

## Department of Systems Engineering and Engineering Management

### Seminar Series

## **Risk-adjusted control charts for monitoring surgical performance**

### **Mr. Philipp Wittenberg**

Department of Mathematics and Statistics, Helmut Schmidt University/  
University of the Federal Armed Forces Hamburg, Germany

Date	21 November 2017 (Tuesday)
Time	3:30pm - 4:30pm
Venue	P7303, Yeung Kin Man Academic Building (AC1)

### **Abstract**

The variable life-adjusted display (VLAD) is the risk-adjusted graphical procedure proposed in the literature for monitoring the performance of a surgeon. It displays the cumulative sum of expected minus observed deaths. It has since become highly popular because the statistic plotted is easy to understand. But it is also easy to misinterpret a surgeon's performance by utilizing the VLAD, potentially leading to grave consequences. The problem of misinterpretation is essentially caused by the variance of the VLAD's statistic that increases with sample size. In order for the VLAD to be truly useful, a simple signaling rule is needed. Various forms of signaling rules have been developed but they are usually quite complicated. Without signaling rules, making inferences using the VLAD alone is difficult if not misleading. We will establish an equivalence between a VLAD with V-mask and a risk-adjusted cumulative sum (RA-CUSUM) chart based on the difference between the estimated probability of death and surgical outcome. Average run length analysis based on simulation and Markov Chain approach shows that this particular RA-CUSUM chart has similar performance as compared to the established RA-CUSUM chart based on the log-likelihood ratio statistic obtained by testing the odds ratio of death. We provide a simple design procedure for determining the V-mask parameters based on a resampling approach. Finally, we illustrate the monitoring of a real surgeon's performance using VLAD with V-mask.

## About the Speaker

**Philipp Wittenberg** received his Diploma degree from University of Hamburg, Hamburg University of Applied Sciences and Hamburg University of Technology in 2012. He is currently a PH.D. candidate under supervision of Prof. Sven Knoth in the Department of Mathematics and Statistics at the Helmut Schmidt University / University of the Federal Armed Forces in Hamburg. His current research fields include risk-adjusted control charts, environmental hazard monitoring and road safety analysis.

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