Universitetet i Stavanger

KANDIDAT

3258

PRØVE

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Seksjon 1

Oppgave	Tittel	Oppgavetype
ℹ	Information	Dokument
1	Assignment	Filopplasting
ℹ	Flyvbjerg (2002)	Dokument
ℹ	Geels (2014)	Dokument
ℹ	Hopkins (2001)	Dokument

1 Assignment

Choose *one* of the three enclosed papers, and then do the following:

1. Conduct a quick heuristic evaluation of the paper.

2. Give a critical account of the following attempts to determine the true nature of science: the Logical Positivists' verificationism, Karl Popper's falsificationism and Thomas Kuhn's theory of scientific paradigms.

3. Taking this account as your point of departure, discuss whether any of the research referred to in the paper you have chosen may be characterized as being truly scientific.

4. Discuss whether values play any roles in any of the research referred to in the chosen paper, and, if so, whether any of these roles might pose a threat to the objectivity of the research.

Din fil ble lastet opp og lagret i besvarelsen din.

Last ned | Fjern | Erstatt

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MEE140 – Take-home exam

Candidate number: 3258

Task 1.

The paper I have chosen for my assignment is number 3, which is the “Was Three Mile Island a Normal Accident?” written by Andrew Hopkins. In the following paragraphs, I will conduct a heuristic evaluation of the paper.

1.1 The Author

Andrew Hopkins is an emeritus professor of sociology at the Australian National University (SafetyConnect, 2020). Of relevant background, Hopkins was an expert witness in the process after the Exxon mobile accident in 1998 near Melbourne. I addition he has participated as a consultant in the process in the aftermath of both the BP Texas refinery disaster and the BP Mexico gulf oil spill. Hopkins has been awarded the European Process Safety Centre safety award in 2008 (SafetyConnect, 2020).

According to Microsoft Academic, Andrew Hopkins has 66 publications and 2 012 citations in total. In the list of the citations sorted by relevance, the three first papers have 656, 620 and 244 citations (Microsoft Academic, 2020). This can indicate the quality of the papers who have cited Hopkins. It is also worth mentioning that the first paper on the list is Terje Avenn, which is a very big contributor to the field of safety science. The citating papers mostly consist of scientific journals within the field of safety science.

1.2 The Journal

The paper is a part of the Journal of contingencies and crisis management. In the NSD register the journal has a scientific level of 1, which is the highest level. The journal has been registered in NSD since 2004 and have had a level 1 score ever since then (NSD, 2020). The paper chosen is from 2001, so there is no scientific level ranking from that year, but it shows that the journal has been consistent on level 1 for 16 years.

The journal is peer reviewed, which means that it has been evaluated by other people within the field of focus (NSD, 2020). This can serve as an indication of the quality of the journal. The journal has an impact-factor of 1.977 (Wiley Online, 2020).

1.3 The Citations

The paper has 127 citations in total. The top 3 citing papers have 479, 220 and 200 citations themselves (Google Scholar, 2020). The list of citating papers does not include a specific review of the actual paper. After a quick overview of the top citating papers, I find that most of the papers only treats the paper as a contribution to the debate and do not evaluate its quality.

1.4 The References

The reference list consists of 23 different references in total. Two of them is papers written by Hopkins himself. Two of the authors which is referred to are James Reason and Charles Perrow. According to Microsoft Academic, Reason has 43 publications and 18 851 citations in total and Perrow has 88 publications and 23 757 citations (Microsoft Academic, 2020). This can indicate that these two references are of good quality.

The oldest reference on the list is from 1979, which is 22 years prior to the year the paper was published. Most of the other references is written within the 1990s. Considering that the paper was published in 2001, you could argue that the references are mostly updated.

Task 2

2.1 Logical positivists verificationism

In the view of the logical positivists, science starts with an observation. We observe something and from that observation, we develop a theory. From that theory there is developed a hypothesis which again is tested. The test shows if the hypothesis is true or not. Therefore, the scientists seek to verify their theory by testing it. They argue that if the test shows the theory to be true, then it is verified. The logical positivists define statements as genuine scientific statements if they are verifiable (Bortolotti, 2008, p. 8). An example of this is the claim about the existence of kangaroos and Platos claim about the existence of platonic forms. The claim that kangaroos exist is verifiable because we are able to observe the kangaroos ourselves, and therefore determine that they indeed exist. We are able to verify their existence. The claim about the platonic forms is not verifiable because we are not able to observe them and therefore not able to verify their existence (Bortolotti, 2008, p. 11).

Scientists, according to logical positivists, uses observation to develop a theory. If we use the kangaroos again as an example. A scientist observes a kangaroo and sees that it is brown. From this observation, the scientist develops a theory that all kangaroos are brown. He then proceeds to test it by gathering a number of kangaroos and register their colour. If all the kangaroos that he gathered are brown, he will have his theory verified. He uses the data we have gathered to draw conclusions about things of the same kind that he has not examined (Okasha, 2016, p. 21). Here is where the problem of the logical positivists verificationism appear and that is the problem of induction.

The problem of induction was introduced by David Hume (Okasha, 2016). It points out that it is simply not possible to completely verify a theory, because we draw the conclusion from a finite number of observations. Like the example mentioned. From the observation of the gathered kangaroos, the scientist concludes that all kangaroos are brown. However, the scientist has not observed every single kangaroo that exists or have existed. Therefore, it is possible for one of them to be of another colour than brown. It is then impossible to completely verify the theory that all kangaroos are brown.

This shows that science is not in fact verifiable, which brings doubt to the logical positivists way of demarcating science by saying that it is verifiable.

2.2 Karl Poppers falsificationism

Instead of defining science as something that is verifiable, Karl Popper claimed that the fundamental feature of science is that it is falsifiable. This means that theories and statements are regarded as scientific if it is possible to discover them to be false (Okasha, 2016, p. 11). Here is when the first problem of Poppers falsificationism appear. If we conclude that all statements that are falsifiable are regarded as scientific, then some statements within for example astrology are also scientific. Given the example in Bortolotti (2008, p. 16), where the astrological theory about the planets position at the time of birth having an effect on the choice of occupation later in life. It is possible to falsify this theory by discovering that the planets position did not correlate with the choice of the occupation (Bortolotti, 2008, p. 16). After Poppers demarcation, we can consider this as a scientific theory, because we were able to falsify it.

In Poppers falsificationist view science is not inductive, but deductive. Induction, as we saw in the last paragraph, means that we develop general theories from certain observations. Deduction works the other way around. We use observation to test our already developed theories and falsify them. This view is problematic, because it does not explain how science proceeds and how we come up with new theories. The critics of Karl Poppers view, states that the way science comes up with new theories can only be in two different ways. Either we use induction and develop new theories from observation, or the theories are generated just by random strikes of ideas. This means that science is either not entirely deductive as Popper claims or that the way new theories develop is not rational.

Another problem with Poppers view is the Duhem-Quine thesis about "underdetermination". Underdetermination is the idea that if we do falsify a theory, we are not able to determine which part of the theory have failed. When we develop a theory and wish to test it, we have to develop an auxiliary hypothesis. If the test shows the theory is false, the scientists have to choose between challenging the hypothesis or reject the theory. The falsification here is not based on the empirical evidence, but the choice of the scientists (Bortolotti, 2008, p. 102). The choice the scientist makes is, in practice, most often based on what is the easiest or what they consider as the best explanation. Therefore, it can be stated that the falsification process is not necessarily rational.

2.3 Thomas Kuhns theory of scientific paradigms

Thomas Kuhn argue that science proceeds by revolutions and shifting paradigms. The revolution is a process where existing ideas are abandoned and replaced by radical new ones (Okasha, 2016, p. 76). The process starts in a period which Kuhn refers to as normal science. Here there is universal agreement in beliefs, theoretical statements, criteria and methods within the scientific community. The sum of these agreements is called a paradigm (Bortolotti, 2008). The revolutionary process starts with the cumulative development of anomalies, which is data that is inconsistent with the paradigm (Bortolotti, 2008, p. 118). As the anomalies develop and multiply, the scientists start to question the existing paradigm and search for new ideas. This period is the period of revolutionary science. Eventually there is established agreement in a new paradigm and science enters a period of normal science again (Okasha, 2016, p. 76).

Kuhn argued that the process of the scientific revolutions is not exclusively based on scientific evidence. The switch over to a new paradigm is not necessarily caused by rational factors. Instead, Kuhn argued that factors like peer pressure within the scientific community contribute to the universal agreement and acceptance of a new paradigm. In this way, science is not necessarily rational (Okasha, 2014, p. 77).

The statement that science is not rational is supported by another claim of Kuhn about the incommensurability of paradigms. Kuhn argues that the differences between paradigms are so fundamental, that it is not possible to compare them. According to Kuhn, when a paradigm shifts to another, so does the theoretical terms and definitions (Bortolotti, 2016). The facts about the world are paradigm relative (Okasha, 2014, p. 78). Since paradigms are impossible to compare, it is not possible to argue that one is better than the other. Therefore, you cannot state that the new paradigm after a revolution is better than the previous because they cannot be compared. Therefore, the process of science is not rational.

Task 3

The research referred to in the paper consist of two different theories. Perrows Normal Accident Theory and Turners Man Made Disaster Theory. In the text below I will discuss these two theories within the verificationism, falsificationism and Kuhns paradigm theory.

3.1 Normal Accident Theory - Perrow

Charles Perrows Normal Accident Theory (NAT) focuses on accidents that appear in tightly coupled and complex systems. Perrow states that accidents within these types of systems are inevitable because it is not possible to create faultless systems. Perrow does not establish measurements for if a system is tightly coupled or complex but uses example of a nuclear powerplant for a system that meets his definition (Hopkins, 2001). Further, he does not provide a time frame for when the accidents are supposed to happen, but states that at one point an accident will eventually occur.

3.1.1 Verificationism

As stated earlier in this assignment, the verificationist view is that what distinguishes science from other disciplines is verifiability. According to this view, one observation which fits with the theory is enough to verify it. This paper focuses on Perrows way of using the Three Mile Island accident to verify his theory. Perrow shows that the system within the Three Mile Island nuclear plant is complex and tightly coupled. Further he shows that because of this complexity, the accident that happened was inevitable (Hopkins, 2001). Through the use of the Three Mile Island, Perrow were able to show that his theory was true and verify it. In the verificationist view, Perrows theory of NAT is therefore truly scientific.

3.1.2 Falsificationism

Karl Poppers falsificationist view is that theories are defined as truly scientific if they are falsifiable. That means that it must be possible through observation to prove the theory to be false. To falsify NAT, we must be able to find examples of tightly coupled and complex systems were accident does not occur. This is problematic, because a counter argument here is that when a system runs without any accidents, it will not be defined as tightly coupled and complex. In other words, there will always be an explanation if the accident does not occur, which is that the system is not complex and tightly coupled.

Another problem about the theory is that is does not state when an accident occurs. This means that if we have a tightly coupled and complex system where an accident is yet to occur, the possibility that an accident in the future will happen is always present. To conclude, the theory is not falsifiable because there will always be an explanation if it does not fit with the observation. Either the system in question is not tightly coupled and complex or the accident has not occurred yet. Therefore, in the falsificationist view, Perrows Natural Accident Theory is not truly scientific.

3.2 Man Made Disasters – Turner

Turners theory about Man Made Disasters (MMD) is in contrast to Perrows NAT. Instead of seeing an accident being caused by the characteristics of the system itself, Turner states that the causational factors of an accident are mainly human. Turners theory is that prior to an accident there will nearly always be warning signs. If these signs are acted upon, it will prevent the accident from happening (Hopkins, 2001, p. 66).

3.2.1 Verificationism

If Turners theory is to be considered truly scientific within a verificationist view, we must be able to verify it. To show that Turners theory is true, we have to only experience an event where early warning signs appears, and they were acted upon. If the fact that the signs were acted upon leads to the possible accident not occurring, then Turners theory is verified. In the verificationist view, Turners theory is then truly scientific.

3.2.2 Falsificationism

Falsifying Turners theory is problematic because of the way the theory is formulated. Turner claims that there will "nearly" always be warning signs prior to a possible accident. By this, he means that it is not necessarily the case every time, but most of the time. So, if an accident is investigated and they find that there were not any early warning signs, Turners theory is still not falsified. This is because he left some room in his theory for cases like this by using the term nearly. It is therefore not possible to falsify his theory and according to the falsificationist view, the theory is not truly scientific.

3.3 Paradigms

According to Kuhns theory, science proceeds by constantly shifting scientific paradigms. A paradigm is a framework that shape scientific work. Kuhns theory is that through a revolution, the scientific moves from one existing paradigm to a radically new one (Okasha, 2014, p. 76). In the article chosen in this assignment, there are two theories which are compared to each other, the Man Made Disaster (MMD) and the Natural Accident Theory (NAT). Each theory presents different views on the causational factors of an accident. The MMD presents a view that nearly all accidents are avoidable and the reason why they happen is mainly because of bad management. The NAT, however, states that some accidents are inevitable and that they are bound to happen. There is really no way of preventing certain accidents within certain types of systems. The move from one paradigm to a new one is according to Kuhns theory mostly based on anomalies that appear within the existing paradigm (Okasha, 2014, p. 76). This leads the scientific community to lose faith and search for a new one. In the article Hopkins (2001) questions the NAT by applying it to the case that in Perrows view is the very foundation behind the NAT, the Three Mile Island incident.

Hopkins (2001) points to various of different factors that fit in to the MMD theory rather than the NAT, considering the Three Mile Island accident. He claims that there were several different early warning signs prior to the accident, which if acted upon could have prevented it. In example, there was a similar incident at the plant 17 months earlier, but it didn't involve the same consequences. Hopkins (2001) argues that this incident can be considered as an early warning sign. Further, he claims that if the company had taken the incident seriously, then the later accident would not have happened. By doing this, he claims that there are anomalies within the NAT by pointing to factors that does not fit into the theory. These factors do instead fit into Turners MMD theory.

The Three Mile Island accident is by Perrow, considered as the foundational example of the NAT. By pointing out anomalies in this example, Hopkins (2001) may cause other scientist to lose faith in the NAT and instead concentrate on Turners MMD. If so, the community would enter the revolution stage within Kuhns theory and the MMD would be accepted as the new paradigm. If that is the case, then these two theories fit into Kuhns theory about scientific progress.

Task 4

4. Values and objectivity

Many philosophers argue that science should be considered as a value-free activity. In short, this means that science´s main function is to show how the world really are. Science should not be influenced by prior assumptions or theories. Nor should it be affected by personal factors (Neumann, 2014, p. 88-89). In a contrasting view, some philosophers argue that values are a natural part of scientific enquiry (Okasha, 2016, p. 123). Richard Rudner went further and argued that values was indispensable in scientific practice (Douglas, 2001, p. 520). In the following paragraphs I will focus on the research on MMD and NAT and discuss whether values have had an influence and how.

The two theories presented in the paper, seek to explain why events like the Three Mile Island accident occur. They offer two different perspectives on the causational factors that lead to the accident. Perrows NAT point to the complexity and the tight coupling of the system as the main cause for the accident. Turners MMD view, does instead look at the human factors and show that the responsibility for the accident lies with the management.

Hopkins (2001) argues that Perrows main motivation for developing the NAT is to shift the blame away from the front-line operators. By stating that these types of accidents are bound to happen no matter what, he shelters the operators from the responsibility. Turners MMD theory tries to do the same thing by showing that the causational factors lie further up the "ladder" within a company. So, to some extent you could argue that both Perrow and Turner have the same motivation for developing their theories.

Having this type of motivation for developing a theory, will pose a threat to the objectivity of the scientific research. Since both Turner and Perrow had a certain standpoint before conduction the research, you could argue that the scientific work has been influenced by prior assumptions. Which as stated earlier, is not a value-free science (Neumann, 2014, p. 88-89). It is a threat to the objectivity because, it is possible that they will mainly focus on the findings that support their initial standpoint.

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