Desired Engineering Attributes
R. Russell Rhinehart
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Engineering is not just about technical competence – State-of-the-Art commercial software beats novice humans in speed and completeness in technical calculations. Engineering is a decision-making process about technology within human enterprises, human value systems, and human aspirations. Engineering is "the use of heuristics to cause the best change in a poorly understood situation within the available resources" (B. V. Koen, "Definition of the Engineering Method", Am Society for Engineering Education, Washington, DC, 1985).

In an exercise with our faculty and Industrial Advisory Committee members to understand our students' employers desires, it became apparent that engineering is a way of balancing opposing ideals; and we developed this list in an effort to capture the values that guide the activity of engineering.

Engineering is an activity that delivers solutions that work for all stakeholders. Desirably, engineering:

- Seeks **simplicity** in analysis and solutions, while being **comprehensive** in scope.
- Is **careful**, correct, self-critical, and defensible; yet is performed with a **sense of urgency**.
- Analyzes **individual mechanisms,** and integrates stages to **understand the whole.**
- Uses state-of-the-art **science** and **heuristics**.
- Balances **sufficiency** with **perfection**.
- Develops **sustainable solutions** – profitable and accepted **today**, without burdening **future stakeholders**.
- Tempers **personal gain** with **benefit to others**.
- Is **creative**; yet **follows codes**, regulations, and standard practices.
- Manages Risk – Balances probable **loss** with probable **gain** but not at the expense of EHS&LP.
- Is a collaborative, **partnership activity**, energized by **individuals.**
- Is an **intellectual analysis** that leads to **implementation and fruition.**
- Is **scientifically valid**, yet **effectively communicated** for all stakeholders.
- Generates **concrete** recommendations that honestly reveal **uncertainty**.
- Is grounded in **technical fundamentals** and the **human context** (societal, economic, and political).
- Is grounded in **allegiance to the bottom line of the company** and to **ethical standards of technical and personal conduct**.
- Supports **enterprise harmony** while seeking to **cause beneficent change.**

Students should graduate knowing these fundamentals about the way of engineering, as a complement to their fundamental knowledge and skill of the core science and technical topics. But, since students are not usually introduced to these concepts in school, I think that these could be important discussion topics between mentors and new employees when seeking to develop your workforce potential.

Where is the middle between, for instance, the opposing ideals of sufficiency and perfection? A straight line is very long. No matter where one stands, the line disappears into the horizons to the left and to the right. No matter where one stands, it feels like the middle, the point of right balance between the extremes. But, the person way to the left thinks they are in the middle, also. The middle is not the academic/science perspective about intellectual ability, which is the fitness criteria for student selection in school. Neither is the middle defined by political or religious dogma, or your personal set of inherited 'shoulds'. The middle is associated with functionality within the enterprise context.

Bio

Russ Rhinehart started his career in the process industry. After 13 years and rising to engineering supervision, he transferred to a 31-year academic career. Now "retired", he returns to coaching professionals through books, articles, short courses, and postings on his web site www.r3eda.com.