This paper addresses the quantification of the value of structural health monitoring (SHM) before its implementation for structural systems on the basis of its Value of Information (VoI). The value of SHM is calculated utilizing the Bayesian pre-posterior decision analysis modelling the structural life cycle performance, the integrity management and the structural risks. The relevance and precision of SHM information for the reduction of the structural system risks and the expected cost of the structural integrity management throughout the life cycle constitutes the value of SHM and is quantified with this framework. The approach is focused on fatigue deteriorating structural steel systems for which a continuous resistance deterioration formulation is introduced. In a case study, the value of SHM for load monitoring is calculated for a Daniels system subjected to fatigue deterioration. The influence of and the value of SHM in regard to the structural system risks and the integrity management is explicated and explained. The results are pointing to the importance of the consideration of the structural system risks for the quantification of the value of SHM.