Week 4: Apply Theoretical Framework

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# Apply an Appropriate Theoretical Framework

## Theoretical Foundations

There are four approaches to studying a business use-case or phenomena (see Table 1). Constructive design is one of the most common research methods for information systems and technology (Silvestrini & Sammito, 2012). These studies identify a problem, build solution artifacts, and communicate the implementation’s unique value (Hevner et al., 2004). In addition, many researchers follow this process to build proof-of-concept and execute case studies. Therefore, this methodology is appropriate for examining the effectiveness of the Elderly Care Smarthome Operating System (ECSOS) solution and its abilities to improve elderly care.

Table 1: Example Research Strategies for Classifying Movement in Video

|  |  |  |
| --- | --- | --- |
| Approach | Description | Study Example |
| Quantitative | Studies the magnitude of a phenomena | Measure the resources necessary to classify movement with embedded systems |
| Qualitative | Explores a concept without a numerical basis | Exploration of reasons movement classification fails |
| Mixed-Method | Combines exploration and studying the magnitude of these issues | What preparation steps reduce the costs movement classification |
| Constructive | Produce artifacts to study a scenario | Create an algorithm for classifying movements |

## Review Literature

## Apply Theory to Project

This research project has three core components which collectively form a proof-of-concept implementation and mechanism to measure results.

First, the team installs WiFi-enabled Eufycam 2C cameras to collect short recordings. These cameras use motion-sensing to trigger short Audio/Video (A/V) recordings (fifteen to sixty seconds). After the filming completes, its controller (Eufy Homebase) automatically uploads the file to Network Attached Storage (NAS). The file creation event triggers an analysis workflow that extracts and publishes metadata to message buses. Developers can author extensions using Function as a Service (FaaS) constructs that subscribe to the notifications.

Second, a machine learning algorithm will classify and annotate the video’s contents. There are several potential implementations (e.g., Open Pose versus Toyota’s approach). The performance and resource requirements between these strategies must exist. Ideally, the model can run in an edge appliance versus uploading into a Public Cloud Service (PCS). However, this raises concerns that the device has sufficient computing capabilities (e.g., parallel processing dozens of cameras). If analysis occurs within the cloud, then it introduces security and privacy concerns. The artificial intelligence algorithm would require additional complexity to address these risks (e.g., supporting CKKS HE encryption protocols).

Third, the ECSOS solution routes the metadata into monitoring and response extensions. These extensions include central services (e.g., identity and state management) and auditing capabilities (e.g., inputs, predictions, and recommendations). One crucial extension is the central audit logs. These tables are queryable within a NoSQL time-series database (e.g., Influx). This technology provides two essential capabilities, native support for tracking system performance across time and Schema-at-Read versus Schema-at-Write (SAR versus SAW) semantics. Datastores that support SAR are more flexible and can quickly adapt to future enhancements (e.g., extending data contracts).

## Controversies and Ethical Challenges

The system’s primary purpose is to increase the patients’ quality of life by remaining within their residency longer. Therefore, this mission statement obliges the solution to detect human activity and respond reliably. Also, patients will only use a continuous video recording solution if they trust its security and privacy controls. There must be explicit and deliberate decisions regarding how information is stored or transferred.

# References

Hevner, A., March, S., Park, J., & Ram, S. (2004). Design science in information systems research. *MIS Quarterly, 28*(1), 75-105. doi:10.2307/25148625

Silvestrini, R. P., & Sammito, G. (2012). Design of Experiments for Information Technology Systems. *Defense AT&L, 41*(5), 30-35. Retrieved from https://search-ebscohost-com.proxy1.ncu.edu/login.aspx?direct=true&db=bth&AN=80409129&site=eds-live