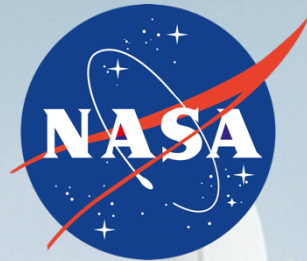# ORGANIZATIONAL ANALYSIS

OF

The Space Shuttle Program

Copenhagen Business School - B.Sc. in International Business

Organizational Behaviour: 48-hour individual home assignment

19th - 21st of October 2021

Number of pages: 10

Exam number:

Copenhagen
Business School
HANDELSHØJSKOLEN

Introduction

This paper aims to identify the organisational issue of NASA focusing on its organisation within its Space Shuttle Program (SSP) and further to analyse this issue using relevant theories of organisational behaviour, hereby the main focus of the analysis will be on the organisational structure of the SSP and its highly bureaucratic culture. Building on the theories from the analysis, two recommendations will be made on suggestions on how to solve the organisational issue and establish a system to avoid disasters like Columbia that happened to be a result of poor organisational behaviour within the SSP.

The main organisational issue from the case of NASA (Edmondson & Herman, 2012) with focus on the SSP is in this paper identified as *a poorly functioning structure with unclear responsibilities that is worsened both by poor communication across offices and misalignment in goals between the top management and its engineers.*

Analysis of structure

To analyse the structure in an organisation, it is first important to understand what it involves. Organisational structure is by Galbraith defined as being what determines where formal power and authority are located in an organisation, as well as: *it comprises the organisational components, their relationship, and hierarchy* (Galbraith, 2012)*.* The organisational structure looking at NASA as a whole big organisation is defined by having a complex matrix structure. The organisation has more than 24,000 employees, where it has many different centers and operations all over the United States dedicated to research, development, testing, and manufacturing of products for the human space flight program and others (Edmondson et al., 2012).

As well does the SSP organisation within NASA have a matrix structure consisting of several centers and offices with divergent areas which they are specialised in, coming from various locations spread over the United States such as JSC in Texas, KSC in Florida, MSFC in Alabama, and more (Appendix A). Due to this matrix culture, the SSP faces some confusion over roles, as its employees find it difficult to navigate in who is responsible for what and who to contact when having a request as there are several offices. *The DAT concluded that Rocha* (engineer) *should pursue this request through his own engineering division rather than following the Shuttle*

Program's chain of command... (to the MMT) (Edmondson et al., 2012). Mentioned shows that the engineers experience role confusion on who to contact with their requests, or when they are facing an issue. Further, the SSP also faces communication problems as when the images were being requested by NASA engineer Rata, *Ham ordered the cancellation when she could not confirm exactly who needed imagery* (Edmondson et al., 2012). The chair of the MMT, Ham, only checked with her own members of the MMT, even though engineer Rata wanted to contact the MMT with his request, it was not passed on. He was instead told to contact his own engineering division, even though the request actually should have been sent to the MMT in the first place. A DoD representative at KSC was contacted, however as he did not put forth a formal request, his informal request on the images was cancelled after only 90 minutes. Even *when these issues (foam strikes) were discussed, there was never any direct communication between the DAT and the MMT* (Edmondson et al., 2012): the communication within the organisation happens to stay within each office rather than moving across departments.

Not only does the SSP experience issues within its matrix structure regarding the confusion over roles and poor communication, it can be argued that the SSP organisation also has some signs and features of a bureaucratic structure where it also experiences issues. The matrix structure originally was formed from bureaucracy, and by sociologist Max Weber bureaucracy is characterised as: *fixed division of labour, a hierarchy of bureaus… and a set of rules governing performance* (Hatch, 2011). Weber's theory can be transferred to the SSP organisation which operates with a very centralised organisational structure with sets of rules and formal requests. This can especially be seen in the situation where the MMT rejects a request due to it not being put forth as formal. Further, the SSP is highly protocol-oriented with only few paths to follow, whereas the engineers did find it *hard to create the number of experiments needed to create the data to prove your point* (Edmondson et al., 2012) as the management of the SSP accepts their own points and are not likely to be challenged from employees below them.

Decisions are made at the top management, where authority clearly not is delegated down the hierarchy. The engineers in NASA who are hired for their concrete knowledge and expertise are not having the discretion to use their skills, and therefore part of their function and value to the organisation is wasted. Even with the engineer Rocha contacting his superior Shack about his worries of the MMT not wanting to pursue images, Shack replied: *I'm not going to be a Chicken*

Little on this (Edmondson et al., 2012). The organisation, from a bureaucratic point of view, does not receive the full value of its engineers due to its top management wanting the engineers only to do what they are told. Not only do the highly educated engineers become frustrated as in the case of Rocha, but this structure also ended up having fatal consequences for NASA because of its disaster, which is partly a result of the organisation having a top-down management who are both bureaucratic and hierarchical.

The analysis allows to conclude that the structure in SSP is very complex and not very well functioning. However, the limitations are that the selected theories and frameworks used to analyse the organisational structure do not clearly explain what mechanisms that have caused this poorly functioning structure or why it is allowed to stay in place in the SSP. To remedy this shortcoming, an analysis of the culture will be carried out.

Analysis of culture

Analysing the culture will help to draw a broader view on the organisational environment and behaviours. To analyse the organisational culture in the SSP, Edward Schein's three dimensions of culture will be applied. This theory aims to explain the concept of culture with it having different layers and how these affect organisations. First, the artifacts and behaviours will be identified and analysed, then the espoused values, and lastly the basic underlying assumptions. Based on Schein, the culture will be concluded using Martin's perspectives.

The first culture level to analyse is the artifacts and behaviours which include tangible, but often undecipherable features (Hatch, 2011). This is due to artifacts being able to take many forms, as objects, verbal expressions, and activities, or even these combined. During the program, the MMT held briefings, and also meetings about its Flight Readiness Review (FRR), and more. Being employed at NASA, engineers are expected to follow written guidelines, do reports, and put forth formal requests for the requests to even be considered. Therefore, these artifacts show that the SSP is a formal organisation that values bureaucratic procedures. Many of the employees working in the SSP must have taken a higher education, as it takes high degrees and experience to become an engineer or an astronaut within NASA. The admission requirement in NASA makes it difficult

to be accepted into their workplace, as they want excellent employees. Further, the top management consists of people who had been in NASA for a long time: *Ham, an efficient manager who had risen through the ranks at NASA* (Edmondson et al., 2012) why these also are highly experienced within their field. The verbal expressions used are also relevant to touch upon, as acronyms and expressions being used in the daily speaking and communication would not be understood by the average person, such as FFR, out-of-family, and more, meaning that the employees are very specialised within the engineering field.

Another artifact that is very clear, and which keeps reoccurring, are the images and the cameras, which are continuingly requested from the engineers. These objectives are what the subcultures within the organisation strongly disagree upon about as to whether the images and cameras are important. The cameras are in fact also really poorly maintained and camera staff has been reduced due to budget cuts that NASA has experienced over the years.

The behaviour and communication from the management to the engineers is somehow formal, but insufficient, as this is done through e-mails and messages, even when the engineers have concerns of serious matters. However, the language used in the e-mails and messages is casual but very descriptive.

Next, the second culture level, the espoused values, will be analysed, which are the shared beliefs and norms (Hatch, 2011). The SSP as an organisation does accommodate some shared values, as it is working together as a team to conduct and succeed in its missions. There is a consistent belief and norm shared on the SSP team, which are hard work, results, safety, and performance, which throughout the mission required the teams to maintain a heavy workload: *These activities required the crew to work round-the-clock shifts in two teams* (Edmondson et al., 2012). Both the management and employees believe that they must perform excellent. The SSP was supposed to operate in a decentralized way, where engineers would have been given more responsibility for them to be able to take part of decision-making. Furthermore, the SSP has a lot of safety procedures that they must follow due to them working in a high-risk environment as they are sending astronauts to space. With this taken into consideration, the SSP wants some good core values, also getting an impression that they want to trust its lower employees and wish to do open communication. However, in real practice, the values that the SSP is hoping to have are unfortunately not a reality. Instead, the SSP are ending up operating in a very centralised way with a very

hierarchic behaviour: *Engineers were often told not to send messages much higher than their own rung in the ladder* (Edmondson et al., 2012).

Due to budget cuts over the years, possible delays on further missions, and big goals, the management wanted to push for performance to achieve results. This creates some issues, as the top management is very eager to deliver results, but at the same time, they are limited because of the budget cuts making them down prioritise a very important value: safety. This creates a misalignment of the goals between the top management and the engineers, as the engineers as professionals prioritise and really push for the change of the safety procedures, and also, they keep requesting images of the foam loss and the left wing. Instead, the top management entirely categorise foam strikes as an *accepted risk*. Further, the SSP has a culture that emphasizes employees to *prove that there's something wrong* rather than *prove that it's right* (Edmondson et al., 2012). The management does not seem to care much about others' requests: *agreed to look into it, which he did five days later* (Edmondson et al., 2012). Either it happened to be an issue regarding communication that caused the five-day delay, or the manager allowed himself to prioritise what he found important before worrying about other issues while the astronauts were in space with their lives put at risk.

Lastly, the deepest level of culture is the basic underlying assumptions, which now will be analysed. These can be described as intangible frames that underpin social relations, and therefore, these can be hard to define (Hatch, 2011). Here it is relevant to study Hofstede's cultural dimensions, as the dimension, power distance, is very appliance to the SSP organisation (Hofstede). The SSP has a culture that has a high power distance creating strong hierarchies within the organisation. There is much power and control from the top management who are pushing to impose their values, assumptions, and meanings: *management was concerned when individuals didn't follow the right route…* (Edmondson et al., 2012). What unites the organisation are the things that are actually believed in, which in the SSP is *safety*. This is a basic underlying assumption as no matter what, they must prioritise safety regardless of other costs, as they are dealing with human lives and at the same time are a world-known organisation. However, it is very clear that there is a misalignment between the layers, as the basic assumption does not go in line with the beliefs and norms throughout the entire organisation. There are already loads of safety procedures in place and to follow, however, the top management deviates more and more from this due to their contrasting values and performance goals.

Based on the above analysis using Schein's theory, Martin's three perspectives on culture will now be concluded on. There is one overall culture in the SSP, however, subcultures are created due to the hieratic levels creating a differentiated culture. There are the lower workers, engineers, who are somehow trying to challenge the top management with their knowledge and skills. However, these are ignored by the top management who sticks to their own beliefs with their bureaucratic leadership being the greatest. There is within the SSP series of frequently conflicting opposites between the subcultures and disagreement of the overall culture, why it can be concluded that the culture is differentiated.

However, there are limitations to both theories used. Schein's theory does not include any perspective of the individuals in the group, as it focuses on the whole organisation as a culture. As well, Martin's theory focuses more on how the organisation is divided, whether it has one culture or subcultures, and is not putting its focus on individuals either.

Recommendations

Based on the analysis, two recommendations will be made on how the SSP's main organisational issue can be solved: *poorly functioning structure with unclear responsibilities that is worsened both by poor communication across offices and misalignment in goals between the top management and its engineers.* By considering these recommendations, the risk of fatal disasters happening because of poor organisational behaviour may be decreased.

Recommendation 1 - Create a structured team who is responsible for the safety procedures:

It has been very clear throughout the case that employees find it difficult to navigate in who is responsible for the safety procedures. There is an overall confusion on how comprehensive the safety should be, and there is a strong disagreement between several parties on whether and when there exist safety-on-flight issues, and how to classify them as being critical or not. To avoid these confusions, the SSP should set up a structured team who are very specialised in these space shuttles, which therefore mainly will consist of engineers. By making this safety team independent from the rest of the organisation, it will be much simpler for the SSP and NASA to create a common understanding and agreement on when a safety-flight-issue occurs, and when it is time

to take action. During every mission, the team must overlook and work directly on all safety aspects.

By implementing this, there will be a greater chance of less misalignment between top management and the engineers. Safety is the united basic assumption, and therefore it is important to have it in place. The impact will be increased effort on making sure that safety procedures are held, as so the top management will be able to focus more on their core role, to manage the organisation, rather than being responsible for the safety procedures when having so many other tasks that need attention.

A limitation of the recommendation is that it may be difficult to convince the management to implement a safety team. The suggestion will also be costly and time-consuming, and therefore investment is needed which NASA may not be able to receive if the top management does not find the safety issue critical enough. Furthermore, the SSP is a very bureaucratic organisation so it may take loads of effort and time to put this suggestion through, and especially with employees finding it very difficult to speak up combined with a *prove that there's something wrong* culture, it can seem to be a long shot.

Recommendation 2 - Regularly evaluations and networking:

The second recommendation is to regularly make evaluations based on how the teams and the individuals work and perform. By making these evaluations, all layers in the organisation will get a chance to speak up. The impact of this recommendation will be to encourage the engineers to communicate directly to the management with their concerns and worries.

To strengthen this implication, it is suggested that networking events to be held. The impact will be an increased team effort throughout the organisation, as the culture will be less formal leading to lower power distance between the managerial layers in the organisation. It will create better relationships between all layers, and thus the more team effort is made, the more will each subculture's behaviour impact one another. It can result in more open communication, less bureaucracy, and shared values amongst the organisation as one.

A limitation of the recommendation is that for this to happen, the management will have to understand that there is an issue with not communicating openly and efficiently. And if they happen to show understanding, will they then be willing to act on the issue? The top management who manages the organisation in a bureaucratic, hierarchical manner, may not be interested in

employees from departments lower than themselves to gain power or the organisation to become more decentralised and organic. On the other hand, this recommendation is not very costly, as well as it is straightforward and can possibly have very large impact.

Conclusion

By analysing structure using elements of organisation design and Weber's theory on bureaucracy, and culture using Schein's levels of culture and Martin's perspectives, this paper creates a clear understanding of the organisational behaviour in the SSP. The SSP structure was at the time being shaped as a matrix with bureaucratic features being very hierarchical and centralised, that at times was challenged by its lower employees, however, mostly without luck. Due to the bureaucratic culture, communication in the organisation is very poor, with the matrix structure worsening this as roles are unclear making it even more difficult to create efficient communicate. There is a misalignment in the cultural levels in the organisations with engineers and top management having different values contributing to the creation of a differentiation culture consisting of subcultures. To accommodate the organisational issue, it is recommended for the SSP to either create a structured safety team or to regularly make evaluations on the teams and individuals as well as to create networking events. These recommendations are suggested as an attempt to lower the risk of fatal disasters happening as a result of poor organisational behaviour.

Appendix

Appendix A: The Space Shuttle Program Organisation

Source: Edmondson, A. C., & Herman, K. (2012). Columbia's Final Mission (Abridged) (A). *Harvard Business School*.

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