University of Twente

Interdisciplinary Research Methodology

University College Twente (ATLAS)

Methodological Review

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1 Introduction

The social science seminars were very eye-opening on the term "research". There are so many research methods out there that we do not know about. From the seminars, we have chosen four topics to discuss on: Narrative Analysis, Improvisation Theatrical Simulation, Innovative Team Research, and Health Psychological Assessment. These topics were chosen out of our own interests, as well as the possibility to apply some of them in our research project/proposal.

Our research project is aimed at monitoring mental health through physical signals. We will mainly be looking at stress and the best way to measure it in order to recognize when it has reached a dangerous level. This research will be done in the hope of coming up with an efficient health monitoring system for specific individuals that will be going to Mars.

The sections below will go on to reflect on and give an overview of the four research methods we have chosen to discuss about. The possibilities and limitations of these methods will be discussed, as well as how they can, if at all, be implemented into our research project.

2 Narrative Analysis

Narrative analysis is a kind of research that is what we humans do on an everyday basis, with or without knowing. We have been doing it in our heads since when we were little children, from listening to bedtime stories filled with hidden life lessons to hearing stories of a sibling's day at school. Narrative analysis is how humans make sense of the world in the form of a story, whether it is in texts, conversations, images, or movies. It is a kind of research that helps in understanding everyday lives.

Although it may not have always been done methodologically, there are people who follow a set of method in order to be able to have a more in depth research. For narrative analysis to be used methodologically, some sort of specific research question should have already been formulated. This is because the method uses a bottom-up process and goes from specific to general. By the end of the method, a general conclusion would have been reached for the research

as a whole.

There are five steps for narrative analysis. The first step is the introduction of the case or story. The second step is the analysis of the storyline. For this step, it is recommended to summarize the storyline, while identifying the setting, the main theme of the story, and the goal that the main character is trying to achieve along with what is supporting him or is in his way. During this step, conclusions should also be drawn in regard to the research question. For the third step, the analysis of the interactional narrative, the point of view is taken into account. Where is the storyline positioned, from whose viewpoint is the story being told from? Not only that, who the audience is should also be taken into account. And again, a conclusion should be made in regard to the research question. Within this step the discussion should also be made on what is at stake in the story - the big picture of what is being presented. The fourth step is contextual analysis. This step asks the "what if" questions by putting the storyline in another wider context. This creates a new case/scenario. The storyline isn't the only thing that is analyzed at this point, but also the storytellers, listeners, and the interaction patterns. As for the last step, the comparative analysis of storylines and interaction patterns, the different cases made are compared. Overall, the method for narrative analysis should be done flexibly, and it is not necessary for the steps to be done in order. In the end, the method should help in developing patterns and overarching findings.

Narrative analysis as a research approach has very little limitations and endless possibilities. This is because so many cases can be made, along with so many combinations of situations. But because of this infinite possibilities, it is hard to judge the reliability of the research other than by transparency (having other researchers come to the same interpretation). Although the possibility of the research may often be able to be approved by gut feelings and common sense, but there is no way to quantitatively determine the reliability.

To determine the reliability is almost like to know the future events that will occur. Most of the time, only time will reveal the reliability of this type of research. In order to do this research well, it is probably best to perform it in collaboration with many people. This increases the possibilities of the cases, which should help in developing a better pattern. This type of research is very creative and theoretical and is very hard to measure, nevertheless, it can be very useful in inspiring future research that could possibly further prove the pattern developed.

3 Improvisation & Theatrical Simulation

A research method that we got acquainted with outside the seminars is improvisation and theatrical simulation. During the course Improvisation & Theoretical Simulation we learned about this method. We did not only learn about the re-

search method, but we also worked with it during class.

Theoretical simulation uses actors to play a certain game to gain insight about the reality. The method takes place in a hyper reality that entails part of the concrete reality. A framework is provided to the actors with rules, relationship between roles and the environment to put a focus on the key parts that you want to research.

This research method is not a really a standard one. It is a very creative method compared to the addressed methods in the seminars. Theoretical simulation is divided in two parts starting with the testing phase.

In the testing phase, microscopic rules are tests to make an adequate model. This holds defining a research question and hypothesis to start with. Then you define a test situation which has to correspond to a real known situation. Microscopic rules are defined with a desired outcome (macroscopic behaviour). You design a game to test your microscopic rules. When tested, the researcher can see if the set rules are useful or not. In this way, a game can be created that has a valuable outcome. When the model is finalised, it is time for the exploring phase. Here you change the game conditions to explore new variables. The results of both the testing phase and the exploring phase will then hopefully be useful for creating more knowledge on the research topic.

To conduct such a research well, one thing is mainly important which is the construct validity. A researcher has to make sure that the roles that the performers play and the rules of the game represent the construct he/she wants to observe. By using the testing phase properly, this should not be a problem.

Theoretical simulation has some advantages. Improvisation has the ability to react to its environment without planning due to its spontaneity. Also, the method gives large amount of control to the researcher. By using performers it is possible to influence factors that cannot be influenced in normal empirical research, such as personality.

Another difference between this and most methods is that improvisation is the only construct that focuses on the process and not on the results of the process.

Since the research method is based on performers and observing human behaviour, it is limited in its usage. It is mainly useful for social science topics, but not really for technical research. Our personal experience with improvisation showed that it is possible to bend the technical topic in such a way that it can be used with this method. However, it did not give any new insights on the topic, which is desired when conducting research.

Another limitation to theoretical simulation as a research method is that it makes use of stereotypes. There are people that have issues with stereotyping

and that might affect the research. Also this excludes researching real personalities, since it makes more use of characteristics than someone's personal behaviour. However, within some topic it might not affect the results if stereotypes are being used. Because the simulation takes place in hyper reality, it is also very hard to determine the reliability.

This specific way of research is really dependant on people. This can be a risky variable. People can be unpredictable compared to, for example, computers. Additionally, if the performers know the aim of the game they are participating in after awhile, this can result in biased outcomes.

Overall, it is a very interesting methodology with some great advantages, but also some limitation (e.g. limited usage). It allows research to be creative and think outside of the box.

4 Innovative Team Research

Innovative team research is research on teams and team innovation. This is a kind of research that is mainly useful for companies and their organization, due to their need to grow. Companies need to be able to notice the trends and innovate accordingly, and the organization of each company is crucial in determining the efficiency of innovation. The more efficient the innovation process, the stronger the company could come out on top in their competition against other similar companies, thus the more money and reputation they can gain. Within the organization of each company are teams of individual workers, collaborating ideas for innovation. Therefore, team structure is very important and highly influences how well the team functions. This is especially crucial in times of emergencies. For a well-structured team, there should be a variety of skills, and personality types should also be compatible.

There are many methods for innovative team research, because there are many different types of tests that could be given to individuals to analyze their own personality and style of working. Some examples are the cognitive style index and the belbin tests. As ATLAS students, we have already become quite acquainted with these tests in the second semester of our programme. As an individual, looking at the results of these tests help to understand where you stand in a team and in which areas you are contributing most. This helps to understand your weaknesses and strengths, which is really helpful in self development. As a team, looking through the results together help to understand the team dynamics and address the possible unspoken tensions, allowing for them to be fixed. Looking at it as a team also helps in task division in order to get a high-quality end product within an efficient amount of time.

Because most of the tests given depends entirely on the person's ideas of him or

herself, in order for this research to turn out well, the person filling in the test should be highly critical of him or herself at that period of time. It should be made sure that the person is not filling it in as someone he or she wishes to be. If the test is filled out incorrectly, the results will not be reflective of the actual team member's personality and skills and leads to biased results. Therefore the limitation of the methods of this research is that it is very hard to determine and proof the accuracy of the tests. There are also so many aspects of a person that cannot be covered by the tests, no matter how many were taken. Also the combination of people group and how one type of personality affects another is a generalization and is not necessarily always true. People cannot be completely generalized and defined by numbers and letters. During the seminar, it was also stated that background diversity negatively influences the strength of the team, due to the problems with misunderstandings. This is not necessarily true. Background diversity can enhance the team strength even more for certain personality types and the input ideas may also be more diverse, possibly allowing for better problem solving approaches and innovative ideas.

Nevertheless, innovative team research is very useful in helping a team member understand his or her strengths and weaknesses. It is very useful for self improvement, which can then improve the team as a whole. This is a valuable for both academia and society. This kind of research does not only have to be used in figuring out team structures in companies, but it can also be used in working academic groups.

5 Health Psychological Assessment

The seminar of Peter ten Klooster gave us an insight on research development in the field of health assessment. It is a very interesting topic, since it not only showed the current way of conducting research, but also the path to the current state.

Both the pattern of diseases as well as the definition of health have changed a lot over the past decades. The main cause of death shifted from infectious diseases, like tuberculosis, to chronic diseases, like cancer. Health also shifted from being more of a physical problem to more of a mental problem. This change makes health very complex and it is therefore also very difficult to measure.

Within health psychology, the focus is on measuring stress. Stress is the adaptive response of the body to potentially threatening events. Stress can be divided into good and bad stress. Bad stress occurs when environmental demands exceed the adaptive capacity of a person, which results into psychological changes.

Measuring in health psychology can be done by assigning numbers to object or events according to certain rules. Examples of these events are marriage and divorce for measuring stress. However, this is not a very reliable research.

It ignores the individual weighting of event, it does not account for interaction between events, and there is no distinction between positive and negative events.

The most widely used measurement technique for biological responses is a questionnaire. It is available for many behaviors and constructs of interest and therefore are very useful. However, this method has some issues. Participants of the questionnaire could memorize certain aspects if they have already participated in such a test and this might to biased results. Additionally, there are many items needed for the reliability and validity.

Modern measurement theories solves most of the questionnaire problems. A development on the field of questionnaires is an adaptive questionnaire. This method, computer adaptive testing (CAT), tailors the questionnaire to the participant. In this way there will be no unnecessary questions. Additionally, it is a more precise measurement and it takes less time for the participant. The only downside of CAT is that it is difficult to make a good CAT test. It has to be tested thoroughly and the items need to be calibrated by a large number of respondents.

Stress cannot only be measured by behavior, but also by physiological changes of the body (e.g. sweat, heart rate, and stress hormones). This can be done by using ECG, EMG, heart monitors, measuring blood pressure etc. The issue with this type of measurement is that it is intrusive, expensive and non-naturalistic. These measurement technologies were difficult to bring around and therefore they had to bring participants to a laboratory of some kind. This does not stimulate natural stress and can even be unethical.

Both the non-naturalistic and intrusive issue can be solved by the development of technology. Wearable health technologies allows the research to be non-intrusive and more naturalistic, since participants can wear them in their own natural habitat. However, the participants are still aware of the fact that they are being measured and might change their behavior on this, which is less by observing human behavior. Nonetheless, stress is difficult to influence and is a natural process, so that should not be a problem.

Overall, the innovation of health assessment shows a lot of potential. The growth over the past decades in heading into the right direction. However, it is not completely finalized. On both the biological and physiological sides there are disadvantages and the interaction between these two is also still unclear.

6 Conclusion

The research methods that have been explained and discussed above are very enlightening and have shown that research is a very broad term. To conclude, the implications of these research methods to our research proposal on the Mars

Space Mission will be discussed. Not all of the research methods are applicable to our research project, but through the seminars, knowledge and insights were gained on the different types and possibilities of research.

Narrative analysis is a tool that could be very useful for our research. This is because our research is posed for such an extreme condition, a lot of imagination is needed. Even if we do not use this research method, we would still be doing it unconsciously, because we are always forming a story in our minds of the different situations that could possibly happen on Mars and the different possible ways in which we could solve it. To use the narrative analysis as a research method tool for our research, we would have to come up with different story scenarios of the change in the Mars colonists' health. Then we would be able to analyze the different situations in regard to our research question.

Improvisation is a method that is not very useful for our project. This is due to the fact that it is a really nice method for social topics, but not for very technicals ones like ours. We focus on how to measure certain body changes and this just cannot be done with looking at human behavior. Most of the time, the main goal of using theatrical simulation is to see how humans react to different (social) scenarios, which are often triggered by external sources. Therefore, it is hard to use it to determine how well a technology will work on an individual person. It is very difficult and not efficient to use this research method to understand triggers via internal sources of a person, because these triggers are often unseen, unlike human behavior.

Innovative team research is also in no way useful for our research, because we are focusing on an individual level and the relationship between technology and one individual person. There is no need for us to look into team dynamics and innovation at all. Even though it may not be useful for our research topic, it could still possibly be used to help our research group work better together, and therefore come up with more innovative research findings. Because the research should take a couple years, it would be practical to apply this research method in forming a stellar research group.

As for the last research method of health psychological assessment, Peter ten Klooster showed us that our research is a valid research. The most interesting part his seminar for our research is the part of physiological responses. The innovation of health assessment shows that measuring stress got more difficult with all the new ways of measuring. However, the improvements of wearable technologies makes this innovation again easier. This shows that using wearable health technology is a good way to measure stress and looking at how to improve this technology, will stimulate the innovation of health assessment.