

# The Art and Science of Solution Design Part 3 of 4: Human Engineering

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Successful Solution Design requires the full analysis of all aspects of human engineering from the initial planning stage through the entire development process to ensure effective implementation and widespread adoption of the final product.

While the technical engineering component of Solution Design is vital, software development is a human-centered process. Although a myriad of human factors has a major impact on the success of development ventures, many of these components are often overlooked, which can result in a breakdown of the entire initiative and the eventual abandonment of projects.

Human engineering failures from the past provide some insight to the complexities that must be thoroughly addressed by a team to successfully execute a project. One disastrous and very public example occurred in 2012, when reports emerged that the U.S. Air Force had to abandon a major software development project called the Expeditionary Combat Support System (ECSS), after spending \$1 billion but failing to create any significant military capability. A lack of thorough planning between out-of-sync stakeholders was cited as the primary issue, resulting in ballooning costs, misused resources, and the ultimate failure of the massive project.

Conversely, development projects that involve the thorough analysis and implementation of effective human engineering processes will be poised for success. A 2013 U.S. Department of Defense Better Buying Power fact sheet illustrates that the Air Force identified and implemented cost-saving initiatives of 15 percent by addressing fundamental human engineering areas in the software development process related to the modernization of its fleet, equaling a \$32 million reduction in its costs.

The human component of Solution Design is complex. One of the keys to achieving successful human engineering is ensuring that the expectations of all stakeholders in the organization are not only understood, but are also in unison throughout the process to ensure ultimate adoption throughout the company. Certainly, while this can prove to be a difficult task, it is an essential aspect of all successful development projects.

Determining the scope of a project can obviously have a massive effect on its eventual success or failure. To further complicate, not all initiatives will have a clear scope at the onset. Although the visionary stakeholders, such as the CEO and COO, may have lofty aspirations of what they want to develop, the company must organize internally to identify its ability to provide the resources and full funding that will be required in the long-term. Even in cases where a company has their own development resources available, a comprehensive analysis of the plans should be conducted. Can the project be completed within the budget that the company has in place? What capacity and resources are required? The design team should acquire the answers to these key questions in the initial stages to harmonize stakeholder interests and concepts, which will lead to the timely and complete creation of the deliverable product.

Establishing a process where the primary stakeholders have participated in designing the solution is a critical component to ensuring that they will embrace and champion the final product. Truly, the process is as important as the outcome, allowing the solution to emerge through the genuine collaboration of all interested parties.

The human engineering aspect of successful Solution Design requires the ability to be equally comfortable talking to all facets of an organization, including technical, management, visionary, and financial, to fully understand the comprehensive needs of the company as a development plan is determined.

Software has a major impact on every level and function of an organization. Therefore, it is essential to allow key stakeholders to have their say in how the solution is developed. However, from a project management and design perspective, the challenge lies in actively taking input from many people, yet effectively cutting through the noise to ensure that the solution is adoptable and manageable in the long term. Certainly, many projects involve a dramatic series of concepts and goals from a wide range of stakeholders with varied interests from their business units. The design team must consider each of these inputs to ensure that everyone feels that they have a voice, while preventing the project from becoming so fractional that it cannot be completed within the specified budget and timeline.

Although clients may believe that they know exactly what they want created, there are many circumstances where the suggested product is not actually the most effective solution to reach their goals. The key to successful human engineering is to thoroughly analyze and manage stakeholder expectations to align with objectives to best meet business constraints. Tying these elements together to result in the actual outcome that the client wants is the art of solution design.

A solid human engineering process is a critical component of effective Solution Design to ensure that all aspects of the client's requirements are both understood and implemented, leading to exceptional value for the entire organization and long-term integration of the deliverable product.

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