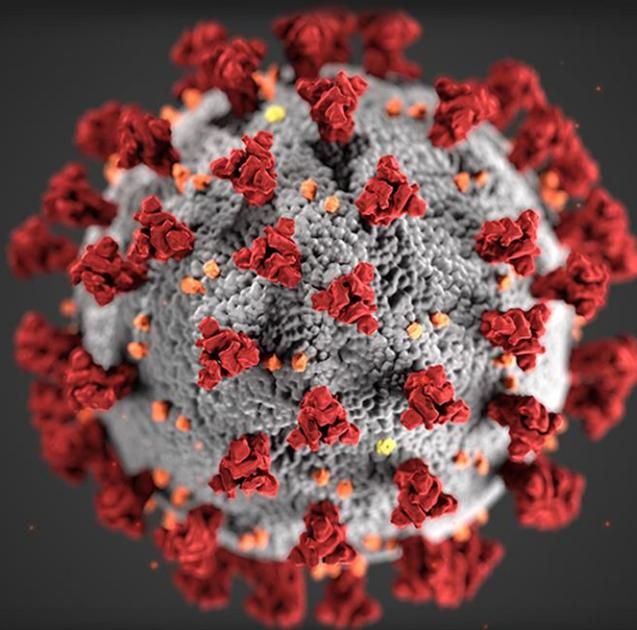




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PREVENTING PANIC IN A PANDEMIC

A strategy to deal with a future pandemic in the Netherlands, based on COVID-19 experiences



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Chapter 1 – INTRODUCTION

On February 27th 2020, the first known COVID-19 patient in the Netherlands was reported during the broadcasting of the information programme 'Coronavirus: feiten en fabels'¹ - a segment in relation to potential COVID-19 infections in the Netherlands - by the Nederlandse Omroep Stichting (NOS) (NOS, 2020). The second patient followed soon after and approximately less than a month later the Netherlands was in 'lockdown'. Today, in April 2021 and over a year later with several lockdowns, infection 'waves' and over 16.500 deaths, the Netherlands seems far from recovered from the pandemic. Scientists warn for 'indirect deaths'², consumer trust has dropped³ and a growing number of young people indicate that they feel more lonely⁴ than ever before.

Fighting a pandemic is a collective exercise in which the government provides the guidelines. It is then no surprise that these guidelines, provided in the form of policies, are subject to critique. However, it is too easy to judge the government's choices without taking their perspective into account with the responsibility to weigh all different factors and consequences.

With having the advantage of being able to look back on a year of experiences in the COVID-19 pandemic, it is time to reflect on the situation and summarize some of the lessons we have learned. Are we too critical and would some of the problems have been unavoidable? Or did the government make suboptimal choices and do we need to improve the strategy? The goal of this report is to analyse the issues encountered in the COVID-19 pandemic in the Netherlands, and construct a framework for how to manage a future pandemic. This framework can act as a foundation for policymakers when trying to combat a new pandemic.

More precisely, we consider a situation in which a future pandemic is caused by an airborne virus which spreads in a similar way as SARS-CoV-2, the virus that causes the disease COVID-19. All viruses have their own characteristics, of which the reproduction number⁵ and the mortality rate largely determine the epidemiological features of the pandemic. This implies that based on these characteristics there are numerous different types of pandemics possible. We do not consider the situation of the COVID-19 pandemic specifically, but we do focus on a similar type of pandemic, thus with comparable values for the reproduction number and mortality rate.

Another important assumption to take into account while reading this report is that we focus on the national policy in the Netherlands. This means that international collaborations and choices on an international scale are left out of consideration, even though they play a huge part in a pandemic situation. For example, scientists from all over the world can share their information and expertise, and

¹ This can be watched on (NOS, Het Coronavirus: Feiten en fabels, 2020).

² E.g. people that do not die from corona but because they do not visit hospitals for cancer (Roerdink, 2020) and (Gorvett, 2020).

³ As explained on (CBS, 2021).

⁴ This is described in (Misirlis, Zwaan, & Weber, 2020) and (NL Times, 2020).

⁵ There is a difference between the 'basic' reproduction number, and the 'effective' reproductive number. This is explained in '

vaccine programmes can be internationally organised. We do not mean to imply that these factors are not important, but we merely wanted to limit this analysis to a limited and clearly bounded domain which is already highly complex.

In order to reach this goal of constructing a strategy for a pandemic, we start with a problem analysis in Chapter 2, first specifically for the COVID-19 pandemic, then generalizing it to a more general pandemic situation. Chapter 3 then identifies the goals required to solve these problems. The framework to accomplish these goals is presented and discussed in Chapter 4. Since the framework is quite abstract and lacks practical details, we present a case study of applying it in a context that we are ourselves very familiar with, namely the University of Groningen, in Chapter 5. The report finishes with a conclusion and some future recommendations in Chapter 6. Some additional information, such as a word list in which some underlined concepts from the report are explained and background information on working together as an interdisciplinary team, can be found in the appendices.

Chapter 2 – PROBLEM ANALYSIS

To be able to present the best way to deal with future pandemics it is necessary to analyse and indicate the problems that arise in a pandemic. A good way to do this is to look at the problems that arise and arose in the current COVID-19 pandemic. This chapter elaborates on the complications and obstacles that the government and the population of the Netherlands were facing during the COVID-19 crisis. By doing this, it aims to provide an overview of problems that may arise during a pandemic. Therefore, this review is also a demonstration of the main challenges that have to be overcome in a future pandemic.

COVID-19 CHALLENGES

The Coronavirus (SARS-CoV-2) was first noted in Wuhan, China in November - December 2019 (WHO, 2020). Increasing globalization since the 1960s normalized international travel and advanced the possibility to trade between countries. For most countries, it is positive that goods and people can easily be transported to other countries, but during the corona crisis many countries noticed that this easy way of transport also goes for viruses. Specifically, this means that by December 2020, COVID-19 spread to all seven continents with the number of deaths and number of infections reaching all-time highs (Booker, 2020). Because of this rapid spread, national hospitals were forced to operate at maximal capacity and almost to the point of collapse.

In the Netherlands the first COVID-19 case was recorded on the 27th of February 2020 (NOS, 2020). The Dutch government was forced to face the challenge of making a policy that was able to tackle the new virus of which even experts knew little about. A month after the (official) introduction of the virus⁶ in the Netherlands, on March 23, the government introduced an 'intelligent lockdown' (Rijksoverheid, 2020). This intelligent lockdown received much critique because it was relatively mild compared to other countries in Europe. Other policies that received much critique in the Netherlands are for example the vaccination protocols, and the way these were rolled out, communication in press conferences and in other forms of media, a disproportionate focus on hospital capacity in the making of the rules, the lack of arguments (or the lack of a model) for the rules and the length of the rules and regulations or lockdowns (RTL Nieuws, 2020). By April 1st 2021, despite the ongoing lockdown, the COVID-19 mortality rate in the Netherlands reached 16,559 with 22 deaths per day (RIVM, 2021).

The ongoing death and infection rates of today (globally and nationally) demonstrate the severity of virus outbreaks, the need to act quickly on limiting the spread the outbreak, and the high prioritization of finding out the properties and symptoms of the disease caused by the virus in an early stage to effectively aid and quarantine those affected (Sullivan, 2020). It emphasises the importance of preventative measures to deal with a pandemic in the short and long term.

The table below provides a non-exhaustive list of problems identified in the COVID-19 pandemic. They have been grouped into categories in order to facilitate an analysis of the relations between types of problems.

⁶ Researchers claim the virus was already in the Netherlands in January 2020 (Strijker, Kempes, & Bunskoek, 2020).

Virus	<ul style="list-style-type: none"> ▪ Unknown time it takes to develop vaccines ▪ Lack of effective treatment ▪ Mutations
Healthcare	<ul style="list-style-type: none"> ▪ Capacity (equipment and personnel) ▪ Allocation of patients ▪ Scaling down regular healthcare
Policy	<ul style="list-style-type: none"> ▪ Enforcement ▪ Laws ▪ Compliance ▪ Privacy and freedom <u>restrictions</u> ▪ Confusion about policy/conspiracy theories
Social	<ul style="list-style-type: none"> ▪ Limited social contacts ▪ Mental health problems due to restrictions ▪ Loneliness ▪ Domestic violence
Economic	<ul style="list-style-type: none"> ▪ Loss of revenue due to restrictions ▪ Unfair advantage for large businesses with strong online presence ▪ Uncertainty in stock markets ▪ Enormous government debts
Education	<ul style="list-style-type: none"> ▪ Unequal access to online education ▪ Loss of interaction ▪ Delays ▪ Cancellation of activities such as exams
Environment	<ul style="list-style-type: none"> ▪ Increase in environmental crimes ▪ Mass slaughtering of animals due to (possible) infections

Table 1 Overview of COVID-19 problems.

PANDEMIC CHALLENGES

Analysing the problems in Table 1, we see that many of the problems faced within a pandemic are complex and interrelated because one problem can affect another problem. The diagram in Figure 1 is based on the problems identified in the COVID-19 crisis and presents the relation between different factors in terms of causes and effects. It shows that on the left side of the diagram, the relations are still relatively simple: a virus affects the healthcare situation in the country. Yet, changes in healthcare will have a big impact on all the other factors on the right side of the diagram. Contrary to this, on the right side of the diagram the relations between factors get so complicated that aiming a solution at just one

of the factors will not be able to solve the problems of a pandemic. For example, when there are changes in the economy, this will affect the social situation.

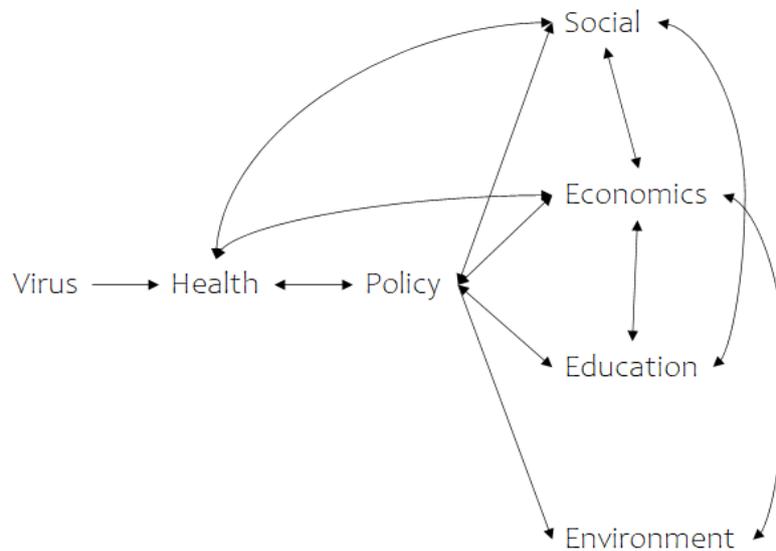


Figure 1 Cause-effect diagram of pandemic problems.

It should be noted that the diagram is just a simplified version of reality, because the suggestion that the virus and healthcare situation are relatively isolated factors is not entirely correct. For example, social and cultural factors determine our relation to animals and therefore affect the probability of a zoological virus coming into contact with humans. There are many conditions related to factors on the right side of the diagram that determine the ways in which the virus is able to spread, or the capacity of the healthcare system at the start of the pandemic. However, we decide to take the situation at the start of the pandemic and do not consider solutions in terms of fundamental and structural changes of, for example, healthcare systems, international relations, and cultures, since those would require an approach on a different time scale entirely.

Furthermore, it is important that the right policy is implemented at the right time. If a measure is implemented too late then the opportunity to prevent problems has passed and a different type of measure should be applied, and if a measure is implemented too early its effectiveness might decrease before the desired effect of the measure is reached. Therefore, a policy should not just contain a plan for which measures to implement, but also a plan for when to implement them. Implementing the right policy at the right moment might prevent problems in the future. This relates to Figure 1 because this visualises the cause-and-effect relations that are present during a pandemic, and those relations are always temporal.

These problems in itself already pose a big challenge, but what makes it even more complex is that a pandemic situation is characterised by uncertainty and limited information. Even though scientists and experts can be asked for their predictions, projections and advice on the situation, they are dealing with unavailability of information and new situations for which new models and theories need to be developed.

SUMMARY OF THE PROBLEM ANALYSIS

- Problems can be best solved by preventing them or solving the most fundamental ones, but this is not always possible in a pandemic.
- Many problems are related to each other, so they cannot be treated as isolated factors.
- Information about the virus and its control is limited and uncertain.

Chapter 3 – GOALS

In the previous chapter, we identified the main problems and challenges to be encountered in a pandemic situation. These have demonstrated that the complex nature of pandemic situations, which depends strongly on many different parameters, is unlikely to be solved by one specific solution. Therefore, we aim to develop a framework which provides a guide and certain principles that lead to a successful pandemic policy to minimise the impact that a virus has on society. In this chapter, we describe the goals for such a framework, in order to solve the problems and overcome the challenges of a pandemic.

MAIN AND SUB-GOALS

When we consider Figure 1, we can derive that the main goal is to reduce, or at least be able to control, the number of infections. Given the way that the virus spreads, this amounts to reducing the number of contacts between people until they are all immune, either by vaccination or infection, to the virus and its mutations.

Again, from Figure 1 we can derive other goals such as: maintaining economic activity, education, social life and health, and the environment to an acceptable level.

POLICY

To realise these goals, a strategy, or policy is defined. An important requirement to consider in the formulation of a policy is the timing of the policy. With timing is meant to put the policy in place at the right time. It also covers certain aspects of the policy that can only be applied for a limited duration. And, in addition, this requirement for timing the policy includes that the policy has to adapt to the continuously changing situation.

It is wise to relate the goals to the most fundamental problems. This means that it is better to prevent people from getting sick (prevention) than to treat them after getting the disease (treatment). The rationale is that in every step further away from the cause there might be auxiliary problems and thus, more problems to solve.

A complexity for formulating a policy is that we have to deal with uncertainty and lack of information. So, we have to reduce uncertainties, gather more information, and work with information and data that is available. The latter is important because we assume that it is not possible to remove all uncertainties and get all information.

The success of the policy depends strongly on the success of the strategy towards, for example, compliance. This would then relate to the timing, and communication of the policy. Compliance and measures are not independent factors because increasing the measures can cause a decrease in the compliance.

In Figure 2 below the main goal of contact limitations in the box on the left can be achieved through measures and compliance represented by the red and orange boxes next to it. However, these have consequences leading directly, or indirectly (through the number of infections or decreased autonomy) to the problems on the right side of the diagram. Therefore, the solutions, given by the framework we

will present in the next chapter, will have to maximise the contact limitations, while minimizing the problems in social well-being, the problems in the economy and the problems in healthcare.

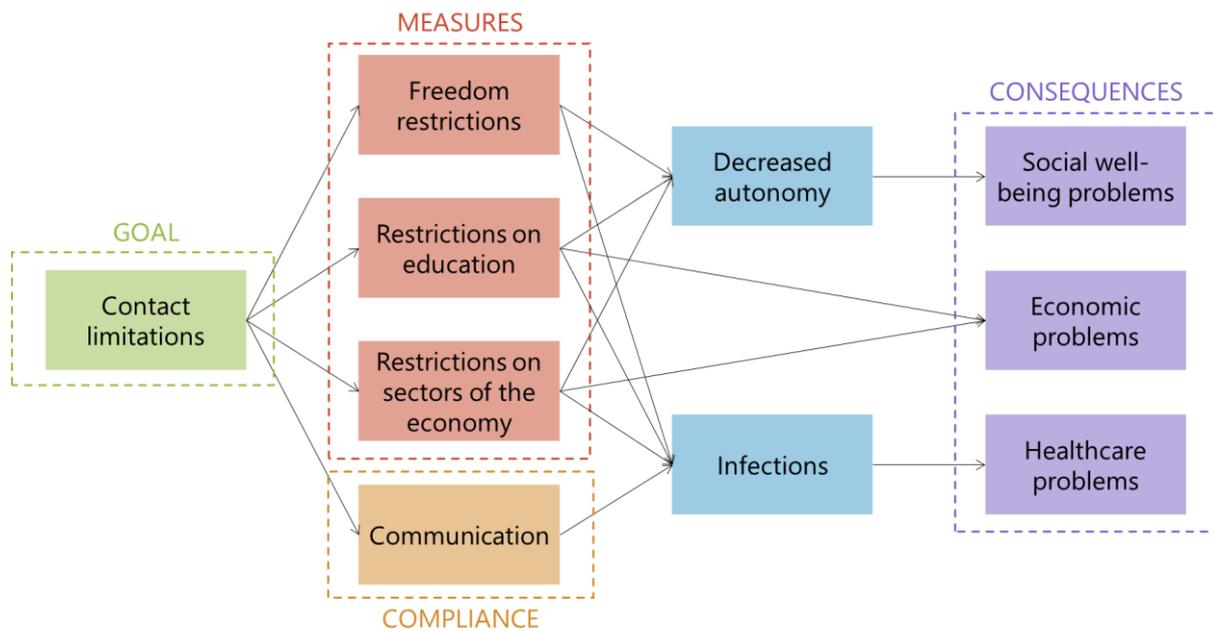


Figure 2 Diagram explaining the policy goal.

SUMMARY OF POLICY IN A PANDEMIC

- Address problems as fundamental as possible.
- Accommodate a guideline for timing the policy.
- Deal with uncertainty and lack of information.
- Use measures and compliance to minimise social well-being problems, problems in the economy, and healthcare problems.

Chapter 4 – SOLUTIONS

In the previous chapters we identified the complex situation of a pandemic. Governments are expected to make flawless decisions and a perfect policy based on incomplete information, which causes much uncertainty when constructing a solution. To address these uncertainties and the complexity of the problems that arise in the presence of a new airborne virus, we aimed to find a multifaceted and multidisciplinary approach.

This chapter presents a discussion of the solutions that we propose for future pandemics. These solutions must minimise the impact of the pandemic on healthcare, social, and economic aspects of society. These aspects are always interdependent to one another, and the exact relation between them is often either unknown, or too complicated to describe precisely. Furthermore, the situation is highly complex and dynamic, every action will lead to a reaction. In the ideal world a government would be able to predict all those reactions and use those predictions to determine the best course of action. However, in practice, as we have seen in the past year of the COVID-19-crisis, there are many unexpected or unknown effects that make predictions and projections unreliable.

This does not mean that we cannot learn from the experiences of the past year. Not having all the information necessary to make the best decision, does not mean that no decision can be made. On the contrary, not making a decision is possibly the worst decision that can be made in such a crisis. Therefore, we have designed a structure that helps to guide the policymakers of the Netherlands to find a good solution that fits the situation of a specific time in a pandemic. Although many details should still be worked out further, we believe that the structure of this solution is a great step in the direction towards being better prepared for future pandemics and avoiding unnecessary mistakes in policymaking.

STRUCTURE OF OUR SOLUTIONS

One of the biggest challenges in this crisis is that everything is connected to everything else: you cannot change one thing without that also affecting something else. For example, you cannot restrict people in their daily life without affecting their mental well-being or economic situation. However, the interconnectedness can be used as an advantage for measures that address several problems. For example, allowing certain educational activities to continue does not only improve the quality of education, but it can also boost social well-being of children and students. But the negative or unwanted effects of measures, such as a devitalized mental health and a pressured economic system also need to be taken into consideration.

This interconnectedness of measures, behaviour and socio-economic situations inspired us to think about the effect of the policy in terms of 'measures' and 'compliance' and the interrelatedness of these two terms. The equation

$$\text{effect} = \text{measures} \cdot \text{compliance}$$

demonstrates an important relation between the 'effect' of the policy measured in contact limitations, the 'measures' of the policy often in the form of restrictions, and the 'compliance' to the policy. Maximising the 'measures' would consist of having many extreme restrictions which in turn will lead to

a decrease in compliance. Maximising 'compliance' would mean that everyone follows the measures very precisely. However, in practice they cannot be maximised simultaneously because compliance will decrease with an unreasonably high number and severity of measures. Therefore, there is a strong incentive to find a combination of measures and ways of increasing compliance to maximise the effect of the policy.

Basing the policy on the healthcare level performance alone will have negative effects on the social and economic levels, which can ultimately affect compliance and the feasibility of the rules. In addition to this, communication can also have an impact on the compliance of the rules. Therefore, we have split up our solutions to manage a pandemic into two parts: the first one focusing on regulating the measures in the number of restrictions and their impact on the hospital capacity, the societal situation and the economic situation, and the second one focusing on strategies to improve compliance.

MEASURES IN DIFFERENT STAGES

In the previous paragraphs we noted that the priorities to manage a pandemic are dynamic and need to be adapted according to the healthcare, economic and social situation. To manage priorities, we have created a model that consists of different stages. Types of models containing solutions in different stages, levels, or phases have been applied by different governments during the COVID-19 pandemic, examples of these are the Dutch government (Rijksoverheid, 2021), and the UK government (UK Government, 2021).

In our approach to manage a pandemic we make a distinction between different *stages* in the pandemic, which all have their own actions. To make clear what these actions are, we decided to look at the three *levels*: healthcare, social, and economic. This is different from the trend in policies chosen in the COVID-19 pandemic, which were mainly directed towards the actions on the healthcare level. In the following paragraphs we will elaborate on how we view the construction of such a model with different stages.

ACTIONS DURING DIFFERENT STAGES

In a pandemic four main stages are distinguished: 0, 1, 2, and 3. In addition we made a distinction between two different situations in stage 0: 0⁻ and 0⁺ which are connected by the type of action required, and distinguished by the proximity of the virus. Table 2 discusses these stages and substages with their actions. The biggest difference between priorities in the stages occurs between stages 0 and 1 compared to 2 and 3. The first stages put emphasis on the healthcare situation and the root of the problem which is the virus and spread of infections. The last two stages acknowledge that solving the problem at the root cause might not be achievable at that moment and priorities shift towards the social and economic situation.

Stage	Characteristics	Actions
0 ⁻	A new virus is identified but not yet found in the Netherlands.	Gather information about the virus, prepare society for measures and restrictions. Prepare for testing and contact tracing.
0 ⁺	The virus has been identified in the Netherlands, but the limited number of infections can still be tracked with contact tracing.	Limit travelling (abroad). Minimise infections with measures and restrictions and advise on general hygiene.
1	A (rapid) spread of the virus in the Netherlands is happening or is unavoidable.	Minimise infections with strict measures and restrictions.
2	The Netherlands is under pressure and <u>stress</u> of the measures and restrictions.	Recover from stress caused by measures and restrictions.
3	Spread of the virus is stable and measures and restrictions can be brought back to a sustainable level.	Adapting to a sustainable status quo.

Table 2 Stages, their characteristics and actions.

In Table 2 'stress' can be interpreted very broadly. For example, closing restaurants puts the economy, restaurant owners, and restaurant employees under stress if no compensation is offered. A characteristic of stress is that it can build up. You can have something that causes much stress at once, but there are also scenarios possible where something that causes a little stress but is still problematic if it lasts too long. For example, in the case of corona restrictions, a strict lockdown causes much stress at once and should therefore not last any longer than necessary, but milder restrictions for longer periods of time should not be treated too lightly. So, we consider it important to treat the impact of a pandemic policy in terms of stress, where it is important to recover from the stress if needed, even though it might happen that not all criteria support that choice. It is key to weigh the different causes of stress and try to facilitate relief at the right time with the right decisions (Ascher & Tonies, 2021).

MEASURES AND RESTRICTIONS

Within each stage there are certain considerations for measures and restrictions and the extent to which they fit the goal of that stage. In general, the measures and restrictions are most extreme in stage 1. Stage 2 is an explicit relative relief of those, without letting the virus spread uncontrollably. Stage 3 is all about finding a sustainable strategy for the long term. The main difference between stage 0⁻ and 0⁺ is the type of measures, because stage 0⁺ is more active compared to the relatively passive stage 0⁻ because it directly affects people's life.

	Stage 0 ⁻	Stage 0 ⁺	Stage 1	Stage 2	Stage 3
Social contacts	No restrictions	Face masks, no touching, no handshakes	Maximum of two visitors per household per day	Maximum of four to six visitors per household	Normal (with distance)
Education	No restrictions	Open, limit unnecessary contacts	Online	Hybrid (online and open)	Open
Events	No restrictions	Small and with reservation, face masks, keeping distance	None	With reservation and masks (20-30 people)	With reservations and/or registrations
Sport	No restrictions	Normal, with contact tracing	No group sports / No sport locations	In small groups/outside	Keep distance
Restaurants	No restrictions	With reservations	Closed (delivery exception)	Only outside, limited people per table, only reservations	Keeping distance, masks while moving
Shops	No restrictions	No evenings, register visitors	Closed	Limited visitors, only appointments	Distance and masks
Travelling	Negative travel advice to affected places	Negative travel advice	Health test before entering the country	Country-specific travel advice	Country-specific travel advice

Table 3 Example of measures according to stages.

CRITERIA AND BOUNDARIES

In the pandemic it is important to understand which stage of the framework described above fits the situation at that moment best. Therefore, it is important to determine the metrics for distinguishing the different stages in the model, that will determine the moment at which the government should move on to the next stage. The criteria for 'healthcare', 'economy' and 'social' each have their own boundary. These boundaries should be quantified by experts to include them in models and to use them. We decided it was best not to include too many criteria in order to get an impression of the situation in the Netherlands on the three different levels (healthcare, economics, social). More criteria could give a more complete impression, but would also cause great complexity as everything in a pandemic is interlinked. Of course, it is always possible, and even desirable, to consider more criteria and metrics in specific situations to construct a detailed policy.

HEALTHCARE

A criterion for the healthcare condition of the country is the availability of non-pandemic-healthcare. This can be monitored by evaluating the ratio of pandemic-patients in hospitals to the total number of patients in hospitals. If this ratio is higher than a certain signal value, this means that regular healthcare has been scaled down in favour of treating pandemic patients. A good ratio value can, for example, be calculated using the data available in the 'Zorgbeeld'-portal (Nederlandse Zorgautoriteit, 2021), similar numbers are shared by the RIVM (RIVM, 2021) (this is data from NICE (Nationale Intensive Care Evaluatie, 2021)) or on the 'Corona dashboard' (Rijksoverheid, 2021) from the government of the Netherlands (this is data from LCPS (Landelijk Coördinatiecentrum Patiënten Spreiding, 2021)).

Focussing on numbers of patients in the hospital means that we do not focus on the number of infections in the population. We consider the number of patients who end up in the hospital (both at the ICU and non-ICU) to be a good representation of the total number of severe infections in the Netherlands. The reason for choosing to focus on monitoring the number of patients in hospitals instead of monitoring the total number of known infections is that the second one depends highly on the number of tests that have been performed. The number of positive tests depends on the testing policy and other factors like the weather conditions or holidays. Furthermore, the total number of known infections include a proportion of asymptomatic or less severe cases which still pose a risk for spreading of the virus but will cause a less severe burden on society and the healthcare system. Therefore, those cases should, in our opinion, not be the leading factor in the development of the policy.

Focussing on only the number of patients in the hospital, and not looking at the healthcare that is not being provided or the number of patients that avoid hospitals, might give only a unilateral representation of the health of the population. If people avoid hospitals for regular healthcare during a pandemic, their medical condition might worsen which can lead to more indirect deaths which ultimately results in a decrease of years of life and a decrease in the health of the general population.

ECONOMIC

A criterion that represents the economic condition of the country is the revenue in different sectors of the economy. This can be monitored by comparing the current revenues with revenues during 'normal' years, possibly corrected by taking factors like the growth of the economy into account to calculate the expected revenues without the pandemic. Monitoring the revenues of a selection of vulnerable sectors in the crisis is an important factor to weigh in for making a policy. The long-term effects of economic problems can have serious effects on the socio-economic situation of the population. An example of this is that rising unemployment rates can affect the healthcare and social well-being of the population.

To a certain extent struggling sectors of the economy can be supported by offering (financial) support such as financial compensation or tax payment extensions. However, this is only a short-term solution. A medium- or long-term solution may be monitoring the revenue-loss as it indicates what the effects of the rules in a policy are. The boundary can be determined by experts and is reached when revenue loss proceeds for too long of a period in time and/or no compensation is offered. The data for monitoring this is available at the 'Centraal Bureau voor de Statistiek' (CBS, 2021) but other sources are also available to the government (e.g. from taxes). It is also possible to take costs into account, resulting in monitoring profits instead of revenues. When a sector receives support from the government or

another party, this should be corrected in the criterion, because this provides a buffer for that sector and compensates for part of the loss of revenue before further action needs to be taken.

It is important to take into consideration that not all sectors will be affected in the same way. Some might be directly affected by policy restrictions whilst others might suffer more from indirect effects and externalities (both positive and negative). Some sectors will also be more adaptable and suffer less due to suitable options for alternative revenue streams. We prefer to only monitor the sectors, which experience negative effects from restrictions, such as retail stores, restaurants, etc., and to eliminate these sectors from the selection to be monitored as soon as restrictions are removed.

SOCIAL

A criterion representing the social condition of the country is the sentiment in (social) media. This can be monitored by performing sentiment analysis on publicly available texts gathered from, for example, newspaper articles, and social media websites such as Twitter, Facebook, Instagram, etc. A threshold value corresponding to an alarming state should be determined by experts.

The general idea of this method is that publicly available texts which have a certain tag, such as texts about the pandemic or the policy, are collected and analysed. A machine learning algorithm then attributes scores to the text for the sentiments that were found in the text. For example, a sentiment analysis of tweets after imposing a curfew will probably give a high score for negative sentiment and a low score for positive sentiment. Data analysts and data scientists can determine which texts are suitable to include in the analysis. Options could be to include or exclude texts from certain sources or let some sources contribute more in the weighing of the results. The data is easily accessible because it is publicly available on the internet.⁷

Although the results from monitoring (social) media are very sensitive to change and influences from the media itself, we consider the development in this part of data analysis highly promising and a good indication of public opinion. An advantage of this method is that public opinions are also strongly influenced by the information that is analysed for the sentiment analysis and thus it could include important predicting signals about changes of the public opinion in the future. An important disadvantage of this method is that it only takes into account public opinions and neglects less-voiced trends in society. However, other methods will face the same problem.

EXAMPLE: CRITERIA FOR COVID-19

In Figure 3 below we have used three available datasets to construct a proof-of-concept for our solution to use different boundaries for assessing the situation of the country. Since we did not have all the above-mentioned data available to us, we used some alternatives which might not meet our preferred standard of quality but are sufficiently adequate for this example.

Data about the ratio of COVID-19 infected patients on the ICU to the total number of available beds (including e.g. mechanical ventilators and healthcare staff) on the ICU was retrieved from (RIVM, 2021). It was rescaled and normalized in such a way that the line starts at zero for no patients with known

⁷ A simple example of the implementation of the sentiment analysis algorithm is provided in the blog by (RAJESHMORE1, 2021). And a more scientific analysis of this method applied to tweets in the COVID-19 pandemic can be found in (Kumar, Khan, & Kalra, 2020).

COVID-19 infection at the ICU, and reaches the boundary when approximately half of the total number of patients at the ICU has tested positive for COVID-19. This example therefore does not include the patients who have been admitted to the hospital and are not in the ICU, and it depends on the decisions made about whether to admit or not admit patients (with or without a COVID-19 infection) to the ICU. However, it does give an impression of the relative situation of healthcare in the Netherlands during the COVID-19 pandemic.

Data about unemployment rates in the Northern area in the Netherlands was retrieved from (Lifelines Corona Research, 2021). This was rescaled such that the starting value is the unemployment rate at the start of the crisis, and the boundary was reached when the average unemployment rate had increased with almost 1 percentage point, which corresponds to an increase of unemployment rate of approximately 20%. This boundary is a bit arbitrary, but in reality it can be chosen based on the trade-off considered to be acceptable with respect to the unemployment numbers in the Netherlands.

The information about quality-of-life ratings of people in the North of the Netherlands was retrieved from (Lifelines Corona Research, 2021). It was normalised in a way to let the highest ratings, during the summer of 2020, correspond to the lowest values in the graph, thus least alarming situation. The boundary, signalling an alarming situation, was chosen to correspond to a rating of 1 out of 10 below the highest ratings of the summer of 2020.

The stages transitions matching the changes in policy by the government in the Netherlands are indicated by the black arrows above the graph in Figure 3. The red arrow indicates the moment at which our framework suggested another change in policy, but this choice was not present in the actual policy.

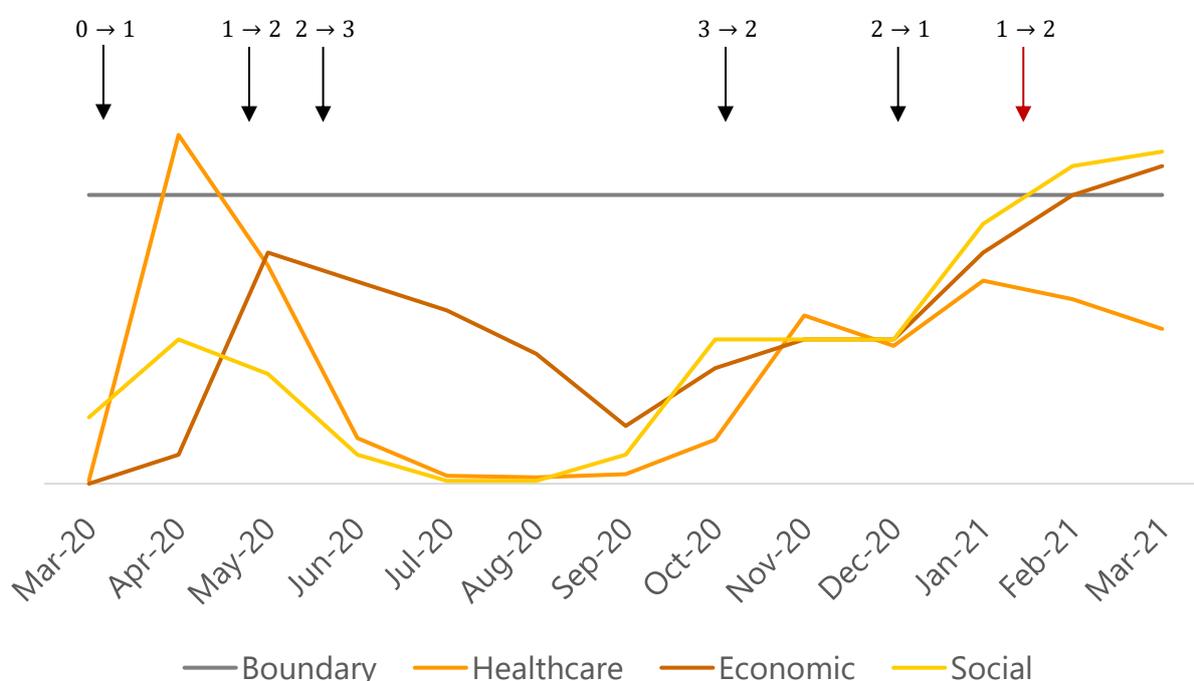


Figure 3 Analysis of criteria for the healthcare, economic, and social situation based on data from (RIVM, 2021) and (Lifelines Corona Research, 2021).

COMPLIANCE

Compliance can be considered just as important as the rules that are set, as without compliance there is no point in setting rules and regulations. That rules and compliance to the rules are interrelated becomes clear in a recent report published by the RIVM which showed that the compliance decreased from 95% to 81% once the limit for visitors at home was put to 1 person per day (RIVM, 2021). Even though this percentage of compliance remains high it might be an indication that the social well-being of the public is related to the compliance of the rules.

Another study, that was conducted at the beginning of the COVID-19 crisis in the Netherlands, showed that people who trust in science had a better compliance to the set measures (Kuiper, et al., 2020). This indicates that one way in which compliance can be improved is to explain the situation in such a way that the population that does not trust science still understands the need for the measures. The same study also showed that people who had the ability to not comply with the measures did this more frequently than those who did not have this chance. Often the reason that people had the ability to not comply to the rules was due to the lack of enforcement. Besides this, the study saw a positive correlation between social norms and compliance. Once more people comply with the measures, others are more likely to follow. This idea is inspired by Social Identity Theory (SIT) where group identity can evoke a sense of belonging and even contribute to norm formation according to that group identity (Figure 4). Tajfel (1979) proposes that groups (e.g. social classes, sports teams, student teams) that create a sense of belonging are an important source of pride and self-esteem. Through these groups, a process of social categorisation occurs where people identify between an 'in-group' and 'out-group', then social identification occurs whereby an identity is adopted according to the group one belongs to, and lastly social comparison occurs whereby groups identify one another based on differences/similarities that another group may have (Figure 4).

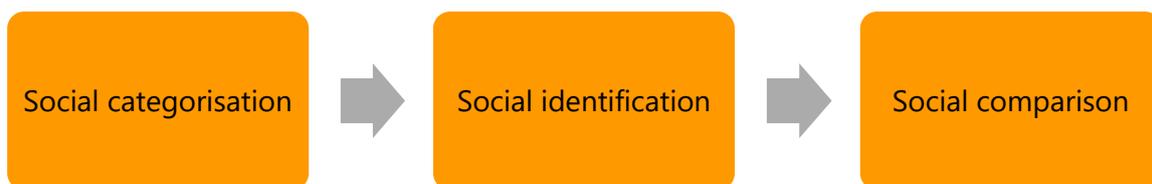


Figure 4 Mental processes in Social Identity Theory.

Practically, this means for example that if you see many people wearing a face mask you are more likely to wear a face mask yourself, and if you see no one wearing a face mask you are less likely to start wearing one. In conclusion, the study by Kuiper et al. indicates that building knowledge about the virus, explaining the reasons behind the measures, and having a stricter security system in place can be helpful in stimulating more people to comply with the measures. Using a bottom-up approach to stimulate compliance could also prove effective. This approach is further discussed in the section below.

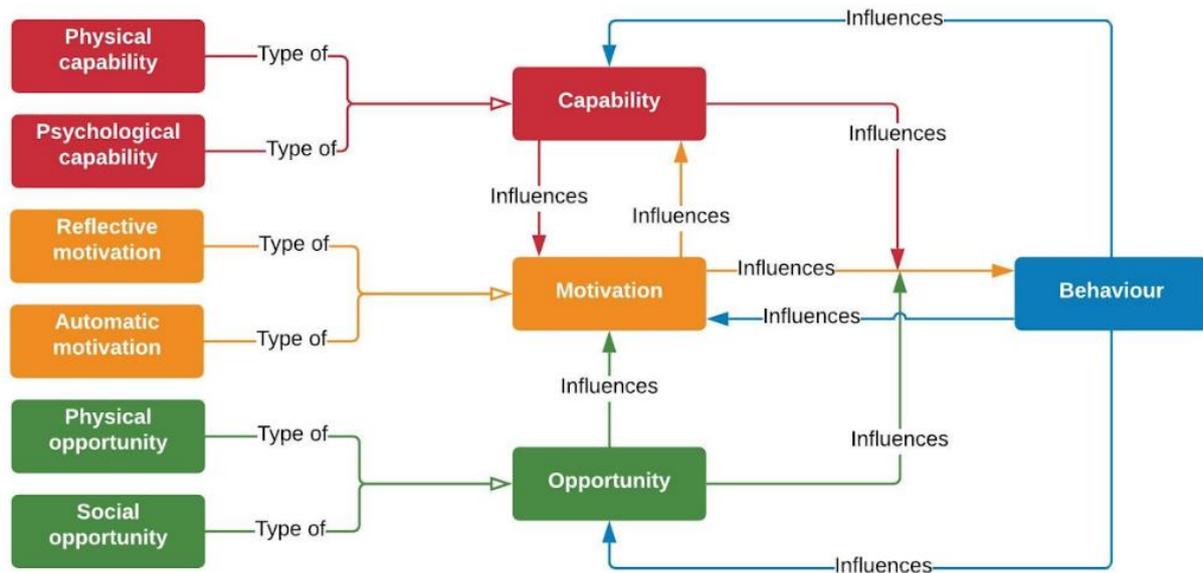


Figure 5 COM-B model (West & Michie, 2020).

The COM-B model (West & Michie, 2020) shown in Figure 5 can be used to model and visualize the factors that influence compliance to the rules. The three main factors that are identified in this model are capability, opportunity and motivation. They are described in the following paragraphs.

CAPABILITY

Within the COM-B model capability is focussed on a *person's* ability to conform to the rules. Capability can be subdivided into a person's physical ability and person's psychological ability where the first relates to people's ability to use their muscles but also to see, hear and receive information into the brain, and the latter refers to the ability to mentally reflect on these information stimuli with their cognitive capacity. A person's physiological capability accordingly consists of a person's cognitive abilities such as memory or understanding.

In the case of managing a new pandemic, the psychological aspect, or the capability to understand what and why the rules are enforced, can be an important aspect to improve rule compliance. A way in which this can be realised is by providing clear and easily accessible communication about this virus in all contexts: how does the virus spread? How can you decrease the spread? Why is this important? What are the effects of the virus to the economy, the healthcare system and the social well-being of the population? Communication techniques like visualization, the organisation of online information days and the spread of leaflets and pamphlets can be useful. In the about 'communication' later in this chapter more information on communication during a pandemic can be found.

OPPORTUNITY

Opportunity, the combination of physical opportunity and social opportunity, in the COM-B model indicates the attribute of the *environment* that makes behaviour possible or that facilitates behaviour. Physical opportunity consists of the inanimate objects of the environment (e.g., a person's financial resources or the size of one's house). Social opportunities involve a person's friends, family, role models,

and social groups that a person is part of or wants to be part of. Social norms are therefore an example of social opportunity.

For the opportunity component in the COM-B model it is important to take into account that in a pandemic situation people are affected differently by the pandemic and the policies that are enforced during a pandemic. People in higher social-economic classes might struggle less to comply with the measures than people in lower social-economic classes, for example, due to their access to delivery services and working from home. For someone, a lack of opportunity could be, for example, that people do not experience the opportunity to quarantine when their livelihood depends on their income to such an extent that they cannot miss a day of work where other people do not feel this pressure. This means that there must be some type of compensation for those that require it, for example by providing subsidies for families from lower socio-economic groups so that they can buy the necessary equipment and facilities to work from home. Besides subsidies, penalties can also create opportunities. In some cases, people and businesses can be stimulated to comply with the rules and regulations by enforcing harsh penalties. Social isolation can also be difficult for people with a low socio-economic status or those families that live in small houses. Isolation methods within hotels could be an option to isolate those members that tested positive.

Social opportunities can develop in the form of a bottom-up approach. The idea of a bottom-up approach is that the stimulation of compliance starts at the lowest level, in this case the public. The biggest aspect of the bottom-up approach is that the responsibility for compliance lies partially with the public, and only indirectly with the government. This relates strongly to the Social Identity Theory (SIT) explained earlier in this chapter. The government can fulfil its responsibility by stimulating compliance through communication and supporting measures, both in the end the responsibility of following the government's policy and advice lies with the public.

Within the bottom-up approach following the crowd plays a big role. This is where people follow the crowd by wearing masks when the majority of people wear a mask. Or when the majority of people stay home one is more likely to also stay home. With the bottom-up approach local and regional institutions can stimulate compliance by making merchandise such as personalized masks, and by stimulating online events. These institutions can also explain the reasons behind the measures and make these clear to those that do not understand. Each group in society has their own values and norms, therefore it is important that these values and norms be researched so that information can be shared effectively. Using people with a certain status (celebrities, teachers, coaches, police etc.) to set an example can definitely influence numerous people to follow the rules.

MOTIVATION

Motivation consists of the collection of mental processes, reinforced by capability and opportunity, that will result in behaviour. When the mental processes are a conscious form of decision making, when you make a plan, this is called reflective motivation. When the mental processes concern habitual and instinctive behaviour this is called automatic motivation. Reflective motivation is easier to change than automatic motivation. Because motivation is a result of the processes of opportunity and capability, as visualized in the COM-B model, we consider it more important to focus on opportunity and capability rather than on motivation.

During a national crisis the government has the responsibility to inform the public about all relevant developments. Over the last year there have been numerous press conferences where the Dutch prime minister and minister of health presented the new measures for the upcoming weeks. Considering that the Netherlands has a diverse population in terms of culture and education, the communication has to be effective for the majority of the population. The information should be provided in a simple and direct manner (Reynolds & Quinn, 2008), without the use of complicated metaphors⁸ to keep the language of press conferences understandable to as many people as possible (Jansen, 2020). Publishing the measures in different languages, those spoken most by the population in the Netherlands, can also help the public understand the information. Besides publishing information in different languages, the language should be understandable to all people from all socio-economic backgrounds.

Furthermore, the government should also mention that the prediction models will not provide all the right information but can only give an indication. Therefore, no promises should be made during the press conferences on when a measure will be scrapped based on the prediction models. This will prevent the public from getting their hopes up when the planned duration of the lockdown is later reconsidered and changed (Reynolds & Quinn, 2008). The information provided should be given in an empathetic way, to show the public that the government understands what they are feeling. The public will also respond better to the given information if this is given with empathy (Hyland-Wood, Gardner, Leask, & Ecker, 2021).

Informing the public about the reasons behind certain measures can be done by visualization in addition to the press conferences. Visualization can be in the form of advertisements on tv with informative information about for example how wearing a mask helps reduce the spread of the virus. Besides this repetition is also a good way for people to better understand the issues at hand and one way in which this can be done is through radio adverts and billboards. Hopefully compliance will improve with the repetition of the measures and through easy visual explanations of the reasons behind the measures.

⁸ An example of a complicated metaphor that was used in the press conference of 24 June 2020 (Mutsaers, 2020): "Vergelijk het met onze eeuwenlange strijd tegen het water. Die heeft ons de reputatie gegeven de voeten droog te kunnen houden. En dat deden we door dijken te bouwen. En vandaag zijn wij samen die dijk die de tweede golf buiten de deur kan houden. Door bij klachten thuis te blijven en ons te laten testen, en door ons door ons echt aan die anderhalve meter afstand en de andere basisregels te houden. (...) De dijk, dat zijn we samen. En als we ons dat blijven realiseren, dan wordt het vast een mooie zomer. (...) En het grootste risico nu is dat je inderdaad zegt 'het water is weg, we gaan de dijk weghalen', maar dat water is niet weg, dat ligt te wachten, de vijand, het virus ligt te wachten om weer aan te vallen. (...) Die dijk is echt sterk. Behalve als we zelf die dijk laten verslappen, dan houden we het inderdaad niet meer tegen. Ja en dan zullen we inderdaad weer genoodzaakt zijn om grotere maatregelen te treffen. En het gekke – nog even inhakend ook op die vraag over dat draagvlak en ik begrijp de vraag heel goed – maar het gekke is eigenlijk, dat noem je de preventieparadox: je hebt iets, door je goed te houden aan een aantal afspraken heb je het onder controle weten te krijgen en vervolgens zeg je 'ja maar waarom is het eigenlijk nodig geweest?'. Het zou echt hetzelfde zijn als dat we in Zeeland de Deltawerken afbreken want: ja, we hebben toch sinds 1953 geen overstroming meer gehad? Dat zou een beetje hetzelfde zijn en dat moeten we dus gewoon niet doen: geen dijken afbreken als we weten dat het water nog op de loer ligt, niet doen."

Urging journalists and other public figures to only publish trustworthy information will decrease the misunderstanding within the population, and will also make sure that people are all on the same page. Sharing conspiracy theories and unproven facts will divide the population and decrease compliance.

We have made the acronym 'D RULES' to be able to identify the above-mentioned tips better:

Different languages

Reduce false hope

Use visualization

Limit misinformation

Empathy

Simple and direct communication

The above solutions are several methods in which the communication between the government and the public can be improved in order to improve compliance of the measures by way of clarity and through explanations.

SUMMARY OF THE SOLUTIONS FRAMEWORK

General structure

- The goal of the policy, contact limitations, is achieved by a combination of measures and compliance to those measures.

Stages

- The implementation of the measures in the policy needs to match the different goals of the stages in the pandemic.
- 0⁻: prepare for testing and contact tracing.
- 0⁺: limit travelling, follow all infections with testing and contact tracing.
- 1: minimise infections with strict measures and restrictions.
- 2: recover from stress caused by measures and restrictions.
- 3: adapt to a sustainable status quo.

Criteria and boundaries

- There are three main criteria to be monitored in order to determine the stage of the pandemic.
- Healthcare: ratio of pandemic-patients compared to non-pandemic-patients in the hospital.
- Social: sentiment analysis of (social) media content.
- Economic: revenue losses of affected sectors.

Compliance

- Behaviour is determined by three factors: motivation, capability, and opportunity which are integrated into the COM-B model.
- Social, physical, psychological and reflective factors play a role in this model which can be internally or externally determined.
- The social aspect of the COM-B model can be stimulated using the bottom-up approach.

Communication

- The 'D-RULES' acronym can be used to identify the tips to improve communication.

Chapter 5 – CASE STUDY: UNIVERSITY OF GRONINGEN

The Netherlands has a large student population and as such the effects of the COVID-19 crisis on educational institutions, in particular those that are tertiary, could be considered as an example of where the aforementioned solutions may be applied. The academic year of 2019-2020 and 2020-2021 saw many students graduating online, studying online, and even having prospective students visit the university and master-classes through a virtual tour. These adaptations exemplify the extreme changes that educational institutions went through, whether administratively or financially, in transferring their services from physical education to *only* online education. Due to this there have been several issues, however communication and compliance to regulations will remain the focus for this case-study.

This chapter will focus on the University of Groningen (UG) as an example of how coronavirus measures have affected the student population. In general, the UG is following the coronavirus guidelines and measures set out by the National Institute for Public Health and the Environment (RIVM) and the Cabinet. Additionally, safety measures are followed by Safety Region Groningen (Veiligheidsregio) and the Municipal Health Service (GGD) of Groningen and Friesland. This chapter will evaluate the measures taken for UG students and staff, according to the stages described in Chapter 2, and discuss the role of the UG in compliance and communication.

Additionally, the Netherlands supports a culture of student organisations on local, regional, and national levels. In reflection of the past year, this report will put forward recommendations that can be implemented within the context of universities in future pandemics, while also evaluating the role of actors that were bearing weight with regards to compliance, in the context of the coronavirus. The actors considered are the UG as a top-down actor and student organisations as potential bottom-up actors.

RESPONSIBILITIES

Chapter 4 of this report states what rules and regulations should be enforced at what stage of the pandemic. The stages for education were demonstrated in this way:

Education	No restrictions	Open, limit unnecessary contacts	Online	Hybrid (online and open)	Open
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The main priority of the UG is to deliver quality employment for its staff which provides quality education for its students. This includes giving students high-quality lectures and seminars, providing adequate spaces and programmes for learning, and also adjusting the learning environment for teachers and students in a way that facilitates prime learning capacities for both actors. Simultaneously, as an education institution for higher learning with an enrolment of over 30,000 students, the UG should also acknowledge its responsibility of socialisation as the faculties and other university-related buildings are social spaces where students come together to work, socialise, and network with one another which is a vital aspect of higher-learning education and student's development.

CRITERIA

Given the solution framework that we analysed, we believe the UG should approach a future pandemic situation in a way that compliance to government orders is stimulated by effective and clear communication to its staff and students, while also acknowledging and acting upon its responsibilities of socio-economic well-being of its students and staff. This includes the implementation of university-faculty communication, university-staff/student communication, and also streamlining communication strategies between staff and student communication; this is especially important since there is the potential of moving a physical university context to an online environment as seen in the COVID-19 pandemic. It should be noted that the stages for a university context in particular may not be so clearly distinguished as the implementation of the model is heavily dependent on the government measures put forward in relation to the situation. Thus, the theorisation of the stages here is influenced by the reference of the measures applied for COVID-19.

ECONOMIC WELL-BEING

In line with the priorities of other international universities, the UG is focused on the creation and offering of academic programmes that would attract more students to the city allowing for further economic and social prosperity. During the pandemic, the UG was very much future oriented towards students that were coming, rather than also focusing on those who remained. This is exemplified by the reduction in tuition fees for students (2021-2022) while international students in 2020-2021 did not have such a reduction despite the majority of classes being held online and with disruptions (University of Groningen, Tuition fees international students, 2021).

SOCIAL WELL-BEING

One of the most pressing issues for students and staff studying or working in a pandemic was that of mental health and psychological stress. For example: Teachers experienced high work pressure to adapt to an online environment in a short period of time, while students often felt isolated and overwhelmed. The Minister of Education in the Netherlands Ingrid van Engelshoven outlined in November 2020 that although damage to the quality of education is limited, there are serious concerns about future consequences related to measures of the coronavirus: "Students and teachers have shown tremendous flexibility, but there is a limit to that". Furthermore, she outlined that the well-being of students and teachers alike is likely to deteriorate, and there is a likelihood that study delay will increase (NOS, 2020). Her expectations are unfortunately already coming true in the long-run, especially with regards to the deterioration of mental health of teachers and students.

The UG student population has seen a heavy decline in its mental well-being possibly due to the duration of the restrictions, and the consequent isolation that is enforced. International students have been particularly affected if they were unable to visit their family. We believe the UG has the responsibility to take such issues into account not only as a social responsibility, but also as an economic responsibility as these students are paying for a service provided by the UG.

INFORMATION-SHARING AND KNOWLEDGE PRODUCTION

Looking out for social well-being in the university context with regards to the priorities of communication and compliance can be shown through information-share and knowledge production processes. This can be enacted by the UG by providing spaces to share information, and especially to promote expertise and knowledge on the context and characteristics of the situation. Such actions could range from producing interdisciplinary public lecture series on the history of pandemics, or on the basics of virus spread and contamination. Infographics could be created on the use of masks (e.g., reminding students that masks are used every day by doctors, surgeons, and nurses to keep themselves and others safe in medical environments), or even simply on what can be done for prevention in the first place. The aim of implementing these platforms for information sharing and knowledge production is firstly, that this will indirectly be a social instance for people to discuss and virtually meet to exchange ideas and information, while secondly, directly combatting any misinformation or misconceptions that are surrounding the crisis situation that may hinder collective compliance.

STAGES APPLIED TO THE UNIVERSITY OF GRONINGEN

STAGE 0-

The UG is still functioning in a normal atmosphere as the virus is not yet registered in the country. The government is gathering information and data about the virus from affected societies to prepare society for potential measures and restrictions. As the UG has many international students as well as students studying abroad in various countries, it is therefore important to keep the students updated on the steps being carried out in the UG that may affect the student population specifically. More specifically, since predictions of steps to take are still difficult at this stage, providing contact details of embassies or other relevant contacts for international students may be a general way to help students keep themselves updated if worries arise. To avoid conflicting information and to remain organised structurally, a service could be introduced as an international service line to have such information centralised for the UG and the students. This would streamline the dissemination of information and also be a possible source of gathering data on the practices of other countries.

Communication by the UG should be preferably shared on the Student Portal and by email with a subject specifically tied to information regarding the virus to attract the attention of the student and to avoid miscommunication. However, emails should only be sent with information that directly affects the students and with information they must know to adapt their behaviour so as to avoid delegitimizing the emails sent due to their quantity. Additionally, to avoid a situation of spam, a page could be set-up on the UG website for any general concerns or updates on the virus. The UG has already successfully done this through the website (University of Groningen, 2021) so, expanding on this idea could only bring further positive results.

STAGE 0+

Within stage 0+ the virus is spreading across the world and we may perhaps already have a few infections within the Netherlands. However, there is not a rapid spread and it is still considered as contained. One important step is ensuring that the UG students that are studying in the Netherlands away from their

home country are provided with guidance on the situation according to government procedure. The role of the UG here is communication with the government on behalf of the students that are on exchange with a partner university to find potential avenues to bring them back safely to the home university. The priority in this stage is prevention of spread therefore compliance with government restrictions is necessary to minimise infections with measures and restrictions; this includes the promotion of social distancing, disinfection of hands, avoiding physical contact (e.g. no handshakes, keeping cover of one's mouth when sneezing or coughing), and possible even advising in favour of masks. Moreover, the UG could promote and act upon the message of "spreading knowledge, not the virus" as a communication strategy to foster compliance and limit infection. This could include providing rationalisations for such behaviour through knowledge-sharing of the medical benefits of such action (this does not necessarily have to be in relation to the virus directly, but possibly about how viruses and bacteria spread in general). Moreover, the UG must enforce medical conditions for students to be able to attend physical classes or show up at any related educational buildings. If students have any symptoms similar to those exhibiting the virus, they must stay at home and call the GGD as soon as possible to be provided the necessary steps according to medical procedure.

A recommendation that may be implemented here as an early source of knowledge and data collection are student surveys. The aim of these surveys would be to compare and analyse student data ranging from basic demographics (e.g., nationality, study programme, duration of stay in the country, working conditions) to specific questions surrounding the virus and knowledge surrounding it (e.g., exhibiting symptoms, working from home, what support is needed, how many people do you meet in a day as an estimate, understanding of measures etc.). Additionally, receiving faculty-specific information about students may aid the potential step of having to adapt and move to an online environment which will be discussed in the following stage.

STAGE 1

In stage 1, the assumption is that the virus is spreading rapidly or such a situation is inevitable in the Netherlands. The priority of the UG is to support government restrictions by also introducing strict measures and restrictions to minimise infections. This is especially important in student cities since often students participate in group dynamics and often share the same living spaces and social spaces. In March 2020, the UG switched to online teaching adapting many seminars and lectures in a short amount of time to online environments. This led to many students and staff working remotely (University of Groningen, 2021). This included the introduction of online examinations, online assessments, online plenary lectures and seminars, and exclusively online meetings. The introduction of online platforms caused a major shift at the UG with many faculties and staff struggling to adapt assessments and examinations online due to issues of security and control, designing assessments and grading them uniformly, and accessibility. The UG could create a team to work on these issues specifically utilising both staff and student's expertise to do so. For example: the UG already provides access to certain programmes that all students can access for free or with heavy student discounts (e.g., Gather, Office 365) and this concept could be further expanded. Additionally, if there are any instances where students do not have the necessary devices (e.g., printers, computers) to work from home, there may be a claim made to the UG to try and accommodate such needs.

An issue that should be addressed here is the different needs for different faculties ranging from the Medical Faculty to the Arts Faculty to Natural Sciences and Mathematics Faculties. Seeing as assessments range from one programme to the other, the UG should have direct communication with the specific faculties to adapt the restrictions according to the programme structure. A communication person for each faculty could be elected to coordinate such communication about measures for the faculty and the students. In labs, for example, experiments might be allowed to continue under restrictions such as a limited number of symptom-free people and wearing masks while moving.

To decrease distance between the student population and the UG communicative processes may be expanded such as sharing SSC information, creating check-in points, marketing a buddy-system and so on. Additionally, compliance can also be strongly stimulated with once or twice weekly physical classes with limited attendance. This could be organised in a way that if there is a large class then alternation can be applied. This is inspired by the current measure which allowed vulnerable students to go to the UG library with permission from the academic advisor (with the implementation of recommended distance). However, it should be noted that in the COVID-19 pandemic 'vulnerability' in itself was re-defined and re-interpreted making it difficult for students who were struggling from similar issues to find legitimacy in requiring spaces. Adapting the general framework presented in chapter 4 to different definitions of vulnerability could create a potential avenue for the UG to act more specifically and concretely on providing more services for these students (under the limitations of national restrictions). This way the social and emotional factors are also kept in balance. Attending physical classes should only be done in smaller groups, and after a negative test for example. The aforementioned aspect of student associations could have also played an essential role here as they are directly involved with students in their day-to-day lives be it through WhatsApp groups online, or even in daily physical tasks.

STAGE 2

In stage 2 the Netherlands is under pressure due to the structural social, and economic stress due to restrictions that were put into place in stage 1. The priority in this stage is to shift from solely quality education to also providing socialisation opportunities. The aim is so that every student and staff member will have an aspect of socialisation as part of their education, and to frame the university's approach as one beyond survival. This could be encouraged through the role of small in-person meetings with others, and also creating a sense of social support within the university network. The Student Service Centre (SSC) can play an active role in facilitating such a network. The basic aspects of this can be reiterating the restrictions in university language: for example, implementing physical measures for public university buildings, creating a framework for physical classes according to the number of people allowed to be in a group or even in weekly increments (e.g., once a week), installing rapid test centres for student checks to university buildings.

As a measure to limit the spread of COVID-19 during the academic year 2020-2021, the UG offered hybrid teaching which included online teaching combined with on-site activities according to the needs of the programme. This measure was aligned with the measures provided by state and medical institutions, such as social distancing, and proved to be effective while the case-count was not high. This is evidence that such a method of learning could be effective for the UG in prioritising quality education, minimising the risk of infection, while also providing the necessary social factor of education.

The UG can act within the measures and play an active role in mitigating and adapting the situation for students, especially in collaboration with student study associations and councils. For programmes that cannot switch to online teaching the students will be able to enter the University buildings by following the indicated walking routes to indicate separate entrances and exits, walking routes and the maximum capacity of rooms and toilets. Moreover, promotion of 1.5 metres distance, face masks, and ensuring hygienic products in bathrooms or classrooms are of the utmost importance for students studying in the university buildings.

STAGE 3

Within stage 3 the number of infections is considered to be stable, and most restrictions will be relaxed to promote a sustainable level of compliance and limitation of any further spread. Physical markers may still be present in public buildings. This is the stage where we will be adapting back to a new status quo. This would include a return to physical classes, or at the very least creating a norm of hybrid teaching across all programmes. The promotion of more small-scale meetings should also be introduced here, and it should be arranged that all students have a course or mentor group that allows them to meet others. However, it is imminent that this stage should be something the UG eases into in a step-by-step process to ensure we do not fall back to a previous stage. The promotion of health and safety standards to combat the virus should continue to be promoted (e.g., washing and disinfecting hands, and social distancing) to prevent surges of infection.

COMPLIANCE

One of the toughest aspects of compliance is encouraging people to follow measures for a long-term length of time, and communicating the appropriate measures to the student population, especially since they might not be directly at risk from experiencing major health consequences from the disease. The COVID-19 pandemic demonstrated that with time compliance decreased due to issues of 'pandemic fatigue' and isolation. Additionally, with 1.3 million students and 150,000 employees being forced into online education across the country, various studies have found that student stress and depression have increased significantly, while teachers are finding themselves with heavier workloads and feelings of isolation since there is a significantly less amount of contact with students (NOS, 2020). Creating further communication between students and university would be a step in the right direction with regards to fostering a sense of community which in itself improves compliance.

As mentioned in Chapter 4, the COM-B model is an important aspect of the proposed strategy for a future pandemic. In particular, the behavioural aspect of the COM-B model can be theoretically demonstrated through Social Identity Theory (SIT). SIT is particularly useful in evaluating the positive and negative effects group dynamics may have on compliance to restrictions and measures in the university's social sphere, and also in creating an effective bottom-up approach. This section will detail how SIT can be utilised within the bottom-up approach whereby the UG, and accordingly governmental restrictions, can extend its influence beyond the UG as an institution. The example application discussed here is that of student organisations.

THE (FUTURE) ROLE OF STUDENT ORGANISATIONS

In Groningen alone there are up to 15 student organisations which much of the student population form part of. This excludes the 61 study associations⁹ and several sports associations¹⁰ which may also be utilised, especially in relation to faculty specific information, in a similar manner to student organisations for this context. Most organisations represent different cohorts and groups of students allowing any individual to find common ground within a community. The effectiveness of these groups is even more emphasised since many students live in student houses that are shared with people in a similar association.

To improve compliance within the university setting a sense of togetherness is necessary. According to SIT, the idea of having an in-group and out-group in relation to compliance in restrictions can be fostered through the sense of belonging that is found in Dutch student organisations. Social identity theory outlines the importance that group identity can play in shaping behaviour as social identities create in-groups and out-groups according to similarities and differences between groups. According to these characteristics, norms are created for behaviour and by complying to these norms, a sense of belonging can be achieved. Additionally, through the construction of social identities based around the norm of compliance to regulations, this behaviour can spill over to individuals that may not even be part of the group such as the general public that observe such norms.

In the start of a pandemic, these associations can be encouraged to play an active role in ensuring compliance to restrictions by advocating for measures to be followed within their communities. The aim of including student associations would be to create a positive group identity that is founded on compliance to corona measures, such actions could include:

- 1) the **creation of masks** with personalised association logos or even nicknames that would register to other students a sense of belonging,
- 2) **local and national events** can be created to stimulate social activity on virtual spaces such as pub quizzes or even beer/wine tasting events where students could come together,
- 3) explicit **promotion of measures** through group identity and encouraging a sense of belonging through compliance (for example: "We association X use masks to protect ourselves and others").

The potential influence of student organisations is exemplified by the response of a representative of Interstedelijk Studenten Overleg (ISO), Dahran Çoban, who highlighted to the Minister of Education directly following her report that although study results are positive, the mental well-being of students is taking a hit (The Northern Times, 2020). It should be noted that we are aware that the UG has different responsibilities to a national government, however according to this framework the UG can utilise its influence through this strategy to compliment the national implementation of restrictions

⁹ As listed by faculty on (Career Services, 2017).

¹⁰ As listed on (Groningenlife, 2021).

SUMMARY OF THE UNIVERSITY OF GRONINGEN CASE STUDY

- Universities have to follow national/local policy but should adapt these requirements to the needs of the student population is has attracted.
- The UG has a responsibility to adapt the measures in place and continue educational activities (online and on-site), while stimulating compliance, maintaining the welfare of students/employees, and continuing to provide a quality education.
- The priorities of the UG should be to comply as an institution/organisation to national regulations, while communicating with governments on what is necessary to support the university population
- Utilise civil society actors to stimulate well-being/compliance within the student population
- Fostering communication & compliance through a bottom-up approach where local actors are included in the process of maintaining balance in a crisis situaton.

Chapter 6 – CONCLUSIONS AND FUTURE RECOMMENDATIONS

This report has presented different types of solutions that can be implemented in a crisis situation like the COVID-19 pandemic. The main problem within such a pandemic is considering that it involves more than healthcare issues only and finding a balance between economic, healthcare and social factors, whilst making sure that the citizens are safe and the spread of the virus is limited. This report has shown that problems within different sectors of society are interlinked and that one solution is often not enough. The model with the different stages that we have presented in this report gives an indication which of these factors should be prioritized during different stages of the pandemic. However, the success of a policy is not just determined by the measures that are implemented through the stages-model because compliance also plays an important role. This is accounted for in the report in the bottom-up approach. In this approach, the compliance of the measures starts at the lowest level, namely the public. To be able to achieve the essential benefits from the bottom-up approach, effective communication from the government is crucial. Besides describing solutions for effective communication, we also described how increasing compliance can be achieved using the COM-B model to consider the different factors that influence a person's behaviour. We ended this report with a case study from the UG. In this case study we discussed measures that were implemented by the UG in particular, while also providing recommendations for the way forward.

This report mentions several solutions to the problems that were faced in the COVID-19 crisis in the Netherlands. Particularly, social and mental well-being was identified as a critical priority to take into account. To further strengthen the presented solutions more research can be done into the social and mental well-being of people during pandemics, and specifically how to handle this properly. Once this is handled properly it might give a boost to compliance. Asking regional and local institutions to also stimulate compliance and help with the communication can be effective in the long run. Examples of these institutions are universities, community centres but also businesses who can provide explanations to their members about the measures, but who can also stimulate their members to follow these measures. Increasing the budget for healthcare and mental health programmes can also have a positive effect on fighting the endeavour of a pandemic, where more beds and healthcare staff are available to help those in need. These are a few examples of how to tackle the mental and social well-being during a future pandemic, but it is inevitable that a new pandemic will present different problems that need solving.

Within this analysis we presented three important criteria that are able to give an indication of the situation during the pandemic. Only three criteria were used in this report in order to keep the report clear and understandable. We believe that these three criteria are essential to keep an eye on at all times, but with the unpredictability of a pandemic and inevitability of facing problems and challenges, more and different criteria might have to be considered as well. We therefore recommend to constantly consider multiple perspectives that include the three criteria suggested in this report, but also the broader context of other criteria that affect these three. The interrelated effects of the different criteria mentioned in this report should be integrated in a model that can be used by the RIVM to act as a roadmap which can be followed by the whole country.

SUMMARY OF THE CONCLUSIONS AND FUTURE RECOMMENDATIONS

- The problems within a pandemic are interrelated and involve a range of sectors (economic, healthcare, social).
- The stages-model can be used to portray the priorities within different stages of a pandemic.
- The COM-B model can be used to stimulate compliance.
- D-RULES can be used to improve communication.
- More criteria can be added within a pandemic.
- Portray the interrelated effects of different criteria in a model for the public to follow.

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APPENDIX 1 – WORD LIST

- **Boundary:** The value for a criterion from where the situation reflected by the criterion is getting problematic in the extent to which compromising is no longer an option.
- **Capability:** A person's attribute that together with 'opportunity' capability makes behaviour possible or facilitates it.
 - **Physical capability:** Involves people's physical functioning (e.g. the ability to see or hear).
 - **Psychological capability:** Involves people's mental functioning (e.g. memory or the ability to express your emotions).
- **Compliance:** The action or fact of abiding or following instructions.
- **COVID-19:** Disease caused by the SARS-CoV-2 virus. Common symptoms: fever, dry cough, tiredness. The disease affects different people in different ways.
- **Criterion:** A principle or standard by which something may be judged or decided.
- **Death rate (or mortality rate):** A measure of the number of deaths (in general, or due to a specific cause) in a particular population, scaled to the size of that population, per unit of time.
- **Indirect deaths:** A result of the conditions created by the impact of the pandemic, rather than because of the virus itself.
- **Measure:** An action (e.g. rule, restriction, financial support, etc.) with a certain goal.
- **Motivation:** Reasons for acting or behaving in a particular way.
 - **Reflective motivation:** Concerns conscious decision making (e.g. making a plan).
 - **Automatic motivation:** Concerns habitual and instinctive behaviour (e.g. ducking down when you see someone/something starts to attack).
- **Opportunity:** An attribute of the environment that together with 'capability' makes behaviour possible or facilitates it.
 - **Physical opportunity:** Involves inanimate objects of the environment (e.g. financial resources).
 - **Social opportunity:** Involves other people and organisations (e.g. social norms).
- **Policy:** A course or principle of action adopted or proposed by the government or another authority by us. Usually consists of a set of measures.
- **Reproduction number (basic), R_0 :** The reproduction number that indicates how fast the virus is spreading. It shows how many people are on average infected by one person carrying the virus, and it is affected by the rate of contacts in the host population, the probability of infection being transmitted during contact, and the duration of infectiousness.
 - **Effective reproductive on number, R :** The real reproduction number is defined as a product of the mean duration of infectiousness and the ratio of incidence to prevalence. Product of the basic reproduction number and fraction of the host population that is susceptible. To successfully eliminate a disease from a population this number needs to be smaller than 1.
- **Restriction:** A limitation or confinement control of freedom for citizens and/or corporations.
- **SARS-CoV-2:** Severe acute respiratory syndrome coronavirus 2, the coronavirus that causes the disease COVID-19.
- **Stress:** The state of mental or emotional strain or tension resulting from the conditions of a situation the pandemic.

APPENDIX 2 – INTERDISCIPLINARY TASK FORCE

The group was initially composed of six students from different disciplines; however, one student left the group two weeks after the project had started. Five students remained from different departments, including: Faculty of Law, Faculty of Arts, Faculty of Science and Engineering, Faculty of Philosophy, and Faculty of Medical Sciences. Such a diverse group was needed to be able to tackle all aspects of pandemic situations, like the COVID-19 crisis, ranging from communication issues to ethics of management to the science behind the virus. The members of the group had not previously worked together so within the first week, as an orientation step, all members took the Belbin team role test, an organizational culture test, and the Leary Rose test. Besides this all members created four quadrant models illustrating which qualities they have, what their threats are, their allergies, and their challenges. The quadrant models were used to identify and understand potential conflicts within the team, and hopefully help prevent them in the long-run.

The diagram in Figure 6 shows the results from the Belbin team role test, and the final division of the team roles is listed in Table 4 below.

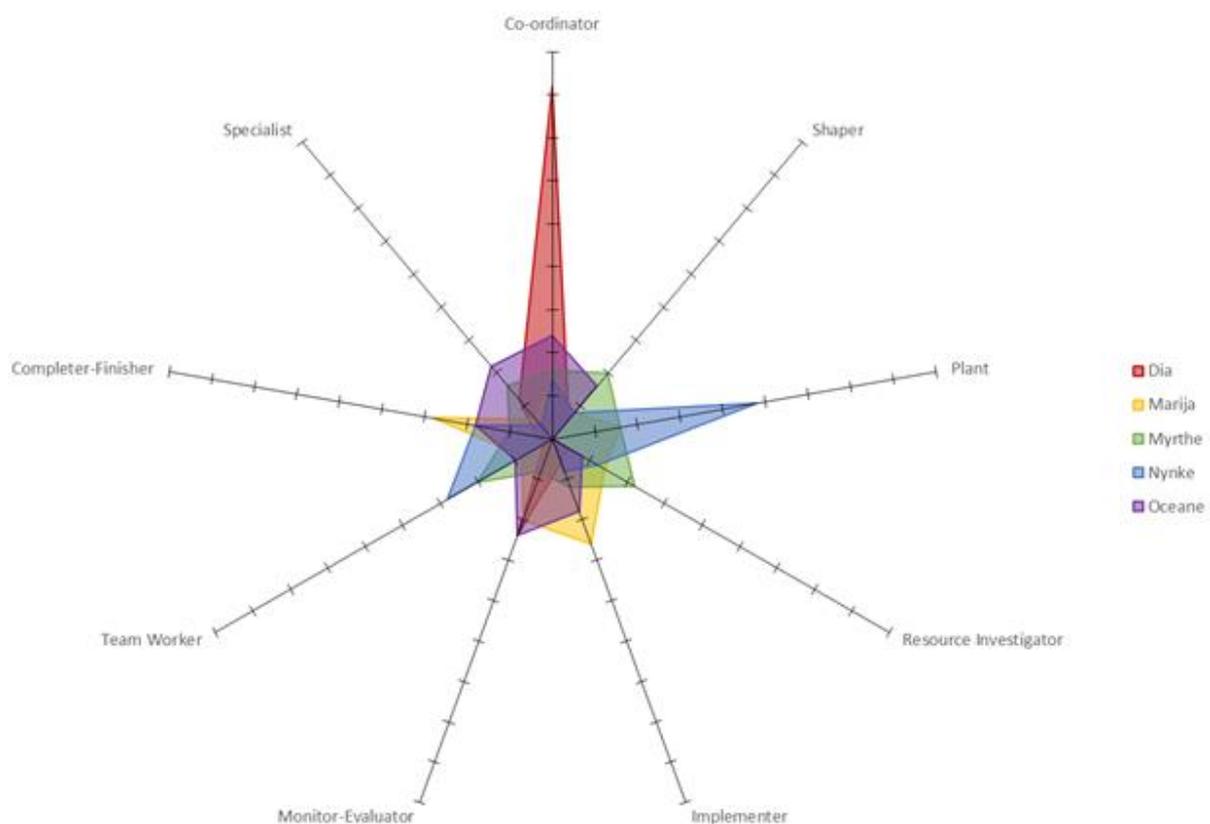


Figure 6 Belbin team role test results.

Group Member	Role
Nynke de Haan	Plant and team worker
Dia Karim	Co-ordinator
Marija Pullicino Orlando Smith	Completer-Finisher and Implementer
Myrthe Scheepers	Resource investigator and shaper
Océane Visser	Monitor evaluator and specialist

Table 4 Team roles based on the Belbin test.

The organizational culture test was done by all members to get a better indication of the way each member likes to work. Fortunately, almost all members were mainly task-oriented, except for one member who had a more general division with similar scores for; person-oriented, role-oriented and task-oriented, this is portrayed in Figure 7. The fact that all members within the team had some degree of a task-oriented mindset was ideal for this task considering the workload of the task and the limited time given for the task, namely ten weeks.

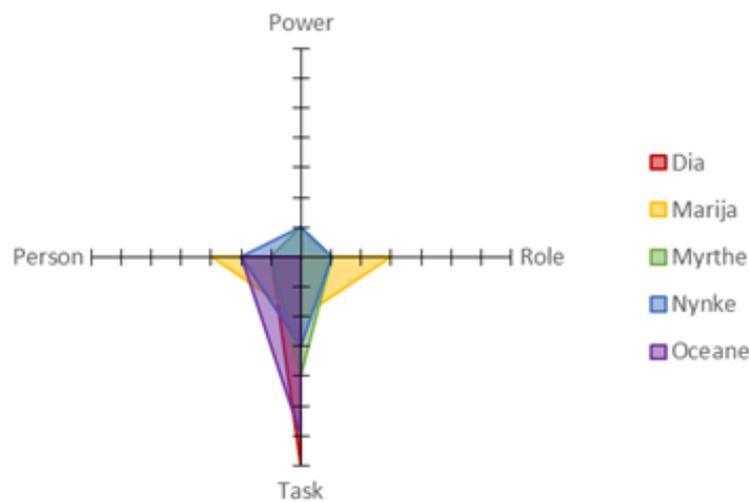


Figure 7 Organisation culture preferences

The group got together every Monday afternoon with the supervisor to discuss the progress of the task, and to clarify any misunderstandings. Besides this, the group also met together without the supervisor two to three times a week to brainstorm and discuss the next steps. The group either met as a whole or in smaller groups to facilitate effective brainstorming and discussion. At the end of every week, a presentation was made for the meeting on Monday. The process of creating ideas and developing a strategy was done in steps as going back and forth was necessary. Any issues during the week were mailed to the supervisor who responded within several hours allowing the group to promptly resume on the issue that was unclear.

Overall, the group work during this project started off bumpy which was largely due to the fact that we had different backgrounds which led to the consideration of different priorities. After around four weeks, we started to understand each other's way of thinking and figured out each other's strengths and weaknesses as individuals, but most importantly as team players. As the project progressed the teamwork improved and the meetings became much more efficient. The brainstorming sessions eventually ran smoother and clear arrangements were made. Fortunately, working on our teamwork early on in the process worked out as without the teamwork we built up during the past weeks a large project like this would have been very difficult to accomplish in such a short time.