ERRATUM

**ERRATUM TO: A CONTRIBUTION TO THE SCIENTIFIC FOUNDATIONS
OF SYSTEMS ENGINEERING: SOLUTION SPACES AND
REQUIREMENTS**

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The article *A Contribution to the Scientific Foundations of Systems Engineering: Solution Spaces and Requirements* written by Alejandro Salado, Roshanak Nilchiani and Dinesh Verma, has been revised due to a missing part the authors forgot to add. The missing part goes at the end of Appendix B, Page 36, right after the sentence “The new compliant space is reduced to four systems.”

The online version of the original article can be found under
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r_1 : The system shall have a mass lower than 5 kg.

$$\begin{aligned} R_B &= R_A \cup \{r_1\} \\ \text{mass}(Z_i) &= i \text{ kg}, i = 1, \dots, 10 \\ CS_{R_B} &= \{Z_1, Z_2, Z_3, Z_4\} \\ \#CS_{R_B} &= 4. \end{aligned}$$

This compliant space is used as a reference to assess how inapplicable and other non-system requirements affect both its size and the compliance of the systems.

Case 1 Inapplicable requirements

The inapplicable requirement r_2 is added to the set of requirements. Because the requirement is actually not referring to the system, but to a deliverable the company supplying the system has to provide, the compliant space remains the same, and thus so does its size.

r_2 : The supplier shall deliver a development plan.

$$\begin{aligned} r_2 &\notin R_B \\ R_C &= R_B \cup \{r_2\} \\ CS_{R_C} &= \{Z_1, Z_2, Z_3, Z_4\} = CS_{R_B} \\ \#CS_{R_C} &= 4 = \#CS_{R_B}. \end{aligned}$$

In case the company does not deliver the required document, i.e., verification of such a requirement is false, the systems are still able to fulfill the initial set of requirements before the inapplicable requirement was added. Consequently, compliance of an inapplicable requirement does not affect compliance of the other requirements.

Case 2 Overlapping requirements as another type of non-system requirements

The overlapping requirement r_3 is added to the set of requirements. All systems in the

compliant space are compliant to that requirement and, as a consequence, the compliant space remains identical and thus its size is unmodified.

r_3 : The system shall have a mass lower than 10 kg.

$$\begin{aligned} r_3 &\notin R_B \\ R_D &= R_B \cup \{r_3\} \\ CS_{R_D} &= \{Z_1, Z_2, Z_3, Z_4\} = CS_{R_B} \\ \#CS_{R_D} &= 4 = \#CS_{R_B}. \end{aligned}$$

However, if r_3 cannot be met r_1 would also not be met, thus affecting compliance of the system. In practical terms, that means that the development entity would not be able to find Z_1 through Z_{10} .

$$c(Z_i, r_3) = \text{FALSE} \rightarrow c(Z_i, r_1) = \text{FALSE}, \forall i.$$

Example 2 Definition of overlapping requirements

Consider the set of requirements formed by r_1 and r_2 .

Dominant overlap:

r_1 . Mass < 1 kg   Case A. Actual system mass = 0.7 kg.

r_2 . Mass < 10 kg   Case B. Actual system mass = 7 kg.

In Case A, both r_1 and r_2 are compliant. As can be seen, being compliant to r_1 automatically results in compliance to r_2 . In Case B, however, only r_2 is compliant. In this case, compliance to r_2 does not automatically results in compliance to r_1 .

Mutual overlap:

r_1 . Mass < 1kg   Case A. Actual system mass = 0.7 kg.

r_2 . Weight on Earth < 1 kg Case B. Actual system weight on Earth = 0.5 kg.

In Case A, both requirements are compliant because a mass of 0.7 kg automatically results in a weight of 0.7 kg on Earth. Therefore,

compliance to r_1 automatically results in compliance to r_2 . In case B, both requirements are also compliant because a weight of 0.5 kg on Earth without other external force requires a mass of 0.5 kg. Therefore, compliance to r_2 automatically results in compliance to r_1 .