relationships independently with these companies and all they were doing is putting different stickers on different boxes."* But besides that, if such connections are brokers, the buyer's loss of control is another disadvantage, as brokers increase their power on the procurement process. Second, in public procurement during a crisis, there is a fine line between fraud and flexibility. Both the Netherlands[11] and the UK[12] have been in the news because of the scandals relating to corruption or suspicious deals with fraudulent suppliers. The experiences of the experts regarding the relationships and networks are summarized in Appendix 5.

3.3.3 Collaborative buying and central procurement

"I also noted that our government, in the early stages of the pandemic, had a lot of direct purchasing of supplies, I think, from vendors in China when, for example, masks were not so easily obtained and surgical gowns and all of those suits, biohazard suits, were not so easily available in the common market. So, I think ***the main goal is to empower further our main central purchasing body*** *to be more equipped to deal with this." (Southern European expert)*	**Versus**	*"Even if we as a [country] with all the hospital purchasers start buying together, is it at all* ***questionable whether they can influence*** *the market in a certain way because the suppliers are often multinationals." (Western European expert)*

Quotes evidencing different opinions on centralized procurement

While no expert mentioned the possible negative effects on collaborative purchasing or central procurement, they questioned whether collaborative purchasing helps combat shortages. A well-known argument for collaborative procurement refers to the power that can be achieved through collaborative procurement. This power can be achieved at different levels, ranging from regional collaboration to European joint procurement. One expert, who disagreed, argued that it is questionable whether the market of multinationals can be influenced.

[11] https://www.nu.nl/economie/6168181/stichting-van-sywert-van-lienden-maakte-bijna-9-ton-winst.html

[12] https://bylinetimes.com/2020/09/14/government-awards-122-million-ppe-contract-to-one-month-old-firm/

3.3.4 Dual sourcing

"I am not saying don't make it in China. I am just asking you to make it in two places" (North American expert).

The importance of not relying on single sourcing has been emphasized by many experts, often in combination with local sourcing. In addition to simply having more than one supplier, the geographical diversification of suppliers is important in times of crisis. This requires knowledge of the supply chain, as second-tier suppliers and raw materials are also geographically diversified.

3.3.5 Stockpiles

Stockpiles, particularly safety stocks, are a popular chain; however, the measure is more difficult to achieve than it seems. In addition to the costs of building and maintaining such stockpiles, continuity (risk of expiry) and scalability (how many products one needs) are difficult to maintain. Similarly, how does one know which product will be in shortage, and which product(s) should be stockpiled? All of these questions leave some experts skeptical about this "redundancy approach"[13], but others have suggested possible solutions and possible upsides to stockpiles. A Western European expert introduced the possibility of rolling stockpiles using raw materials. The rolling stockpile should ensure continuity, in which the government sells medical equipment well ahead of the expiration date, either at the market price or at a discount. There are multiple potential buyers in this scenario: other countries, the private industry, healthcare providers, or selling back to the supplier. Simultaneously, raw materials minimize the risk of expiry and optimize product diversification. An expert from Oceania used stockpiling as a backup plan for medical products of lower quality, in which the products were donated to the community reserve. The experience of experts in stockpiling is summarized in Appendix 5. Similarly, in Part I of our MaSSC studies, many Dutch interviewees had a wide variety of views on stockpiles, which is analyzed in Section 5.2 in report 1.[14]

3.3.6 Local industry

The most popular measure discussed by experts are opportunities for local industries, which has left many experts divided in their opinions. Those not in favor of a local industry argued that the continued financial pressure of the healthcare sector leaves countries unable to afford spending more on medical products when they are cheaper and of the same quality elsewhere. In contrast, experts in favor of local production referred to the supply chain trends in reshoring and nearshoring, as well as recognizing the downsides of offshoring. Foremost, this tradeoff relates to the question of attainability, which is twofold. First, the attainability of building up a local industry within a few years, and second, the attainability of paying a price premium in the long run after the COVID-19 crisis ebbs away. Another expert from Northern Europe pointed out that even if European countries produce PPE domestically, the raw materials are still sourced from Asia. Hence, the dependency would not be resolved, but shifted.

At the same time, many experts are in favor of building local industries, arguing that they can build sustainability, overall cost reductions, autonomy, and more. First, sustainability

[13] We refer to the approach of maintaining safety stock or excess stock "redundancy measures".

[14] https://pprc.eu/er-is-geen-simpele-oplossing-voor-de-inkoop-van-medische-materialen-in-crisissituaties/

and cost reduction can be achieved by diminishing transportation (costs) according to experts from Africa and Western Europe. At the same time, it provides autonomy, which is important for countries that are have fewer resources to compete in international markets. At the same time, with autonomous security, domestic production also provides job opportunities. Moreover, local production does not exclude outsourcing. According to a Northern American expert, these two are not mutually exclusive: one can partially produce products in-house and outsource the rest. To counteract the attainability question raised by skeptics, Western Europe proposed a European manufacturing industry. However, others are not convinced, as they argue that European collaborative initiatives during the crisis were far from optimal.

Overall, the experts remain divided on local industries. Appendix 5 summarizes the opinions of experts regarding local industries. Similarly, in part one of our MaSSC studies, many Dutch interviewees had a wide variety of views on a local industry; see Section 5.3 in report 1.[15]

[15] https://pprc.eu/er-is-geen-simpele-oplossing-voor-de-inkoop-van-medische-materialen-in-crisissituaties/

Highlights of supply side issues

Measure	Upsides	Downsides
Framework agreements	• Allow for security, speed, efficiency, and volume guarantees	• Unreliability – it is not enough
Supplier relationships	• Larger networks, • Preferred customer status • Direct communication (with manufacturers) • Better intel (i.e., on quality)	• Loss of control if it is a wholesaler • Possible corruption • Is it enough?
Collaborative buying	• Increased purchasing power • Centralization of procurement knowledge	• Is it enough?
Dual sourcing	• Less dependency • Geographic diversification	• Requires better knowledge of the supply chain • Is it enough?
Stockpiling	• Reusability • Security • Rolling stockpiles	• Costly • Which product(s)? • Maintainability • Scalability
Local industry	• Sustainability • Security • Autonomy • Local jobs • European approach • Cost reduction • Dual sourcing	• Attainability • Quality • Raw materials • Competitiveness • Cost efficiency

The supply measures can be divided in an interesting manner with difficult trade-offs:

- The first three measures can be seen as attainable (price wise) to procure medical equipment in times of crisis. Many experts agree that only having these three options available might not be enough to combat a crisis similar COVID-19 (supply security).
- The last three measures might have a significant influence on supply security in times of crisis but are seen as less attainable in the long term, when demand is stable (price wise).
- Consensus is higher in the first three measures (mostly because it is not very costly, but lower in the last three measures, because it is a high investment).

3.4 Skills and competences

The data paint a clear picture: various countries around the world benefit from introducing professionalism and best practices to procurement and supply chain processes. When a mature professional procurement system is already in place, one can be concerned with higher-level issues as the foundation has been laid. This foundation is often composed of staff capacity, performance, professional skills, competence, and accountability. These key aspects eliminate inefficiencies, which in our data correlate with the signs of corruption, ineffectiveness, and fragmented procurement practices. The so called "cracks" in this foundation have been more visible in times of COVID, which has called for a firmer approach to professionalizing healthcare procurement; and has highlighted the importance of procurement maturity.

3.4.1 Low professionalization

"*Where there has been non-professional procurement, there has been dumping, where there have been purchases without control, there will be costs in the long run in terms of inventory, maintenance, and depreciation"* (North American expert).

Achieving professionalization at the national level is essential to ensure that buyers have the required understanding, competences, and integrity. However, not all regions have the right tools and regulations for achieving this. An example region that stands out within the data is Africa, when looking at the lower end of professionalization within the procurement community. What was voiced out of the African region largely pertains to issues of regulation maintenance, isolation, and dependency. These issues have created undesirable conditions that make it difficult for them to lay down a foundation. When procurement regulations are not professionalized, standardized, or continuously advancing, staff cannot be held accountable for issues that arise. This starts by embedding the rules of law into procurement systems, either manually or digitally, and keeping them close to practice. Without proper tools in place, there have been concerns about corruption. Along with currency fluctuations and dependency on other countries, these pressures imply low levels of procurement maturity. While other regions may have shared the plans they wish to fulfil in the coming years, most African countries shared their priorities within their national security and rules of law. This may indicate that their system was not ready to advance to a higher level of maturity. This may also mean that a lack of connectivity can be found in the country, which may have consequences for navigating a transition phase in which many structures are changing and that an overall strategic plan does not exist. If procurement systems within these countries are professionalized, one would be able to "*hold someone accountable to issues of ethics, issues of law, and if one does not have [their system professionalized], [they] will be talking about the same thing 10 years later.*" From this statement, it is clear that professional development opportunities are necessary to build a working system with growth opportunities and for these new skills and regulations to receive ample opportunities to be applied. However, it is important to note that this is not an easy change. The plan to professionalize procurement should align with a region's national agenda and thus its overall service practices; otherwise, these changes will be difficult to initiate. However, these nuanced differences emerge from the data. Not all regions with low maturity deal with corruption, decency, or currency changes. Other examples of regions with lower levels of maturity are Eastern and Southern Europe, which share the idea that without professionalization and further discussions on investing in procurement processes, the

system becomes difficult to navigate. However, the status of these regions varies greatly from the state that African countries were found in, which is why both, Eastern and Southern Europe have been given the opportunity to focus on their higher-level list of priorities.

3.4.2 High professionalization

"One of our biggest challenges across the public sector is capacity and the resilience of our buyers, not just our supply chains - understanding and investing in capacity has to be higher up the priority list – are we ringfencing investment to support developing our capacity and capability, so we are ready to meet and deliver on future challenges and expectations?" (Northern European expert).

A more stable foundation was observed and expanded when the professionalization of the system seemed high. Worries about skills, dependency on others, and proper regulations changed to worries about capacity and supply chain management, transparency, and advancing procurement systems. Thus, the conversation shifted. When valuing what is especially important before and during a crisis, professionalization was considered first, followed by the transparency of information portals, and finally, the evaluation of the integrated system. The flow of information is especially important within regions where professionalization is high. Having space to invest in capacity and e-procurement was a large characteristic of belonging to a region with high professionalization and, thus, a region of high maturity. Future agendas targeted visibility issues and data systems, with the region showing the highest maturity levels, targeting creative thinking and the resilience of their buyers. This explores how, once a foundation has been laid out, a system can build upon it and improve its structures so that one can focus on higher-level issues. Discussions in this region, namely Northern Europe, focused on their well-functioning data systems, plans to improve e-procurement platforms, and relations with suppliers abroad.

3.4.3 Evaluation outcomes: a reflection on future procurement trajectories

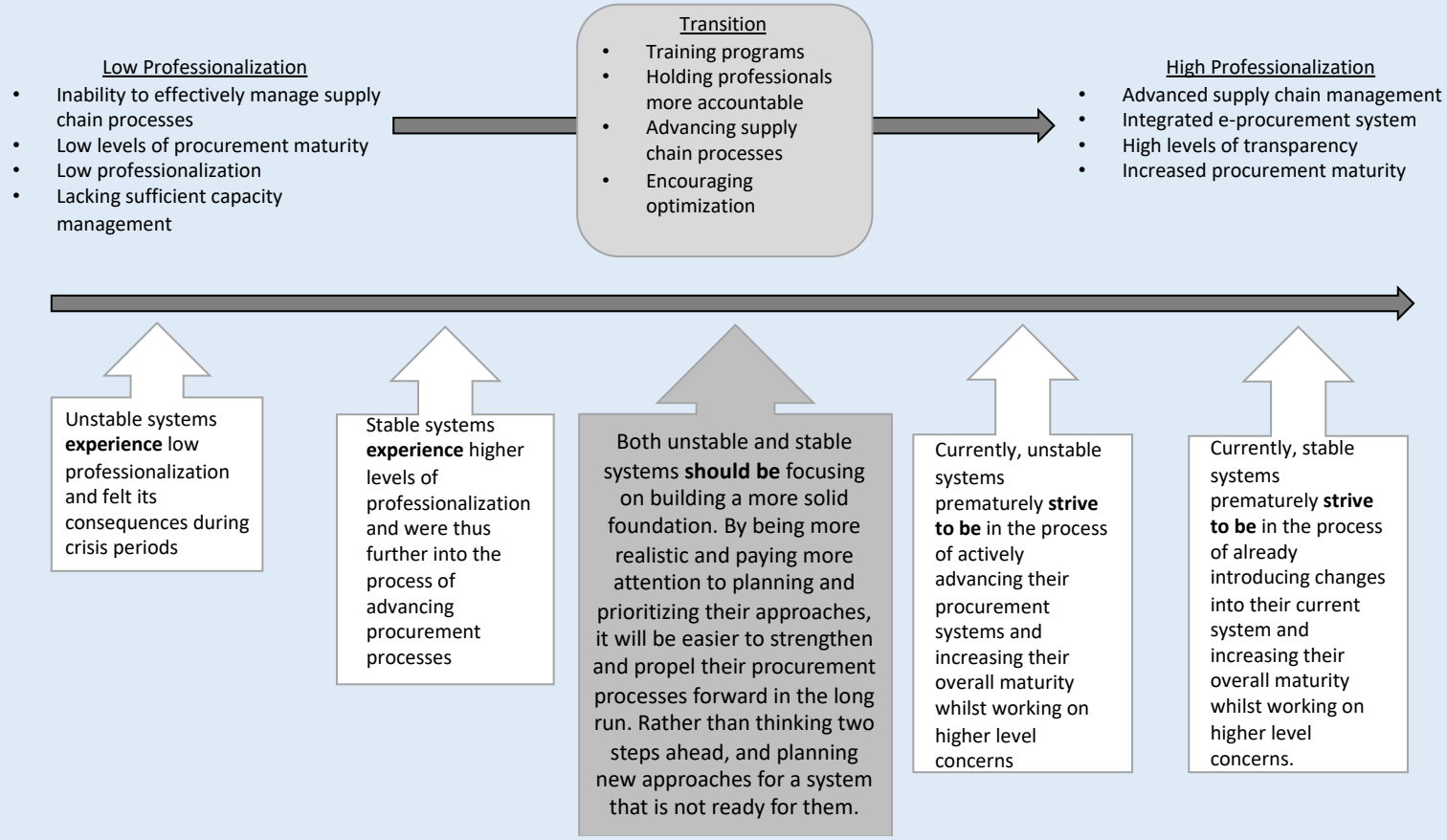
"*You would not have had this problem(s) if your public procurement in a non-emergency situation was doing good, because if it was doing good in a normal situation, you could have borrowed some of those good practices. In other words, the cracks can be seen much more visibly now. However, this does not mean that the cracks did not exist or that the cracks were a result of the pandemic. They must have existed. They became visible because of the pandemic much more."* (Asian expert)

Experiences during the pandemic were eye-opening and led experts to reflect on procurement tactics. Whether a region had concrete strategies set in their system or whether the pressures of the pandemic highlighted the limited number of strategies that came into play, many regions analyzed the consequences of their successful or less successful processes. During this time, it also became apparent that when procurement was able to help achieve tactical and strategic goals, it encouraged the expansion and optimization of performance. When experts felt that there was some success, they were able to focus on encouraging optimization. What thus transpired out of the data were experts' thoughts on training, the creation of better systems, and investment in both procurement processes and procurement systems. The data shows that e-procurement systems greatly support these plans. Successfully managing information systems enables capturing data and delivering information that aids performance monitoring. However, this solution was mentioned by a majority of the interviewed experts, but not it was not sufficiently

considered. Hard skills and specific procurement competencies were not sufficiently focused on. Many experts focused on the bigger picture, namely digitalizing procurement. However, procurement struggles due to human error cannot be replaced with data systems. The main challenge here is to understand that an internal team should focus on mastering the basic functions and integrating the entirety of their system before phasing in data systems. Although this is desired in future procurement trajectories, experts were unable to detail their plans for e-procurement. It was often mentioned that entering data systems and structures make procurement processes more efficient and approachable; however, the different tools, guidelines, templates, or the underlying systems were scarcely mentioned. The experts did not share information about understanding how and when to introduce these systems and what needs to be considered. Understanding where the regions' priorities lie and what can be done to improve one's system is a vital step. From there, a decision should be made on whether the focus should lie on skills and professionalization, transparent information portals, or the evaluation of the overall process so that one's procurement system can become more efficient. Moreover, while the experts mention the importance of educating professionals on how to invest in their procurement procedures, there seems to be a grey area in translating this to practice. Although introducing e-procurement may only be possible when minimal "cracks" can be found in the foundation, it is also only possible with a clear plan. E-procurement systems will improve skills and professionality; however, the introduction of these systems will require more time. Within the data, there is minimal information regarding what training schemes are to be used, who is to be involved, how this new system can be integrated, and when it can be integrated. Therefore, there seems to be a disconnect between what people believe the procurement realm is ready for and what is possible. This does not seem to be solely dependent on the maturity level of the region.

Highlights of skills and competences

Nearly all the interviewed experts alluded to the importance of professionalization. Professionalization became a benchmark to understanding the maturity of a procurement system. We formed a maturity hierarchy using the data, revealing the factors that experts from different regions felt were most important for the future. Portraying this, the chart below shows both unstable (fragile systems, without professional backing) and stable systems (solid foundations, with professional backing) and their perceived suitability within the procurement realm. Unstable systems, for example, with low professionalization, bore the consequences of their underdeveloped toolbox. However, stable systems, that had high levels of professionalization, were slightly further in the processes of advancing their procurement processes. It is interesting to note however, that when both systems discussed the future, they seemed to be multiple steps ahead of what was realistic for each individual system. Both systems were prematurely striving for procurement above their capacity. Countries should be focusing on nurturing their foundation and preparing by taking steps that might eventually lead them to a more professional, advanced environment.



3.5 Information systems: maturity of the digitized world

3.5.1 Four stages of electronic systems

Information systems are fundamental for many procurement functions. With regards to IT systems, experts have a wide range of expectations: the functions and use of procurement systems range from managing stocks and predicting demand to communicating with suppliers and ordering products. The interviews with experts show that there are different levels of IT integration in the procurement function among the countries in our study. These levels of integration have impacted the challenges faced by these countries during the crisis. Similarly, interviews with experts revealed different functions and expectations of the electronic systems used in their countries. Some electronic systems are used for e-procurement, some for information sharing, and others for stock management. Sometimes, different functions are integrated, and sometimes, different electronic systems coexist. Although the variety in functions of these systems was wide, their usability (the degree to which countries use IT systems to support procurement) was also high. An African expert mentioned that the COVID-19 crisis facilitated the switch from manual to electronic, whereas an expert from Asia indicated that COVID-19 facilitated the shift toward a fully integrated system. Four different stages of electronic development emerged from the data. The four stages are as follows.

- **Stage 1**: Introducing electronic systems for efficiency and combatting corruption
- **Stage 2:** Robust electronic systems, applicable in times of crisis
- **Stage 3:** Increasing understanding of the supply chain, demand, and supply through electronic systems.
- **Stage 4:** Fully integrated electronic system based on real-time data

In the following sections, we describe what each stage entails, how electronic systems fit a country's system, and what experts argue is the best way forward. It is important to emphasize that the various stages are dynamic; therefore, countries can move between them. Similarly, countries are not always necessarily in a single stage. We found countries (especially in Northern and Western Europe) that are focusing and improving significantly in stage 3 and 4 but tend to forget the important aspects of stage 2, such as "the easiness of usage," or even stage 1, which entails using information and electronic systems for its purpose.

3.5.2 Stage 1: Introducing electronic systems for efficiency and combatting corruption

"Procurement processes have been manual. They are now using electronic processes… The government attempted to introduce electronic procurement, which was bold. People did not like it. When the crisis came, the problem became unimaginable" (African expert).

Especially African countries had difficulties with electronic systems, as the necessary infrastructure was not always there: "What is important now is strengthening the Internet. The main base of this whole process is strengthening the Internet" (African expert). Similarly, a change in attitude is necessary: "The first thing that should be changed is the attitude of people in offices that deal with procurement. It is possible to move away from the manual, [if people are educated about new platforms]. It is just a big task." (African Expert). According to experts, combating corruption has a high priority; the country was dealing with this before COVID-19, and now even more so; hence, they are pushing for e-procurement to be able to

handle this better. At the same time, electronic processes improve efficiency. Due to the rapid changes caused by COVID-19 and the need for efficiency and combatting corruption, some experts felt that e-procurement will move forward quicker compared to how it was before COVID-19.

3.5.3 Stage 2: Easy-to-use electronic system applicable in times of crisis.

"Information systems… we actually started with nothing. We started with an Excel sheet, like everyone else, I think, and within six months, we had developed a complete IT tool with stock management." (Western Europe)

Even though Western European countries have solid e-procurement systems in place in stable times, the efficient usage of these systems in times of crisis was not always possible. Many e-procurement systems were disregarded during the crisis, as integrating crisis functions such as reporting stock availability into existing systems was not possible and would have taken too much time. Instead, new, highly simplified systems (for example, spreadsheets built from scratch) emerged during the crisis. Simultaneously, system integration and standardization across the country was an important aspect of the usability of electronic systems in a crisis. However, this was often not possible: "Q*uite soon we saw that there are actually no information systems or calls for managing the crisis at the national level, because all the different municipalities and areas have their own systems and data structures, and their own ways of working in the area of digitalization"* (Northern European expert).

In some countries, especially in Eastern Europe, electronic procurement is very law-based; the function of electronic systems is to ensure that laws are followed. This regulatory focus provides less room to focus on the efficiency and usability of a system, which is often seen as the primary goal of electronic systems. Additionally, some e-procurement systems were only used during non-emergency times because electronic purchasing channels are too complex to be used urgently. Similarly, the excessive data and information that could be gathered from e-procurement are not properly analyzed or used to make the system efficient.

Even though the usability of systems in crisis proved to be difficult for many countries, there are examples of good practices: "One important thing is that we have the electronic public procurement running all the time, 24 hours, seven days per week without any harm, so that we can also run all the other procurements needed. […] Thus, procurement was able to run smoothly. It was not just part of the urgent procedures regarding medical and other supplies needed to respond to the COVID crisis, but also all other procurement that was needed for the functioning of the state. So, I think that this was really important" (Southern Europe).

3.5.4 Stage 3: Increasing understanding of the supply chain, demand, and supply through electronic systems.

*"A major focus is rightly investing in effective ecommerce systems, but this should also be about gaining deeper layers of understanding and evidence in the supply chain – where are those supply chain vulnerabilities and where might we have alternative solutions" (*Northern European expert).

Even though the ease of use in times of crisis proved to be difficult during COVID-19, many experts emphasized the advantages of developed systems, which included gaining a deeper understanding of the supply chain. At the same time, according to a North American expert,

such advanced systems could also help with transparency issues. Similarly, integration of data for demand and supply forecasts will be equally important in the future: “I think the important thing is to work specifically on the supply chain: use data to be prepared, to forecast, and to be hands on the demand” (Northern European expert).

3.5.5 Stage 4: Fully integrated electronic systems, based on real-time data

“Right now, we are trying to integrate all the procurement systems since the very beginning of the process. Just the procurement planning then goes into this e-tendering or a catalog system and right now kind of developing our econ and monetary evaluations. So basically, in the future, we would like to have an integration of procurement systems” (Asian expert).

The pandemic is (albeit forcefully) changing how experts examine e-procurement and its opportunities. As they have been using the more advanced electronic-tendering system since 2008 and electronic-catalog systems since 2012, Asian experts have pointed out the need for fully integrated electronic systems to be better prepared next time.

Highlights of information systems

The interviewed countries fall under various dynamic stages that change based on internal (involvement of people within) and external pressures (involvement of both public and professional bodies), as witnessed during COVID-19. Similarly, countries are not necessary completely in one stage. We found examples of countries (especially in Northern and Western Europe) that focus and improve tremendously in levels 3 and 4 but tend to miss out on the important aspects of level 2, such as "the easiness of usage," or even stage 1, which entails using information and electronic systems for its proposed purpose.

Stage 1	**Introducing electronic systems for efficiency and combatting corruption** • Efficiency • Combating corruption • Strengthening the internet • Changing attitudes
Stage 2	**Easy to use electronic system applicable in times of crisis** • Transition from stability to crisis • Integration and standardization across the country • Stock availability across the country • Shifting focus from law to efficiency and usability • Usage of excessive data and information
Stage 3	**Increasing understanding of the supply chain, demand, and supply through electronic systems** • Gaining a deeper understanding of the supply chain • Transparency • Accurate demand and supply forecasts through data
Stage 4	**Fully integrated electronic system, based on real time data** • Integrating planning, tendering, catalogues, economic, and monetary evolutions

For some countries, there seems to be a mismatch between the challenges they encountered during COVID-19, and the identified future strategies. Except for interviewees from African countries and some Asian countries, many interviewees acknowledged challenges that correspond to our stage 2: main issues during the crisis were with the usability and efficiency of electronic systems in times of crisis. Interestingly, the challenges do not necessary align with the focus for future preparedness, as the focus for future preparedness often shifted towards more advanced electronic systems, with the increased need for transparency and more accurate forecasts based on real-time data.

Chapter 4: Clustering procurement challenges and future preparedness priorities

Method

To understand future preparedness better, and for countries to learn from other countries in similar positions, we created clusters of interviews of experts who encountered similar procurement challenges and hence preparedness priorities during the COVID-19 crisis. These five challenges are:

A. Insufficient procurement professionalization
B. Regulatory hurdles
C. Strained harmonization endeavors
D. Striving to enhance supply chain knowledge
E. Collaboration and coordination obstacles

On interviewing multiple experts from one country, we noticed that they had similar views on challenges similar within a country, but their proposed actions were more diverse. We clustered experts according to the challenges faced by their country, whilst providing a wide view of proposed actions on an expert level. By clustering countries with similar challenges, one can (more easily) learn from experts from other countries.

However, countries that fall within one cluster did not necessarily perform better than countries within another cluster. This also does not indicate that countries did not have challenges with regard to other clusters. Moreover, it indicates the bottleneck (the biggest challenge) of the cluster: where the biggest gains can be made, according to experts from those countries. For example, as Country X has a complex decentralized governing structure there were many issues on collaborating and coordinating. Therefore, future preparedness, according to experts from country X, will likely first focus on working on collaborating and coordination. This is not to say that there are no challenges with regard to regulatory issues in such a country or supply chain knowledge enhancements are required, but without enhancing collaboration and coordination efforts, the effects of supply chain enhancements and regulatory issues are suboptimal. Hence, in this case, enhancing collaboration and coordination efforts is a pre-condition before focusing on other developments.

Figure 1 depicts the five different clusters that emerged from dataset. It shows that even though we made strict clusters, our interviews indicated that certain countries are on the cutting edge of two clusters. For example, Romania is on the cutting edge of “Diminishing regulatory issues” and “Harmonization efforts,” and is slightly closer to cluster C. Similarly, Canada is on the intersection of “Harmonization efforts” and “Supply chain knowledge enhancements.” However, one cluster does not fit on this scale, as its case is unique (as emphasized by the bold cut-off line). The severity of collaboration and coordination challenges was only seen in the US.

A. Insufficient procurement professionalization	B. Regulatory hurdles	C. Strained harmonization endeavors		D. Striving to enhance supply chain knowledge		E. Collaboration and coordination obstacles
ETH RWA ZAF UGA ZWE	ESP IND HUN POL SRB RUS	BGR HRV SVN PRT ROU	BEL FRA DEU WLS	ISL NZ CAN IND SWE ITA	NOR FIN AUS BTN SCT IRL	US

In the following sections, we explain the different clusters and the challenges faced by the countries in those clusters during COVID-19. We acknowledge that internal challenges (i.e., challenges within the healthcare system of a country) can be influenced by external factors, such as the wealth of a country. These influences are discussed in Chapter 5.

4.1 Cluster A: Insufficient procurement professionalization

"Procurement processes have been manual. They now use electronic processes. We talked about sending suppliers emails, but I did manual first. The government attempted to introduce electronic procurement, which was bold. People did not like it. When the crisis came, the problem became unimaginable" (African expert).

African experts from multiple countries across the continent encountered similar challenges during COVID-19, which were highly corelated with the degree of procurement professionalization. Due to the lack of electronic processes, for example, the processes all had to be manual, which was time consuming. At the same time, elementary data – for example, estimations of demand – were not available: "for future procurement and future epidemics of COVID-19, we need to have the basic data. What exactly do we need as a country? What in terms of the items we need, the quantities we need, and the qualities we need. So, it provides us better insight on the starting point and to that" (African expert). While other countries had similar problems with demand estimations, the root of these problems is different: within cluster A, basic data are not available; in other clusters, problems arise when combining data and integrating it for future usage. Similarly, the lack of a stable foundation also had negative side effects on procurement in terms corruption: *"That element of professionalization is not being taken into account and it is giving room for individuals to do unethical things that will eventually cost in terms of efficiency and effectiveness."*

While the challenges stem from professionalization issues, foreign dependency has increased difficulties for African countries. Many experts in African countries have reported a combination of challenges in importing medical materials. In addition to the aforementioned issues (professionalization and foreign dependency), countries face currency problems (such as generating foreign currency) and corruption. The geographical location of many African countries is also relevant. Countries that do not have their own harbors or well-established air freight hubs face a major additional challenge for their inbound logistics. External factors will be elaborated upon in Chapter 5.

Table 2. Summary of insufficiencies in procurement professionalization

Summary **Insufficient procurement professionalization**	
• Procurement professionalization • Electronic procurement (data) • Corruption/ethical issues • Foreign dependency	• Geographical location • Currency problems • Focus on local supplier(s)

4.2 Cluster B: Regulatory hurdles

There are two main regulatory issues for procurement during COVID-19. Some countries did not have a (sufficient) legislative backbone in place pre-COVID, which hindered the response to the pandemic, as there was no (sufficient) structure to fall back on. However, in other countries, challenges arose in relation to emergency procedures in place regarding procurement regulations. In the latter, the lack and unclarity of regulations during COVID-

19, in combination with procurement regulations being perceived as obstacles, became an issue, leading to uncertainty, chaos, and problems with transparency.

The lack of a (sufficient) legislative backbone prior to the Covid-outbreak was the main issue in India and Russia. Although there was no legislative backbone in India, the legislative backbone in Russia was perceived as insufficient: "*Due to rigidity of regulation, in my opinion, it is very simplified. Russian procurers are very limited in terms of the spectrum of available procedures. At the same time, for instance, there are no real regulations for supply chains. This only concerns direct contracts. However, this method is relatively simple. So, from this point of view, Russian procurers before this crisis also faced many problems and often managed them informally. They did the same last year. So from his point of view, the situation was not very different."*

For the other countries, the changes in regulations during COVID-19 created chaos, such as in Spain: *"It was chaotic, to the point that it reached a situation where not even our own leaders, our own politicians, were clear about what was happening and what could be done. The problem arose because a law was passed that blocked all the deadlines, the different deadlines that all administrative procedures undergo, were paralyzed"* (Southern European expert). In addition to chaos, experts discussed corruption and transparency issues. The change in emergency regulation is related to the fact that regulations are often seen and presented as inconvenient. According to an eastern European expert: *"Very quickly, the earlier ideas that public procurement is a nuisance, that it takes a lot of time, were confirmed, and how good that we do not have to do it now. This is somewhat because of the previous image of public procurement actors. If public procurement had been presented efficiently, the decision-maker might have taken a different approach"* (Eastern European expert. Another Eastern European expert agreed to this point, stating that: *"We understand the public procurement regulation as an obstacle to efficiency, buying something rather than a helpful instrument and a good instrument to support. "*

Table 3. Summary of regulatory hurdles

Summary Regulatory hurdles	
Challenge 1: no legislative backing pre-COVID-19 • No existing legislative backbone • Rigidity of regulation requires only simplified and limited procedures	**Challenge 2: emergency procedures hinder legislative backing** • Chaos • Transparency • Corruption • Regulations have an image of ineffectiveness and inconveniences

4.3 Cluster C: Strained harmonization endeavors

"It's not the problem of the procedure, it is the problem of the logistics, it is the problem of the organization, the governance and so on. I think, from a systematic point of view, this is really hard because we are used, maybe it's not the right expression, being a sitting duck waiting for the supplies to come to you to respond to your official notices." (Eastern European expert)

In Chapter 3, we discuss five different themes in which the experts indicated challenges and corresponding improvements for future improvements. Whereas for the countries in the previous two clusters, the apparent bottleneck mostly fits into one theme, the countries in this cluster mostly dealt with harmonization efforts between different themes and between different stakeholders. Two important aspects here are the trade-offs between costs and security (explained in Section 3.3) and the disconnect between knowledge and power (explained in 3.1.4).

On the disconnect between knowledge and power, a Western European expert said the following: "*Politicians want to be able to show off their results, so we see that at least three ministries in a row have been involved in the purchase of mouth masks. Because they all want to show off, even though they do not know anything about it."* The following quote expresses the trade-off questions regarding security and costs: *"I am a bit skeptical because we still have price pressure and still have those high costs in healthcare. Therefore, I assume that we only have a short-term effect of this crisis, where we will spend a little bit more money in bringing back production and putting it in stock. After the short-term effect, we have to find the balance between being a bit better prepared on the one hand and being cost efficient on the other."* (Western European expert)

For countries within this cluster, processes within the procurement system are already advanced, and before advancing on specific themes (such as those identified in Chapter 3), the focus should be on connecting different themes to simplify and understand procurement processes and interactions.

Table 4. Summary of strained harmonization endeavors

Summary Strained harmonization endeavors	
• Trade-offs between costs and security • Disconnect between knowledge and power	• Understanding the complete procurement system, processes, and interactions

4.4 Cluster D: Striving to enhance supply chain knowledge

"There was never a time when thought we had a problem; we never had the problem of not being able to have anything. So, we are very, very lucky and are now thinking about the future." (Northern European expert)

According to interviews with experts, it seemed that the problems and challenges faced by the countries in this cluster were relatively small. Collaboration and cooperation went well, as procurement professionalization was more advanced (above average), and discussions were in full effect surrounding possible improvements for future pandemic preparedness. These possible improvements were mostly focused on professionalization of the supply chain, such as increasing insight into the supply chain structure, understanding redundancy, and integrating advanced data systems. Experts from these countries provided the following examples:

- **E-procurement advancement:** *"Right now we try to integrate all of the procurement systems. Procurement planning goes into e-tendering or catalog systems, and right now, I am developing our econ and monetary evaluations. Therefore, in the future, we would like to have an integrated system of procurement."* (Asian Expert)
- **Supporting government objectives:** *"We have a very strong policy push for indigenous people and businesses in a modest economy. Thus, there has been much movement. I mean, these changes are already being discussed, and we are sensing that we are already moving towards policies that will benefit particular groups."* (Expert from Oceania)
- **Shifts in the procurement mindset and training**: *"As procurement professionals, we are trained to have the cost focus, everything we do is based to lower the cost." "Well, as public procurement officers, we are not trained to work on risk assessments in the supply chain."* (Northern European expert)

Table 5. Summary of Striving to enhance supply chain knowledge

Summary Striving to enhance supply chain knowledge	
• Problems and challenges in the countries in this cluster were relatively smaller • Advanced possible improvements for future pandemic preparedness	• Increasing knowledge about the supply chain • Understanding redundancy • Integrating data learning • E-procurement enhancements • Supporting government objectives • Shift in procurement mindset and training

4.5 Cluster E: Collaboration and coordination obstacles

"I am fighting my own government; I am fighting the rest of the states. I am trying not to fight my cities and my hospitals who are also out in the market sourcing everything." (Northern American expert)

In the United States, experts had unanimous views on the main challenge related to the lack of coordination and collaboration, especially between states. This lack of coordination and collaboration is deeply rooted not only in the decentralized American healthcare culture and influenced by the different terms and conditions per state, but also by the differences in procurement training. Furthermore, one expert argued that information-sharing and collaborative approaches are met with resistance. Another study mentioned a lack of trust between organizations. More information about the cooperation and collaboration approach of the United States is provided in Section 3.1.2, and quotes corresponding to these matters are provided in Appendix 4.

Table 6. Summary of collaboration and coordination obstacles

Summary Collaboration and coordination obstacles	
• Decentralized healthcare culture • Lack of trust	• Differences in training per states

• Resistance in sharing	• Different terms and conditions per states

Highlights of clustering procurement challenges

The table below shows that even though we made strict clusters, our interviews indicated that certain countries are on the cutting edge of two clusters. For example, Romania is on the cutting edge of "Diminishing regulatory issues" and "Harmonization efforts," which is slightly closer to cluster C. However, one cluster does not fit on this scale, as it case is unique. The severity of collaboration and coordination challenges was only seen in the US.

A. Insufficient procurement professionalization	B. Regulatory hurdles	C. Strained harmonization endeavors		D. Striving to enhance supply chain knowledge		E. Collaboration and coordination obstacles
ETH RWA ZAF UGA ZWE	ESP IND HUN POL SRB RUS	BGR HRV SVN PRT ROU	BEL FRA DEU WLS	ISL NZ CAN IND SWE ITA	NOR FIN AUS BTN SCT IRL	US

These clusters relate differently to the five different themes indicated in chapter 3. However, in all the clusters, one or two themes are more prominently present compared to the other themes. This does not mean that the other themes do not impact the cluster. The table below visualizes the linkages between the clusters and the themes, in which the darker box(es) represent the main theme(s) of the cluster.

	Governance	Rules and regulations	Supply side issues	Skills and competences	Information systems
A	Inductor of supply professionalization	Backbone of professionalization	Possible focus on local industry	Set-up professional procurement	Basic information systems needed
B	Inductor of regulatory clarity and backing	1. Legislative backing 2. Clarity on regulations	Fighting corruption	Understanding (the importance of) legislation	Ensuring (easiness) of regulatory implementation
C	Integrator of systems connectivity- combine knowledge and power	Understand how legislation fits in the system	Understanding the trade-off costs-security	Understanding system, right people right place	Connecting function
D	Support enhancements	Support enhancements	Understanding redundancy	Flexible and dynamic skillset & mindset	System integration
E	Towards a collaboration	Provide unity	Diminish rivalry	Focus on unity	Information sharing

These different identified themes all relate to internal challenges and do not acknowledge external factors, such as the wealth of a country. These external commonalities between clusters are discussed in chapter 5.

Chapter 5: External influences

Method

In the previous chapter, countries were categorized into clusters based on the challenges experts faced during COVID-19. These challenges are essentially grounded in the five themes that were explored in Chapter 3. However, these challenges are not solely based on the internal processes of the countries in focus, and external influences might also play a role in the evolvement of these challenges. Before we closely analyze the clusters in Chapter 6, in this section we work on identifying the external characteristics of the clusters to provide a more complete perspective of the context each cluster may be in. Two external influences are discussed: the level of wealth of countries and country geography. This refers to the level of isolation, to be precise. Wealth relates both to an existing level of procurement maturity prior to COVID-19 as well as the opportunities to invest in improvement of preparedness. Wealthy countries may have a better starting position – in terms of necessary conditions – to deal with a pandemic now and to improve their preparedness for a future crisis. The wealth of a country is measured through GDP-PPP, using data from the World Bank. The geographical location is based on how isolated a country is—the number of neighbouring countries. First, the level of isolation determines the difficulty of battling a pandemic – where very isolated countries are better positioned to control a virus compared to very "connected" countries. At the same time, due to their experience with isolation, they might be better prepared to handle difficult nation-wide situations with limited help from outside. Similarly, their overall foreign dependency might be lower, compared to less isolated countries. Below, we address the impact of these two factors on the clusters introduced in Chapter 4.

The table below provides an overview of the two external influences that should be considered in light of the challenges encountered during COVID-19. In this table, the averages of neighboring countries and wealth are compared among clusters. The same analysis is performed for each country, and an overview is provided in Appendix 6. In the sections below, we discuss whether and how these averages support our assumptions.

Table 7. Overview of external influences per cluster

	Number of countries in cluster	Neighboring countries	GDP -PPP (Wealth)
Cluster A: Insufficient procurement professionalization	5	5	4,747
Cluster B: Regulatory hurdles	6	8,3	26,680
Cluster C: Strained harmonization endeavors	10	4,8	40,125
Cluster D: Striving to enhance supply chain knowledge	11	1,45	48,48
Cluster E: Collaboration and coordination obstacles	1	2	63,413

5.1 Geographical location

A large difference was observed in the "neighboring countries" within different clusters. Neighboring countries are those that share a common border and are in a similar area, yet

they are ruled by different regulations. First, it appears that countries that are more isolated (cluster D) are affiliated with different strategies and challenges than other clusters that withhold countries that are less isolated (e.g., cluster B). African country experts, for example, reported a combination of challenges that often came down to their geographical location, making it difficult to import medical materials. Thus, the geographical location of many African countries has been shown to have a significant influence on their challenges. Countries that do not have their own harbors or well-established air freight hubs face a major additional challenge for inbound logistics.

In addition, the number of neighboring countries also signifies the differences in a country's behavior. That is, the more isolated the countries are, the more independence they display. The focus on their individual state meant that it became easier to avoid interference from outside, allowing for more creativity in their strategies, resulting from the fact that they cannot directly impact neighboring countries as easily. This pattern can be seen as moving from Cluster A to Cluster E. However, it is noteworthy that these countries do feel the impact of their isolation, as importing and exporting goods tends to become slightly more difficult.

5.2 Wealth (GDP- PPP)

The averages of GDP-PPP per cluster show a clear pattern among the clusters: wealth increases from cluster A to cluster E, indicating that the type of challenge is (at least partially) influenced by the wealth of a country. This means that wealthier countries encounter different challenges than less wealthier countries. Therefore, one can possibly learn from the challenges of any country, but countries with similar external influences (such as wealth) will provide more accurate views. This is possibly because wealthy countries have advantages in procurement maturity prior to COVID-19 as well as opportunities to invest in improving preparedness.

5.3 Country specific external factors

While we accounted for general external influences between clusters (applicable for each country), country-specific external influences should not be overlooked. One example includes the consequences of Brexit in countries in the UK. However, besides political influence, other external influences, such as natural disasters, are important. In the unfortunate case of Croatia, COVID-19 and a series of earthquakes occurred at the same time: *"Well, it's difficult to say, because, as you probably know, we had a couple of natural disasters in Croatia in the first year. One of these was the Covid pandemic. The other was a series of serious earthquakes."*

Highlights of external factors

The external factors explored in this chapter provide an extra layer of context and a new perspective on the collected data. It has confirmed that several external influences impact the challenges that form our clusters; and has provided explanations, parallel to our previously mentioned internal influences, for why countries have undergone their individual trajectories. What we have found, similar to chapter 4, is that one cluster does not fit well in the external influence's analysis, as this case is unique: namely, cluster E (the USA). This is probably because this cluster comprises a single case-study.

"Wealth" and "geographical influence" have emerged as significant external factors. We see a clear distinction between the clusters within these factors. Wealth increases from cluster A to cluster D, implying that wealth influences the type of procurement challenges and the kind of future preparedness strategies that countries display. Similarly, countries that are more isolated (cluster D) generally tend to have different challenges compared to countries that are less isolated (cluster B). As such, the external factors indicate that one can possibly learn from any country, but countries with similar external influences (e.g., geographical influences and wealth) will provide more accurate views.

Chapter 6: Conclusion per theme, cluster, and principal insights

In this last chapter, we condense the lessons learned throughout this report. We first summarize the previously introduced five themes (6.1), after which the five clusters are encapsulated according to their internal strengths and weaknesses, and external threats and opportunities, to understand differing strategic perspectives (6.2). This chapter ends with a conclusion that highlights the most essential elements that affect all countries equally (6.3). By digging deeper into the data, we come to understand the bigger picture in terms of the future of procurement. By focusing on the three overarching elements, we highlight the points that should be high on a country's agenda. These three principal insights include balancing competences and regulations, balancing knowledge and power, and focusing on the next step instead of streamlining the focusing on the future.

6.1 Summary of the five themes

In Chapter 3, we report insights from our data using five themes.[16] These findings present a wide variety of insights from the interviews in a structured manner, displaying the diversity and complexity of procurement challenges and future opportunities. The table below provides a summary of the five themes explored in Chapter 3.

Table 8. Condensed summary of the five themes discussed in Chapter 3

Theme	Condensed Summary
Governance	The decentralized versus centralized procurement debate should not be predominant. One should focus on the importance of trust, resistance to share information, willingness to collaborate, and structural complexity. Important considerations in managing network governance are: • Local empowerment • Disconnect between the knowledge of professionals and the person who holds the decision-making power • Fair (perceptions of fairness) distribution among health care organizations • Inclusion of the private sector • EU/International collaboration
Rules and regulations	There is a strong link between procurement professionalization and procurement regulations, but the usage of rules and regulations was suboptimal during COVID-19. Why: Regulations felt like an obstacle to procurement Threats and consequences of a lack of legislation: Chaos, corruption, limited to no flexibility in procedures, being several steps behind.

[16] Harland, C.M., Knight, L., Patrucco, A.S., Lynch, J., Telgen, J., Peters, E., Tátrai, T. and Ferk, P. (2021), "Practitioners' learning about healthcare supply chain management in the COVID-19 pandemic: a public procurement perspective", International Journal of Operations & Production Management, Vol. 41 No. 13, pp. 178

	Opportunities in enhancing legislation: Important for transparency, fast responses, structured creativity, less corruption, less chaos, faster decisions.
Supply side issues	Possible ways to increase supply are a trade-off between cost and efficiency, making the supply of medical equipment a redundancy question. We have identified six possible solutions to increase supply: 1. Framework agreements 2. Relationships and networks 3. Collaborative buying and central purchasing 4. Dual sourcing 5. Stockpiles 6. Local industry Among experts, consensus was higher among the first three measures. This is mostly because costs are lower. However, they were lower in the last three measures as they entail higher investment.
Skills and competences	Within the data, we found a disconnect between the challenges encountered with respect to professionalization and future professionalization opportunities. Here, we argue that experts are prematurely striving for procurement advanced above their capacity. Countries should rather be focusing on nurturing their foundation and preparing it for the steps that may eventually lead them to a more professional and advanced environment.
Information systems	We differentiated between the four stages of maturity in terms of information systems: 1. Introducing electronic systems for efficiency and combatting corruption 2. Easy to use electronic systems that can be used in times of crisis 3. Increasing understanding of the supply chain, demand, and supply through electronic systems 4. Fully integrated electronic system, based on real time data Data suggest there might be disconnect between the challenges they encountered during COVID-19, and the identified future strategies. Many interviewees acknowledged challenges that correspond to stage 2: the usability and efficiency of electronic systems in times of crisis. Interestingly, the challenges do not necessarily align with the focus for future preparedness, a the focus for future preparedness often shifted towards more advanced electronic systems, such as levels 3 and 4.

6.2 Summary of integrated clusters

In the following section, we integrate and summarize the data gathered from our interviews with experts along with the external factors that further explicate a country's response to the crisis. We emphasize the differing contexts and internal challenges, thereby recognizing various outcomes. These internal challenges are derived from internal processes and not necessarily from national systems. The goal of this section is to combine these internal and external perspectives to highlight the relationship between these factors and bring forth lessons that can be used for future agendas for their strategic planning. Displaying summaries allows us to gain an understanding of the strategic choices that countries have

faced and the choices that are more available to them. The tables below are loosely based on a TOWS analysis, which is an extension of a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis, adding strategies. and the tables are structured and based on combining the internal and external factors. These factors are broken into the identification of threats and opportunities (external factors), and strengths and weaknesses (internal factors). These factors are then combined to create sets of strategic perspectives to explore how internal strengths can impact external threats and how internal strengths can be combined with external opportunities. In addition, factors are also combined to explore how internal weaknesses pair with external opportunities and how internal weaknesses pair with external threats. Consequently, all strategic perspectives are covered, leading to a rich summary that corresponds to our previous chapters.

6.2.1 Insufficient procurement professionalization (Cluster A)

When looking at Cluster A's external contextual environment in terms of its threats and opportunities, and the internal environment's strengths and weaknesses, a clear understanding of Cluster A's circumstances in a crisis is presented. This cluster comprises varying African countries where external influences greatly impeded the ability to manoeuvre procurement structurally and professionally during the COVID-19 crisis. It is clear in the summarized table below that the contextual factors of this cluster limited procurement advancements and proposed varying procurement threats that led to nationwide complications. Thus, the internal procurement situation pre-COVID highlights the substantial need for procurement professionalization; future foci also include the slow integration of electronic procurement systems and putting a large focus on local suppliers.

Table 9. TOWS matrix for Cluster A

Internal Factors / **External Factors**	**Strengths** • Openminded professionals who have newfound energy for change	**Weaknesses** • Lack of internet and electronic infrastructure within procurement establishment • Limited procurement professionalization
Threats • Corruption within government and bureaucratic processes • Geographical location • Currency and wealth generation issues	ST • Showing interest in giving more responsibility to procurers, and local stakeholders will pace the further development of procurement	WT • Dependency on foreign countries to procure supplies is not beneficial; thus, more focus should be placed on eventual local sourcing
Opportunities • Access to foreign establishments for help	SO • Opportunity to learn from well-established procurement organizations	WO • Room for internal growth amongst professionals • Space to slowly integrate electronic procurement systems as procurement structures are currently limited

6.2.2 Addressing regulatory hurdles (Cluster B)

By looking at Cluster B's external and internal factors in terms of threats and opportunities, and strengths and weaknesses, how national procurement threats influence a nation's decision-making trajectory can be observed. The two outcomes are shown below. Cluster B1 explores a country's behavior when legislation is only loosely followed, and cluster B2 displays a country's behavior when no (sufficient) legislative backbone exists, where rigidity and adhocracy are more common in national processes. The tables below show that it is very important to consider a country's external and internal factors before further considering new strategic tactics. For example, cluster B1 cannot easily utilize cluster B2's internal strategies, as the context creates friction in doing so. Therefore, two sets of strategic perspectives can be contemplated and taken into consideration for future procurement planning.

Table 10. TOWS matrix for Cluster B1 - Steering away from regulations

Internal Factors / **External Factors**	**Strengths** • Creative energy amongst procurement professionals • Ability to think outside the box and come up with new solutions	**Weaknesses** • Surpassing regulations eliminated transparency, and increased chaos, fraud (forged certificates) and corruption, along with confusion
Threats • Low(er) levels of wealth • Legislative regulations have an image of ineffectiveness and inconvenience • Geographical location in terms of higher number of neighboring countries	ST • Sharing innovative ideas amongst procurement networks with neighboring countries	WT • Need to understand the importance of legislation in order to highlight the necessity of legislation
Opportunities • Flexibility found within the procurement system, as legislation is perceived as flexible	SO • Utilize creative thinking and the flexibility of the system to push procurement advancements forward within the legislative boundaries	WO • Utilizing flexibility to eliminate and readjust the unnecessary hindering of regulations, while keeping and developing other legislations that allow for flexibility and innovation

Table 11. TOWS matrix for Cluster B2 - Strong focus on tight regulations

Internal Factors / **External Factors**	**Strengths** • Despite not having (sufficient) legislative backing, actions have been achieved in terms of procurement	**Weaknesses** • Not much room for creative thinking and innovative ideas
Threats • Low(er) levels of wealth • Low bureaucratic processes	ST • The need of the purchasers is often undermined due to the lower levels of wealth	WT • Inexperience with creative thinking in combination with the

• Nationwide systems and processes are perceived as rigid • Geographical location in terms of higher number of neighboring countries	and low bureaucratic processes, but purchasers should be given more credit and flexibility	rigidity of the systems threatens innovative ideas, which is why mindsets need to change in terms of making room for creativity
Opportunities • Clean slate in terms of room for designing a more complex regulatory system	SO • Through the COVID crisis professionals have come to understand what their procurement systems need in terms of legislative backing; this should be slowly integrated into legislation	WO • Create a more proactive mentality and promote team spirit surrounding new legislative rulings

6.2.3 Strained harmonization endeavors (Cluster C)

Combining Cluster C's external factors with the cluster's internal strengths and weaknesses pre- and during COVID-19, we present an understanding of Cluster C's future procurement opportunities. With the advanced procurement systems represented within this cluster, the main challenge lies in the lack of harmonization within the system. Understanding the processes in the system, the stakeholders involved, the interactions, and focusing on preparedness strategies and protocols is vital for future preparedness. However, the difficulties this cluster may deal with include the trade-off between cost and security. At the same time, there is a mismatch between knowledge and power, as the data show that procurement expertise is not in a position where executive power is found. Perspectives on these elements need to be considered for further strategies.

Table 12. TOWS matrix for Cluster C

Internal Factors / **External Factors**	**Strengths** • Educated, well trained professionals scattered throughout the system • Mature, advanced procurement system that is willing to develop and advance	**Weaknesses** • Inability to understand who is truly in charge • Not comprehending the complete procurement system, processes, and interactions
Threats • Cutbacks in healthcare financing • Lack of collaboration between buyers and other stakeholders on the buying side	ST • Due to the lack of harmonization between and within system(s), understanding how legislation fits into the system becomes extra important	WT • A disconnect is created between the knowledge of professionals and those who hold decision-making power
Opportunities • High wealth within countries	SO • Ability to effectively integrate electronic systems into the current system	WO • Trade-off between costs and security within system processes is realized

6.2.4 Striving to enhance supply chain knowledge (Cluster D)

The problems and challenges within the countries in this cluster were relatively small compared to those in the other clusters. Combining the external factors, which are split into threats and opportunities, with the internal procurement environment, split into strengths and weaknesses, highlights future perspectives. Future considerations lie in enhancing this cluster's already advanced supply chain knowledge. This includes enhancing e-procurement, integrating data learning, supporting government objectives, and including the private sector. In this case, geographical location leads to isolation, which can be an advantage in times of crisis, but it might also be a threat for future procurement opportunities. The main insights from the integration of these elements are explained in the table below and show numerous perspectives on the strategic components.

Table 13. TOWS matrix for Cluster D

Internal Factors / **External Factors**	**Strengths** • Advanced procurement systems in place • Large network of foreign establishments	**Weaknesses** • Supply chain knowledge is not continually enhanced whilst developments are happen fast
Threats • Cutbacks in healthcare financing • Geographic isolation due to limited number of neighboring countries could lead to difficulties with foreign collaborations and supplies	ST • Make use of connections with varying foreign networks to understand how other stakeholders utilize advanced procurement systems to their advantage	WT • Focus on enhancing supply chain knowledge by employing what is nationally available, and attending to expert opinions
Opportunities • Higher wealth within countries • Geographic isolation due to the limited number of neighboring countries	SO • Ability to consider local suppliers • Opportunity for the private sector to be included • Ability to have a more self-sufficient procurement function, independent of neighboring countries	WO • Shift needs to occur in procurement mindsets through training surrounding e-procurement and data learning

6.2.5 Collaboration and coordination obstacles (Cluster E)

Cluster E merges external threats and opportunities with internal strengths and weaknesses to display differing perspectives on how these procurement factors can influence or facilitate new strategies. The highly decentralized procurement structure provides a high structural complexity in this single-case cluster. The consequences (and potential future threats) of this highly decentralized approach include a lack of trust among different states and institutions, resistance to information and product sharing, and increased rivalry and competition in the market. First and foremost, future opportunities in this cluster are based on solidarity, integration, and unity. Within this cluster, opportunities arise not only as a result of

increased information sharing and networking, but also of the overlap and agreement in procurement professionalization and regulations across states and institutions.

Table 14. TOWS matrix for Cluster E

Internal Factors / **External Factors**	**Strengths** • As the USA has always been used to levels of isolation, the country was able to work around the issues that come with it • Developed sound procurement systems	**Weaknesses** • Procurement systems were fragmented and deal with high structural complexities • Lack of trust between establishments led to resistance in sharing and an increase in rivalry
Threats • Geographical isolation due to limited number of neighboring countries	ST • Spend time focusing on national procurement challenges, and developing national strategies further	WT • Make integration and standardization a priority so procurement systems can become more unified
Opportunities • High(er) wealth	SO • Sound procurement systems in combination with higher wealth give a stable foundation to focus on process alignment within the procurement function	WO • Opportunity to invest in advancing, developing and unifying e-procurement systems and (further) training

6.3 Overarching conclusion

Now that an extensive overview of the five themes and clusters has been provided, in this last sub-section, we provide the three most essential takeaways, independent of the challenges encountered during COVID-19. As countries begin transitioning to their new normal, crisis management and evaluation of crisis trajectories has become extremely important. Our conversations with procurement experts highlighted the biggest challenges and consequences. At the same time, it has provided us with insights into understanding a country's behavior during this difficult time for procurement. It has become clear that an appropriate balance between one's crisis strategy and one's own context remains a vital element in refining procurement processes. Countries should embrace new innovative views on the future of procurement and simultaneously tailor these to individual contexts. The three key elements related to these lessons need to become a vital part of the conversation about the future: (1) the balance between professionalization and regulations, (2) the balance between knowledge and power, and (3) the balance between what needs to be done now and what to focus on in terms of the future. These three fundamental components will be discussed below; consequently, they hold the potential to become the building blocks for reimagining the procurement function. Keeping these elements in mind while transitioning to new and improved processes that work within the realms of the new normal allows countries to move forward at an appropriate pace suited to their needs. With experts' newfound energy and ability to look back at their crisis trajectory, the procurement landscape will be able to propel forward at an appropriate speed.

6.3.1 Balance between professionalization and regulations

Strengthening the skills of procurement staff may be a foolproof way to professionalize the procurement environment; however, investing in professionalization is not easily mastered or completed. While it is a necessary step that is required to build on the maturity of procurement systems, it needs to be brought in line with legislative backbones and regulations. To effectively advance the supply chain, a balance must be found between these elements. Procurement is not meant to be a rigid tick-the-box activity, and it should not be guided by individuals creating their own version of the guidelines. Procurement is meant to strike a balance between both and elicit critical thinking to explore issues at hand and devise appropriate procurement solutions. It is important to note that falling back on the standard processes and ready-made regulations is not always optimal. Leaving room to think "out of the box" often leads to innovation and engaging stakeholders in new pioneering ways, and not just delivering new resources and providing what is required. These elements are often intertwined and help to translate and propel procurement further into a more dynamic realm. These challenges are applicable to all the countries interviewed. Within the data, various legislative contexts were disclosed, as displayed in the table below. Namely, countries with minimal legislative ruling, rigid legislative ruling, and flexible legislative ruling. Depending on whether low or high professionalization was observed in a procurement environment, countries acted differently during the crisis. From these data, we determined the optimal position for a procurement system that actively seeks to strive to advance and update its procurement processes; it is essentially the most beneficial balance. This optimal position is found at the intersection of legislative flexibility and high professionalization, as shown in the table below. This seems to be the best position for countries when looking at Cluster B's two frontiers. However, this balance between professionalization and legislation is equally important for the harmonization efforts that need to be carried out in cluster C. It may also be helpful for cluster D, where achieving this intersection could help the cluster more efficiently explore their supply chain enhancements. It should be noted that working towards this intersection takes time and should be a gradual process for all countries, independent of the pre-COVID challenges.

Table 15. Balancing gradations of legislation and professionalization

	Low professionalization	**High professionalization**
Limited legislative backbone	Chaos, room for corruption, confusion amongst professionals	
Rigid legislative backbone	No innovative and flexible ideas and objectives	Difficulties implementing innovative and flexible ideas
Flexible legislation backbone	Chaos, room for corruption, minimal usage of legislative opportunities	Ideal position: Understanding how creativity and legislative backing are intertwined

6.3.2 Balance between knowledge and power

Experts have indicated that there is a disconnect between knowledge and power. Experts indicate "Politicians want to be able to show off their results, so we see that at least three ministries in a row have been involved in the purchase of mouth masks. They all want to show off, even though they do not know a thing about it" (Western European expert). Hence,

responsibility and executive power often lie within the government. However, experts argue that procurement knowledge is often not in the same place. Hence, many experts argue that knowledge and power should be aggregated to better handle future pressures on the supply chain. While multiple experts indicated the need for supply chain mapping, one expert indicated the opportunities for expertise mapping: "If we look to the future, I think that there should be some kind of national-level center that is working with the private sector, if something like this happens again. There should be, I would not say, an organization, more like a virtual organization, where the best purchasers are. They know that in China, we can get this and this material, and from Vietnam, we can get this and this material. I think that the national government should take care of that and involve companies who already have good procurement channels and good contracts before the same kind of situation hits us again. It is quite easy to map. It would not take more than a couple of weeks to determine who those people are and what their expertise is. Someone should update information a couple of times a year." This balance can and should be restored either through expertise mapping, shifting the power to where the knowledge is, or shifting the knowledge to where the power is.

6.3.3 Balance between what needs to be done now and what should be done in the future

At the time of disruption and increased uncertainty, many countries turned towards forward planning and thinking about what their next developments could be: developments that would fix many of the procurement issues experienced during the COVID-19 crisis. This meant that focus was placed on the future and the direction in which countries were striving to propel themselves. While this benefits the country in the long term, more emphasis should be placed on abetting the current circumstances. In some settings, forward thinking should focus on the near future (focusing on current problems) more than on distant future (focusing on advanced enhancements). This is because, through conversations with experts, countries with unstable foundations often share more about their ideal procurement environments and plans (thinking five steps ahead) than how they foresee developing their procurement strategies in the near future (the next step). We thus argue that more time should have been put into the "now," and the "here". For example, experts often shared that digital transformation and heightening levels of transparency were high on their agenda, and although digital transformation is an effective tool for integrating practices and making processes more efficient, countries need to consider their context, possession of organizational abilities, and current position in procurement. Questions need to be asked about what feasible steps can be taken to remedy one's foundation "now," rather than placing all of one's focus on the future. There may be a gap between what a country plans for the next few months and years to come. This gap requires an appropriate balance. With increasing evaluations and reassessments during this time, there are heightened levels of reexamination of current strategies and plans. This needs to be properly utilized to assess what can be done about both, a country's current position and its future position, using a step-by-step approach.

6.4 Final conclusion

In this research we aimed to learn from 45 public procurement experts, from 33 different countries, who shared their lessons learned regarding the improvement of public procurement preparedness in a health crisis. This research answers the two main research

questions: (1) what are these countries doing now to be better prepared for future (health) crises, and (2) what should these countries actually be doing?

As we expected, the interviews provided a variety of well-informed expert views, and discussions of various courses of action within the set of countries in the scope of this research. Countries differed with respect to the severity of the COVID-19 crisis, the current organization of the healthcare sector, their strategies to cope with material shortage during early stages of COVID-19, and the (contextual) factors procurement professionalization, wealth and geographic isolation. As this research is not an audit, we have not tried to reconcile the various points of view – nor have we summarized a set of generic precise recommendations for improvement. Rather, we have provided deeper insights in the encountered challenges and lessons learned in countries around the world. We identified possible strategies for improvement and discussed priorities for different clusters of countries. Additionally, we explored different narratives even within a set of similar countries, acknowledging that every approach both has benefits and risks.

Introducing five clusters of countries based on similar COVID-19 challenges allowed us to discuss strategies per cluster, including an analysis of internal strengths and weaknesses, and external opportunities and threats. These strategies for improving public procurement preparedness for a crisis are specific to the characteristics of each cluster, and therefore provide specific guidance with respect to their priorities. We conclude with defining three generic tensions in public procurement crisis preparedness that every country needs to find balance in.

We hope this research feeds into future agendas for public procurement crisis preparedness, leading to better policies, protocols, and procurement systems – and finally to better crisis procurement in a next crisis.

Appendices

Appendix 1. Data processing, management and integrity

This study complies fully with the university and ZonMw standards for research ethics and open science. Ethical approval and data management processes were managed by the University of Twente. While for most research funded by ZonMw, ethical and data risks lie in human tissues and medical data privacy (for example), in this study, the focus was on commercial confidentiality and ensuring interviewee identity would be sufficiently safeguarded to encourage a genuinely reflective and critical stance in the interviews. Without this, the research team's prospects of capturing participants' learning from experience would have been reduced.

The full document setting out the ethics and data management processes is available on request. Key aspects include:

1. Recording interviewees' explicit consent
2. Providing the opportunity to review the interview transcript
3. Anonymizing/pseudonymizing interviewees in reporting findings
4. Uploading metadata on the data collected in the public domain so that future researchers can be aware of this study.
5. Establishing a process by which requests from other researchers to access the data can be considered and determined in a way that considers the interests of all stakeholders.

All interviews were recorded, transcribed, corrected, and redacted where necessary, translated, and loaded into the project databank (see Figure 1, columns 1 to 3). Transcripts and documentary data were uploaded to Atlas.ti software for the analysis of qualitative data.

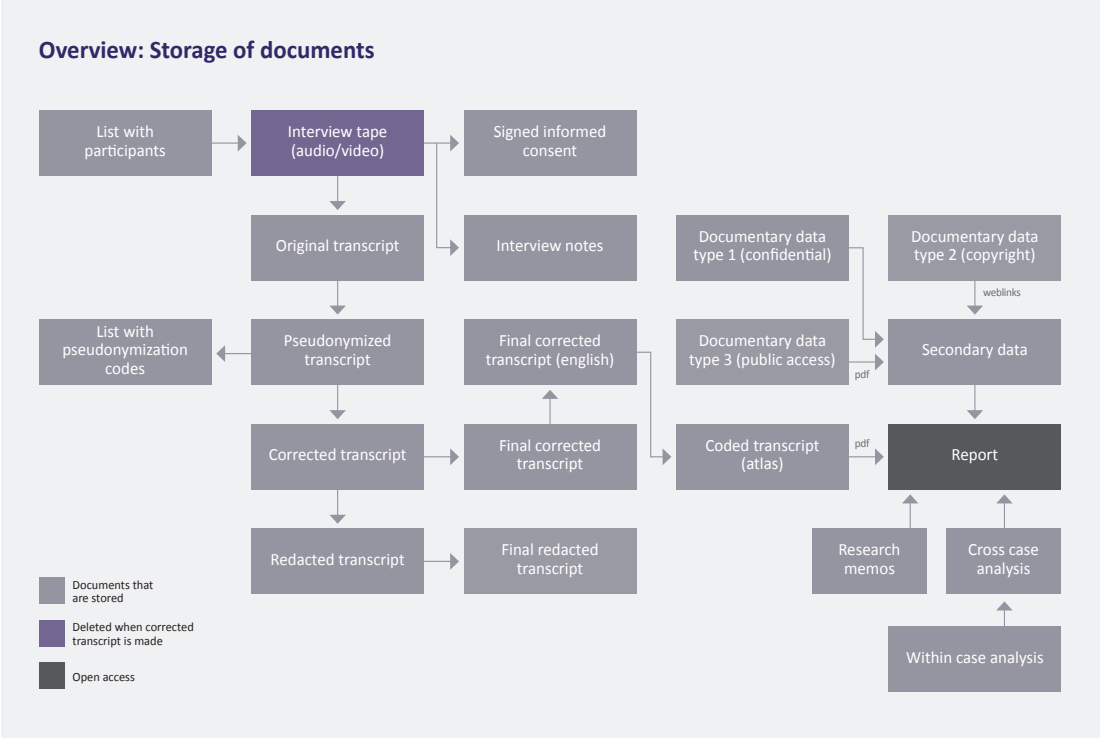


Figure 1: Data management plan

Appendix 2. Main messages in quotes per expert, divided per continent

		Main message in quote(s)	Theme(s)
Africa	Expert 1	"Most African countries trying to design to produce, instead of importing, to focus on import substitution goods by producing locally and also importing materials, also required foreign currency. That's also become a challenge nowadays. Due to the covid, exports are too much reduced and generating foreign currency is also becoming a problem. For that, the main important thing that I'm thinking right now is doing too much on import substitution materials instead of bringing the goods from abroad. The other important thing is involving the local suppliers and contractors instead of foreign contractors coming from China or somewhere else."	Local production, value of currency
	Expert 2	"Three factors are to be taken into account. One is the economic level of the country. In one word, we are not a manufacturing industry, which means that we have to import most of the items. And the second thing is the geographical location. So we are not on the sea, we are more like landlocked. So things we import have to go through for example Mombasa, which complicates, again, the situation. The third thing is the access to finance, to buy what the country needs."	Local production, geographical location, and value of currency
	Expert 3	"One of the biggest issues is and it's not just a South African issue, […] is the professionalization. "	Professionalization
	Expert 4	1. "A dependence on China and the West in terms of equipment, which that is a deep lesson to South Africa and many other African countries that we don't like. We need to be able to find a way in terms of building capacity to be able to get manufacturing." 2. Another critical issue, […] comes from the society of the corruption, and the government is trying its best to be able to find a way to manage that." 3. "Another important thing is this aspect of the strategic importance of procurement and supply chain management, whereby the aspect of awareness of the importance of supply chain procurement became very imminent and therefore this request in terms of professionalization of procurement and supply chain management."	Local production, corruption, procurement professionalization
	Expert 5	"What I noticed, is a weakness in our system that as much as we have a provision in the act to professionalize public procurement, the element of professionalization is not being taken into account and it is giving room for individuals to do unethical things that will eventually cost in terms of efficiency and effectiveness"	procurement professionalization, corruption
	Expert 6	"The first thing that should be changed are the attitudes of people in offices that deal with procurement. It is possible to move away from the manual, with electronic lessons. It's a big task. What is important now is to strengthen the Internet. The main base of this whole process is strengthening the Internet. People have no choice."	e-procurement, professionalization,
	Expert 7	1."For future procurement and future epidemics for the covid-19, we need to have the basic data. What do we exactly need as a country? What in terms of the items we need, the quantities we need, the qualities we need. So it provides us better insight on the starting point and to that." 2. "We need competent technical persons with the proper skills that can be able to interpret and aggregate data for effective planning. So we need the technocrats on board. So we need that expertise from the different fields that should be able to enable us plan procurement in a far much better way than what is done now."	Data, technocrats

		Main message in quote(s)	Theme(s)
Asia	Expert 1	“So COVID-19 will encourage us to get contractors to get local suppliers, some local people, as well as local producers.”	Local production
	Expert 2	“So if in doubt of this pandemic, what we are helping them is to make their procurement is digital based procurement. So we put all in catalogue and they can purchase through catalogue.”	e-procurement
	Expert 3	“Right now we try to integrate all of the procurement systems since in the very beginning of the process, which is just the procurement planning then goes into this e-tendering or a catalog systems and right now kind of developing our econ and monetary evaluations. So basically in the in in the future, we would like to have an integration systems of procurement.”	e-procurement
	Expert 4	“I think the most important things that India now needs to look at, is to create legislative backing, legislative power on public procurement. So India is one of those few countries in the world which does not have a legislation on public procurement. Now, this is surprising, because India, also India's public procurement size, is one of the biggest in the world. It's almost 25 to 30 percent of its GDP.”	Legislation

		Main message in quote(s)	Theme(s)
Oceania	Expert 1	"We had more cooperation than within the US. We formed a national cabinet, which was the premise of each of the states, the leaders of each of the states and the prime minister, formed a national cabinet. They worked together to make sure that we cooperate with the procurement of whatever we needed. Because, if we hadn't we would have been chasing each other, as they did in the US and basically undercutting each other in the market.”	Collaboration
	Expert 2	“The key challenge is that as we are all competing in the same market for the same products and not knowing that we're all talking to the same people driving prices. So that coordination across the different states was pretty good because we were sharing intel coordination.”	Coordination
	Expert 3	1.”One of the problems is the decentralized nature of the district health boards, and they do very different things in different regions across the country. Even though it's a small country and a small population, the variability within the regions that are run by these district health boards is enormous.” 2. “I would say there's still a lot of sort of hidden and not corruption per say, but a lot of things have happened because it's a small place, because it's very isolated.”3. “We have a very strong policy push for our indigenous people and businesses and the modest economy. So there's been quite a lot of movement. I mean, it was already happening, and it has pushed as well that in the sense of moving towards policies that will benefit particular groups”	Decentralization, transparency, local focus

		Main message in quote(s)	Theme(s)
Northern America	Expert 1	1.”They saw that and realized that they actually needed to cooperate.2.”We need to be able to manufacture domestically because we're never going to be able to compete as a client internationally, which is a little bit different from the idea that borders are closed and therefore we need to be able to produce domestically.” 3.“Professionalism, recognition of that professionalism and understanding, supply chains, understanding both supply and demand curves and what moves those and probably the dynamic around collaboration across jurisdictions”	Cooperation, local production, professionalization
	Expert 2	“I think the main challenge that I see was there was not really a preparedness. I think that's the main issue that needs should be addressed in Canada the health care system is just decentralized. The provinces work separately from each other. And there are a few communication between them.”	Preparedness, decentralization
	Expert 3	“we're centralized, but we also have a bit of a decentralized structure in that departments have authority to do their own procurements. Everybody was dispatched but what they also decided to do because of the spread was to establish some task forces. These were task forces that were cross functional to all of the emergency functions. We realized that we needed a multi department team. We actually pulled in buyers from other departments, which is not normal.”	Sharing of expertise, cross functionality
	Expert 4	“Right so I'm fighting my own government, I'm fighting the rest of the states. I'm trying not to fight my cities and my hospitals who are also out in the market sourcing everything.”	Rivalry
	Expert 5	“We have four very big national systems. They each are doing things separately. [...]We have no integration, the way you do in the UK and other countries.”	Integration

		Main message in quote(s)	Theme
Eastern Europe	Expert 1	"We need to be more internationally to collaborate and have more solidarity.[…]. I think solidarity is one of the things that is majorly missing during this coronavirus."	Solidarity
	Expert 2	1."Around the peak of the first wave, in the middle, the public procurement rules were switched off. […] From a procurement point of view, I would say that it was not successful." 2. "Very quickly, the earlier ideas that public procurement is a nuisance, that it takes a lot of time, were confirmed, and how good that we do not have to do it now. This is a little bit due to the previous image that public procurement actors had. Because if public procurement had been presented as an efficient thing, the decision-maker might have taken a different approach."	Regulations, image of procurement
	Expert 3	"The contracting authorities were free to buy outside the procedure: we understand the public procurement regulation as an obstacle to efficiency, rather than a helpful instrument and a good instrument to support. [...]That also this public procurement regulation, particularly the new one, gives this opportunity for public and contracting authority to buy the necessary stuff for combating the covid-19 and maybe other pandemics in the future in a more efficient way, than we are doing without this procedure."	Regulation seen as obstacle
	Expert 4	"I don't know if someone learned something from this crisis, but in practical terms, no one is doing anything to manage the damages and to fix the problems that we all witnessed during this crisis. We learned some lessons, but I guess they are all on the personal level. As much as the government is concerned, nothing happens, unfortunately."	Did we learn something?
	Expert 5	"Because for instance for Germans, yes, it is emergency. But for Russia, yes last year was difficult, but many years before as well. So, of course, it was not good, but this year in some sense was more or less comparable to previous years."	Experience with difficulties

		Main message in quote(s)	Theme(s)
Northern Europe	Expert 1	"But I would say that the local decision making, and meaning here municipalities, it has been a challenge. Every time when you do something, you have to ask the municipalities, what they think about the decision. And the decision making is so much local that it takes time to make national level changes"	Local vs. effective decision making
	Expert 2	"The most important learnings post pandemic are around preparedness and the focus is on making sure we build more resilient and diverse supply chains, that we've got procedures in place to respond to critical issues and that we've got transparency and the connections and supporting governance in place to respond quickly."	Preparedness and resilience
	Expert 3	"Covid has raised some important questions about how (un)prepared we were and the type and volume of stocks that people were sitting on – it exposed a lot of poor practice and raised questions about how much testing took place before the crisis and how much testing should be taking place on a regular basis."	Preparedness
	Expert 4	"We moved to a more centralized structure in the last few years which was hugely beneficial during the crisis. Independent of the nature of the crisis and whether it is acute or chronic we are going to continue being centralized."	Centralized
	Expert 5	"There was never the time that we thought that we had a problem here, not the problem that we could not have anything. So we are very, very lucky there and we are now thinking about the future. I	Everything went well

		hope that we will have a larger stock, well organized and so with first in and first out and so on like that. So I am sure that will be the case in the future."	
	Expert 6	"So your question was that it was what should have been done differently, I think this was obviously unfair for the elderly sector that personnel didn't have PPE, whereas in the hospitals everyone had."	Equal distribution
	Expert 7	"Redundancy and data, I think those two will be key questions to discuss as learning points. We have to rethink how we look into the supply chain in health care, because we need a kind of redundancy that can be different, the measures taken to build redundancy. I think to work on specifically the supply chain, use data to be prepared and to forecast and to be hands on the demand."	Redundancy, data
	Expert 8	"We need to build models to be able to take into account the different factors and what is a pandemic, where will it hit and what kind of equipment will we need? And from that make different kind of scenarios, or what are we going to stock?"	Scenario planning

		Main message in quote(s)	**Theme(s)**
Western Europe	Expert 1	1." Politicians find it very difficult to learn the lessons of the past because they are not confronted with them after four or five years. That is already something very fundamental. 2." How we teach public procurement. 3. "Politicians want to be able to show off their results, so we see that at least three ministries in a row have been involved in the purchase of mouth masks. Because they all want to show off, even though they don't know a thing about it."	Role politicians, teaching procurement
	Expert 2	1."We have that strategic purchasing consultation, where we might have to come up with an emergency scenario. That we make a certain procedure for that, that we use as soon as the need is very urgent and that we can work faster as a result".2. "I also think it is necessary to train the purchasers better and how they can deal with creativity of the specifications."3."Another point is the involvement of purchasers in the process. We were too late with that now."	Emergency procedure, training creativity, involvement of procurement
	Expert 3	1.Local production: "That's what we opted for, to say look, because we are going to buy raw materials, the manufacturer has to be in a certain region, around [*country*] or preferably in [*country*], who can then manufacture it because otherwise the transport would be too long." 2.Flexible Regulations: "Of course, we always have an article that you can purchase more flexibly during a crisis period. But it's not flexible enough yet."	Local production, flexible regulations
	Expert 4	1."I think there is no doubt that was not a particular problem in [*country*]. The main issues about the pandemic were with regards to the modification of the contract and the extra costs." 2. "I think there is not a good coordination between the states, the regions and the cities and all the localities as we can say."	Contract modification, costs, coordination
	Expert 5	"What was ignited in the new law on the 7th of December 2020 is that for the next crisis, the government will be able to adopt similar measures: without asking the permission of the parliament to be more reactive in case of a crises, you won't have to go before the parliament."	Flexibility in regulations and contracts
	Expert 6	"On the one hand, you could say one could say, yes, they have been successful in the purchasing and supply system because they were able to get products delivered. But on the other hand, they paid a very high price so that today, the scandal is they paid too much."	Price versus security

	Expert 7	"To go to the question of what should we do in the future? Then I personally question whether we can do much at all, because this crisis was almost impossible to predict. Also, the ideas with back sourcing, I am also a bit skeptical about that, because we still have price pressure and still have those high costs in healthcare. So, I assume that we only have a short-term effect of this crisis where we are going to spend a little bit more money in bringing back production and putting it in stock. After the short-term effect, we have to find the balance between being a bit better prepared on the one hand and being cost efficient on the other."	Predictability, costs versus efficiency

		Main message in quote(s)	Theme(s)
Southern Europe	Expert 1	"It was absolutely chaotic, to the point that it reached a situation where not even our own leaders, our own politicians, weren't clear about what was happening and what could be done. The problem came because a law was passed that blocked all the deadlines, the different deadlines that all administrative procedures undergo, were paralyzed."	Uncertainty due to regulations
	Expert 2	1."Well, it's difficult to say, because, we had a couple of, natural disasters the first year. One of them was definitely the Covid pandemic. The other one was a series of serious earthquakes." 2."I think there are some discussions about further empowering the central procurement for this, or the main central procurement body, to have more expertise, be more experienced and to act more quickly to procure certain supplies that may be necessary in the fourth wave of the pandemic and so on."	External influence, central purchasing expertise
	Expert 3	1."We [public] look for lower prices and a distant relationship with the supplier, they [private] look for higher quality and strategic relationship with the supplier. which was disastrous on our end and excellent in their hand." 2."I think that it is not so much an issue of quality of procurement, but rather an issue of lack of long term available infrastructure."	Learning from private, long-term infrastructure
	Expert 4	"There are three major issues. The first one is the prevention procurement. It means that before the specific crisis, we can organize several procedures that will be very useful to use during the crisis. The second, the strategic line: it is very important to structure and to plan the connections with the supply chains. Then we have a third idea, which is very important: common sense coordination and cooperation between public contracting authorities."	Preparedness, supply chain connections, coordination and cooperation
	Expert 5	"I think that this thing with COVID is somehow more centralized: It affects us all. It's affecting the entire community, the country, the European Union, all of us on the planet. So, in [*country*] they took centralized procurements for all those goods, medicines and masks, gloves, whatever was necessary to help."	Centralization
	Expert 6	"One of the important manners was that we actually have the electronic public procurement running all the time, 24 hours, seven days per week without any harm, so that we can also run all the other procurements needed. […] So actually, the procurement was able to run smoothly. It was not just the part of the urgent procedures regarding medical and other supplies needed to respond to the covid crisis, but also all other procurement that was needed for the functioning of the state. So, I think that this was really important."	e-procurement

Appendix 3. Relation between themes of main messages and five themes

Subthemes within Europe

Theme *(Harland et al, 2021)*	Sub-themes	Occurrences
1. Governance	Centralization, coordination and cooperation, long-term infrastructure, Local vs. effective decision making, equal distribution, role politicians,	9 times
2. Information Systems	e-procurement, data, scenario planning	4 times
3. Skills and competences	supply chain connections, Learning from private, central purchasing expertise, teaching procurement, training creativity, involvement of procurement, understanding resilience, solidarity, experience with difficulties, experience with difficulties	7 times
4. Regulations and procedures	Preparedness, uncertainty due to regulations, Flexibility in regulations and contracts, contract modification, emergency procedure, regulation seen as obstacle	10 times
5. Supply side issues	Local production, costs versus efficiency, price versus security, high costs, redundancy,	Five times
Various	Predictability, external influences, image of procurement, did we learn something?	Five times

Subthemes outside of Europe

Theme *(Harland et al, 2021)*	Sub-themes	Occurrences
1. Governance	Rivalry, integration, decentralization, cooperation, coordination, collaboration	7 times
2. Information Systems	e-procurement, strength of the internet, attitudes towards electronic systems	4 times
3. Skills and competences	Sharing of expertise, cross functionality, understanding supply chains, recognition of professionalism, awareness, technocrats	6 times
4. Regulations and procedures	Preparedness, transparency, legislative backing, corruption	5 times
5. Supply side issues	Local production, local focus, geographic location, value of currency, dependence on Asia	6 times

Harland, C.M., Knight, L., Patrucco, A.S., Lynch, J., Telgen, J., Peters, E., Tátrai, T. and Ferk, P. (2021), "Practitioners' learning about healthcare supply chain management in the COVID-19 pandemic: a public procurement perspective", International Journal of Operations & Production Management, Vol. 41 No. 13, pp. 178-189. https://doi.org/10.1108/IJOPM-05-2021-0348

Appendix 4. Quotes that reinforce the governance subsections

Centralization versus decentralization

Experts on having a centralized approach	Experts on having a decentralized approach
Asian expert: *"the centralization was unbearably high, which should have been exactly the opposite. And there's something I found between [country] and China. China is contrary to the expectation, actually decentralized, a huge part of the decision making off, you know, on the local municipality of Hubei province. But in [country], it was heavily centralized, and this is because most bureaucrats don't really know what to do with general financial rules."*	**North American expert**: *"So, I think that's the main issue that needs should be addressed in [country] the health care system is just decentralized. The provinces work separately from each other. And there are few communications between them. So, I think that's the challenge that needs to be addressed, because the provinces don't really know what the other provinces are doing during pandemic."*
Northern European expert: *We have centralized and professionalized, so we were in a position to do some 'resource pooling' here. […]so it's just one of the things to bear in mind around structural issues: that resource pooling is a possibility when you establish the right kind of structures and professionalize in advance.*	**Expert from Oceania, who works in a decentralized governance**: *"There was cooperation at the political level and that translated at the state level. Nationally, there is cooperation at the political level between the states and the federal government. That translated at the state level through procurement at the state level into adequate supplies."*
Eastern European Expert: "*Overcentralized, I think it's a good idea, at least for [country]. It was a good solution to have one entity which deal with this process, because in general, hospitals are underfinanced. They don't have enough money and they don't have the people. Professionalization is so low. So, they didn't have the know-how."*	**Western European Expert:** *"I think that we should move towards a more centralized approach and not be as fragmented as we are now. This will require a list of specialists that we can draw from, because in the meantime our daily work will continue. So early involvement, expertise, and a centralized approach with sufficient manpower and professionalism and thinking about a plan of action/procedure in such a situation."*

Collaboration and cooperation in a decentralized approach

	Australian experts on collaboration and cooperation	American experts on collaboration and cooperation
Structural complexity (Degree of decentralization)	*"I think, more cooperation than within the US. We formed a national cabinet, which was the premise of each of the states, the leaders of each of the states and the prime minister, formed a national cabinet. They worked together to make sure that we cooperate with the procurement of whatever we needed. Because, if we hadn't, we would have been chasing each other, as they did in the US and basically undercutting each other in the market. So, we cooperated in the market, but it was the states doing the buying."*	*" I don't think it's a good thing that 52 state agencies go out with different terms and conditions, with different procurement training, with different answers to vendors."* *"Right so I'm fighting my own government, I'm fighting the rest of the states. I'm trying not to fight my cities and my hospitals who are also out in the market sourcing everything."*

Willingness & trust	*"There was cooperation at the political level and that translated at the state level. Nationally, there is cooperation at the political level between the states and the federal government. That translated at the state level through procurement at the state level into adequate supplies."*	*"Yeah, and they're also very resistant to sharing information and doing something collaboratively across them. So just as the government doesn't seem to have a strong public health perspective, in a sense, neither do the large system see this as a community issue."*
	"In terms of procurement at the state level, I think we learned the lesson well that cooperation is a much better path to take. I don't think we would consider that what's happened in the US is any kind of model to pursue."	*"Because we're very fragmented. They're not part of a trust. Some of them are in. Some of them aren't."*

Different views on local empowerment

Different views on local empowerment
Northern European expert: *"It is about bringing key decision makers or enablers together centrally to be able to collaborate, to set the tone, direction, the strategy – deal with escalated issues and roadblocks but there are local issues and challenges to be overcome here – we need to make sure local leaders engage early so that their local teams and corporate governance is right too."*
Northern European expert: *"I would say that the local decision making, and meaning here municipalities, it has been a challenge. Every time when you do something, you have to ask the municipalities, what they think about the decision. And the decision making is so much local that it takes time to make national level changes in [country]."*
Asian expert: *"there's something I found between [country] and China. China is contrary to the expectation, actually decentralized, a huge part of the decision making off, you know, on the local municipality of Hubei province. But in [country], it was heavily centralized, and this is because most bureaucrats don't really know what to do with general financial rules."*

Expertise not within central purchasing body

Expertise not within central purchasing body	Political influence
Western European expert: *"Do you know that you have a federal procurement department, where there are about 110 purchasers? Among those 110 purchasers is a specialized section, all of whom do medical purchasing and nothing else. Oh yes, and where is it? I said: 'In Defense, of course, there is a whole medical service, there are specialists and things have not gone well with those specialists. They are the most competent purchasers in the field and they only managed to bid for one third of the purchases and then it all went wrong because everyone wanted to come up with things they didn't know about."*	**Western European expert:** *"They seem to have a strange standoff relationship with the states whereby they want to be in control but they don't want to see responsibility to the states, because it makes them look like they can't manage. But the fact that things go wrong means that everyone knows that they can't manage."*
Eastern European expert: *"yes, they (procurement institution for covid supplies) know how to deal with these kind of things. Unfortunately, what they didn't have was a good knowledge of the market. They didn't know where to go, what suppliers to contact, the Ministry of Health had that actually. […] The best experts are in the Ministry of Health. They have all the connections. They have all the knowledge. They know the markets. They know what is needed, when is*	**Asian expert: "***And a thing is also a lack of trust that you read between what the government thinks is what the other states must be doing. So, they don't really trust their local level officials. I mean, of course, it doesn't come on the front, but you can see the undertones of this, that local level officials, local level bureaucrats and chief ministers and the state level officials, well, they don't know any better. So let us try*

needed, how to deal with it. So in my opinion, it is imperative that the minister of health be appointed the main institution for public procurement in this specific area."	*to tell them what has to be done, because they might just move it up."*
Southern European expert: *"Well, I think there are some discussions about further empowering the central procurement for this, or the main central procurement body in [country] to have more expertise, be more experience and to act more quickly to procure certain supplies that may be necessary in the fourth wave of the pandemic and so on."*	**African expert: "***Actually, the good thing that I have seen right now is that the leadership style is changing. They give more power to the lower level of management, rather than a central level type of decision that it was before. This helps to enhance the efficiency of the procurement process."*

Private sector inclusion

	Private sector inclusion
Collaboration based on expertise	**Northern European expert:** *"I think that there should be some kind of national level center, who is working already with the private sector, if something like this happens again. So there should be some kind of, I would not say organization, more like a virtual organization, where are the best purchasers. And they know that in China we can get this and this material, and from Vietnam we can get this and this material. So I think that the national labor government should take care of that and involve somehow the companies who have good purchasing channels and good purchases already, before the same kind of situation hits us again."*
Usage of private resources	**Eastern European expert:** *"I think what we should think about is the public private partnership and the creation of establishment of much stronger hospitals in [country] and also by usage of the private resources. I think that it is important to combine this, the sources, the public with the private. This is very important."*
Fear of loss of control	**Asian expert:** "*This constant fear that you see in those documents about private sector taking over something, which is private sector fleecing the governments or, you know, not giving the government good deals. So, there is this feeling against private entrepreneurs, companies and suppliers."*

Appendix 5. Quotes that reinforce the supply side subsections

Relationships and networks

Upside	Downside
Direct contact with manufacturer. *"So we did go directly to China and ordered directly from the manufacturer there. So, we could say that maybe middle of April we have had all the goods."* (Northern European expert)	*"They all believed they had great relationships independently with these companies and all they were doing is putting different stickers on different boxes."* (North American expert)
Contacts in Asia. *"They had some very strong connections with the Chinese manufacturing industry. And so we were able to get a lot of really good intel from them."* (North American expert)	**Power of brokers. "***I think a lot of it had to do with the fact that what we were primarily dealing with was brokers. We were not dealing with the manufacturers, we were not dealing with the actual dealers, we're dealing with brokers, and so I think these brokers had to secure financing and had to provide that financing, and when I terminated, they were holding the bag."* (North American expert)
Intermediaries. *"We contracted a company in China to be our eyes on the ground to go back to the verify product from the factory. And we often insisted on some samples coming through. So our clinicians could actually have a look at them."* (Expert from Oceania)	**Accusation of corruption.** *"Their general director was recently charged with an accusation of corruption. Lots of intermediaries appeared in this context because the people who knew the markets also knew how to deal with this. So instead of going directly to the main suppliers, the producers, they set up intermediary companies through which they ran the process. And the result was that the prices exploded."* (Eastern European expert)
Allowing for flexibility. *"It's a pandemic situation. It's very important to have collaboration with local suppliers and other companies inside the country, so you can have this flexibility to change your production to help with the situation."* (North American expert)	

Stockpiling

Upsides	Downside
Western European expert: *"What we have done now in the first place is to make sure that our strategic stock, our iron stock as you call it, is back up to standard. So we have built up a very large stock at the moment. And we try to maintain it on the basis of a* ***rolling system*** *as we call it. "*	**North American expert:** *"So the stockpile wasn't set up for something quite that scale."*
Expert from Oceania: *"The federal government was stockpiling items and they were sending us some items, but they actually weren't suitable. They end up having to pass it off to the community reserve. So, we had some items that were suitable for hospitals and some that weren't. But rather than throw them away, we actually stockpiled. So, if we had an outbreak in the general community that didn't need clinical grade product, then those products could be* ***reused****."*	**Western European expert:** *"We had this huge stockpile of mouth masks and it was eventually parked by the Ministry of Public Health in a number of defense warehouses. At a certain point people asked: what should happen with this? Because they didn't know any better and a number of mouth masks were about to expire, the stockpile was destroyed for money, but I don't know whether it was hundreds of thousands or millions. And a good year later or two years I don't know, we needed them, but the* ***continuity was not maintained*** *and they were not there."*

Local industry

Upside(s)	Downside(s)
Cost reduction. *"So there was actually a directive that these entities that drive the innovation and which was actually successful with most of the PPE and the sanitizers were now being developed locally. We were no longer importing it. We totally reduced the cost of these items."* (African expert)	**Cost efficiency.** *"If we get new laws, where the government in [country] says 20% of the products must be bought in [said country], that would not really be a positive thing if you think about it that we also have to keep it cost efficient."* (Western European expert)
Sustainability. *"The only sustainable solution is to manufacture and is to have local plans to manufacturing the products locally. Because when we are importing, I would say we suffer in delays and of course in cost, because maybe you get something from China, but you find the price of acquisition is probably half of the transport costs. Which means that if we get local manufacturing plans, we will probably reduce the costs by 40, 50 percent. So that is to me, the one sustainable solution." (African expert)*	**Competitiveness.** *"Okay, we have local suppliers, but their prices are higher. So what are you doing now? So another thing is to have local suppliers that are also competitive and regarding two main criteria the quality and the price*." (North American expert) *"In the case of simple products, consumables, you can really make a case for it, but if the product produced with [countries] labor costs twice as much, then it is not a competitive situation. If the Turkish costs a third of a hundred, then it is very difficult to favor a domestic product over a high-quality Turkish product from a domestic distributor."* (Eastern European expert)
Autonomy. *"The question of the economic autonomy, we do not have a lot of industries anymore and therefore we are more depending on other countries, not only European, but third countries to provide."* (Western European expert) *"We need to be able to manufacture domestically because we're never going to be able to compete as a client internationally, which is a little bit different from the idea that borders are closed and therefore we need to be able to produce domestically."* (North American expert)	**Raw materials.** *"The question is now how they will compete when it comes back to normal, because I'm not sure all of them will be able to compete. But of course, the funny thing is that raw material and production equipment, at the end of the day, it comes from China. So even though we are able to produce this stuff in [country], or I think the other European countries as well have started to raise the question of the raw material, it is also a question when it comes to pharmaceuticals, because yeah, 80 to 90 percent of the raw materials of all global pharmaceuticals are produced in China or India."* (Northern European expert)
Security. "We also focused a lot of attention on the supply chain, where do the products come from and what is the guarantee of delivery. In the end, that all worked out, the raw materials already came from the EU. That has not been the case with all other purchases. Production took place in [country], so that also gives a guarantee. It does require creativity and insight into the market." (Western European expert)	**Quality.** "Of course, afterwards everybody ran into it, and everybody started manufacturing the same items. Now you would be having around 100 manufacturers of suppliers around the city. Around 300 manufacturers of face masks, around 300 manufacturers of disinfectants. The part of the problem are the quality issues and the capacity of those suppliers. Now they become real, because there are so many small suppliers that are part of the game. So the government, as we prepare for the crisis, we must also prepare for assurance of these suppliers and for what is delivered with them." (African expert)
Local jobs. *"I think the government is encouraging the contractors and suppliers to go in more local and contractor to employ more local people and suppliers can engage because I think local produce and this has been going on for a while."* (Asian expert)	
Dual sourcing. *"How is that possible? I'm not saying don't make it in China. I'm just asking you to make it in two places in China or also make it in another country. It's not unreasonable for us to say the government believes in order to do business with responsible vendors, you have to secure your supply chain."* (North American expert) *"We're not saying don't outsource it- look, traffic paints the perfect example. How is it possible that a single explosion near the factory that manufactured almost all of the traffic paint that was important to the United States was able to decimate the ability to*	**Attainability.** *"So I'm not quite sure whether the public opinion will really allow us in one or two years to build up our own manufacturing capacities in the country."* (Western European expert)

paint stripes on roads across the country?" (North American expert)	
European approach. *"A national manufacturing industry is of course very difficult, so it would certainly have to be a European manufacturing industry. I do think that attention should be paid to going a bit more European. I think we should at least go European, and that it should also be investigated under which specifications this would be possible to give some guarantee. So it also requires research to find out how far we can go in this as Europe. I do not have an immediate answer to that either, but it should be possible."* (Western European expert)	

Appendix 6. External factors, full table

	Country code	Severity of COVID measures	GDP -PPP (Wealth)
Cluster A Insufficient procurement professionalization	ETH	40.74	2,421.9
	RWA	48.15	2,213.0
	ZAF	41.67	13,355.6
	UGA	60.19	2,293.5
	ZWE	40.74	3,456.3
	Average	**46,29**	**4,747**
Cluster B Regulatory hurdles	ESP	37.96	38,343.2
	IND	71.76	6,501.5
	HUN	62.96	33,253.9
	POL	50.93	34,406.2
	RUS	48.61	28,213.4
	SRB	28.70	19,366.8
	Average	**50,13**	**26,680**
Cluster C Strained harmonization endeavors	BEL	59.26	52,626,6
	BRG	50.00	24,620.0
	DEU	84.26	54,263.6
	FRA	69.44	46,712.0
	WLS* (UK)	42.13	45,852.7
	HRV	37.96	29,134.0
	ITA	76.85	41.890.2
	SVN	75.00	40,124.3
	PRT	31.48	34,090.7
	ROU	52.78	31,945.7
	Average	**57,92**	**40,125**
Cluster D Striving to enhance supply Chain knowledge	AUS	66.20	52,397.4
	BTN	78.70	11,126.1
	FIN	43.06	50,810.5
	SCT* (UK)	42.13	45,852.7
	IDN	66.20	12,068.2
	IRL	23.15	95,237.2
	ISL	37.96	55,224.7
	NOR	48.15	63,287.6
	NLZ	62.04	44,212.9
	SWE	50.00	54,929.5
	CAN	78.24	48.091.0
	Average	**54,17**	**48,48**
Cluster E: Collaboration and coordination efforts	**US**	58.8	63,413.5
	Average	**58.8**	**63,413**