



**Texas A&M University at Qatar
Electrical and Computer Engineering Program**

**ECEN 403-502
Electrical Design Laboratory I
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**Ethnographic Study Report
Data Logger for Mechanical Systems**

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“On our honor, as Aggies, we have neither given nor received unauthorized aid on this academic work.”

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Introduction

The purpose of this ethnographic study is to analyze the culture that is related to our project. Before diving into the details of our project, we as engineers need to analyze the people who will be using our product. We need to understand the problems and difficulties they face everyday, as well as get insight from them on how we can improve our design to cater to them. Tasks were divided among team members as shown in Table 1.

Table 1: Task Division among Team Members

Team Member	Task
Abdulrahman Al-Malki	Technical Writer
Faisal Al-Mutawa	Editor/PR Person
Mohammed Alsooj	Cameraman
Yasmin Hussien	Script Writer

Cases Under Study

Our project will be used exclusively in the oil and gas industry, so we focused our study on people with industry experience. First we talked with Dr. Shehab Ahmed to give us initial insight. He is an electrical engineering professor with valuable theoretical knowledge, as well as, a lot of practical experience in the oil and gas industry. Next we talked with Eng. Nasser Elfayoumi from RasGas to hear about the issues related to our project. Finally, we went to Schlumberger in Qatar to get first hand experience with how our project can help the industry. The people we interviewed are shown in Table 2.

Table 2: People Interviewed for our Ethnographic Study

Case	Location	Person Interviewed
University Professor	Texas A&M University at Qatar	Dr. Shehab Ahmed
RasGas Engineer	RasGas HQ	Nasser Elfayoumi
Schlumberger	Industrial Area	Yassine Mhadhbi

Study Analysis

University Professor:

Dr. Shehab Ahmed gave us an analogy to help explain the idea behind our project better. He compared our data logger to fitness trackers that are currently trending around the world. He explained that these fitness trackers help record and measure our “performance” when we are exercising for example. This helps us realize if we are exercising right by checking how much we improve over time, as well as show us where we are doing something wrong so that we can improve.

He further explained that this could be said about passive mechanical systems. When the tools are being utilized in harsh environments like downhole or even outer space, it’s very difficult to know whether the tool is working or not. Plus, even if it’s working we can’t know how efficient it is, resulting in losing opportunities to enhance the tool. Therefore, our data logger can help to prove and improve the performance of a mechanical system.

RasGas Engineer:

Nasser Elfayoumi, a petroleum engineer, talked about examples of current systems that utilize data logging. He talked about offshore systems used in oil retrieval. These systems operate in the sea where it is significantly more difficult to control the tools than on land. This is because of things that we can’t control like the wind and the tide. This makes delicate processes like moving oil platforms very difficult and very dangerous. Because of the massive size of these platforms, any unplanned contact will result in a very powerful collision that could cost casualties and millions of dollars.

He then explained how data logging could help immensely in these situations. By having precise data logs of the motion of the oil platforms, they can be moved in a very accurate manner. This can be even further improved by having automated systems that use the data logs to move the oil platforms without human intervention. He explained this would help a lot since human workers can’t possibly work in these harsh environments for prolonged periods of time. Machines, on the other hand, are capable of working in harsh environments, which is another benefit of data loggers.

Schlumberger:

We went on a trip to Schlumberger in the Industrial Area with a view to learning more about how data loggers are used currently in the industry. We went on a tour first and looked at several tools used in the field. We then took a look at how the data is looked at and interpreted by an Engineer working in Wireline. We also had an interview with Yassine Mhadhbi, who is a petroleum engineer with first hand experience in downhole tools and data logging. He talked about the safety aspect of data logging, as well as how data logging is implemented in different mechanical tools.

Impact on Design

From Dr. Shehab's analogy, we realized that the user experience is a very crucial part of our design project. We need to make our design as accessible and user-friendly as possible. We can do this by adding more common peripherals for when the user wants to view the data. If time allows, we can also make the connector modular so that it can be replaced with user's preferred peripheral protocol.

For RasGas and Schlumberger, they seemed to be concerned the most with the safety aspect of data logging. In this case, we could implement in our code a "burst logging" mode where if the sensors detect movements, logging happens every millisecond instead of every second. This would help in viewing certain events in detail for troubleshooting purposes.