

PHYSICS VERSUS QUALITATIVE SOCIAL SCIENCE: CASE STUDIES ON OPERATORS OF ADVANCED OFFSHORE VESSELS

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Many situations of societal importance - like voting, queues, crowd movement, and collective (integrated) responses in stock markets - are readily accessible for measurements and modeling using standard quantitative approaches. However, it will be argued in this contribution that physics could also benefit from drilling deeper into the *qualitative* parts of traditional social science. While physics uses quantifiable concepts for data organization, analysis and theoretical statements, traditional social science rely, to a large extent, on *qualitative* concepts. Thus, it may seem that these two branches of science are incommensurable. It will be argued that this is not necessarily the case: physics approaches may lead to additional insights into data organized using qualitative concepts. Furthermore, it will be stated that knowledge *accumulated* in such qualitative concepts may be unfolded through exposure to quantitative approaches. The quantitative treatment does not replace the qualitative concept with its organization of data, but (if successful) reflect it in ways that allow deeper understanding or criticism.

Examples will be given from studies of operators (captains, first officers) at the bridge of advanced vessels that support inspection and maintenance of offshore oil installations. The concept 'quality in task performance' was scrutinized through 'projections' onto quantitative measures that, intuitively, should reflect it [1]. Data from training sessions on full-scale bridge simulators was used, which allowed identical conditions for several (independent) crews. The conclusion was negative, in the sense that it was hard to discover any systematic reflection of 'quality in task performance'. A second study is based on an analysis of interview [2]. The aim is to determine whether the classical concept 'alienation' (or, possibly, de-alienation) describes the man-machine relation at such high-technology bridges. The analysis proceed through a decomposition of alienation into four parts, with citations from the interviews being organized in a tree structure.

[1] K. Christensen, G. Kleppe, M. Vold, V. Frette, *Physica A* **415**, 503 (2014).

[2] V. Frette, T. Sydnes, J. Ferkingstad, and S. Tvedt, (unpublished).