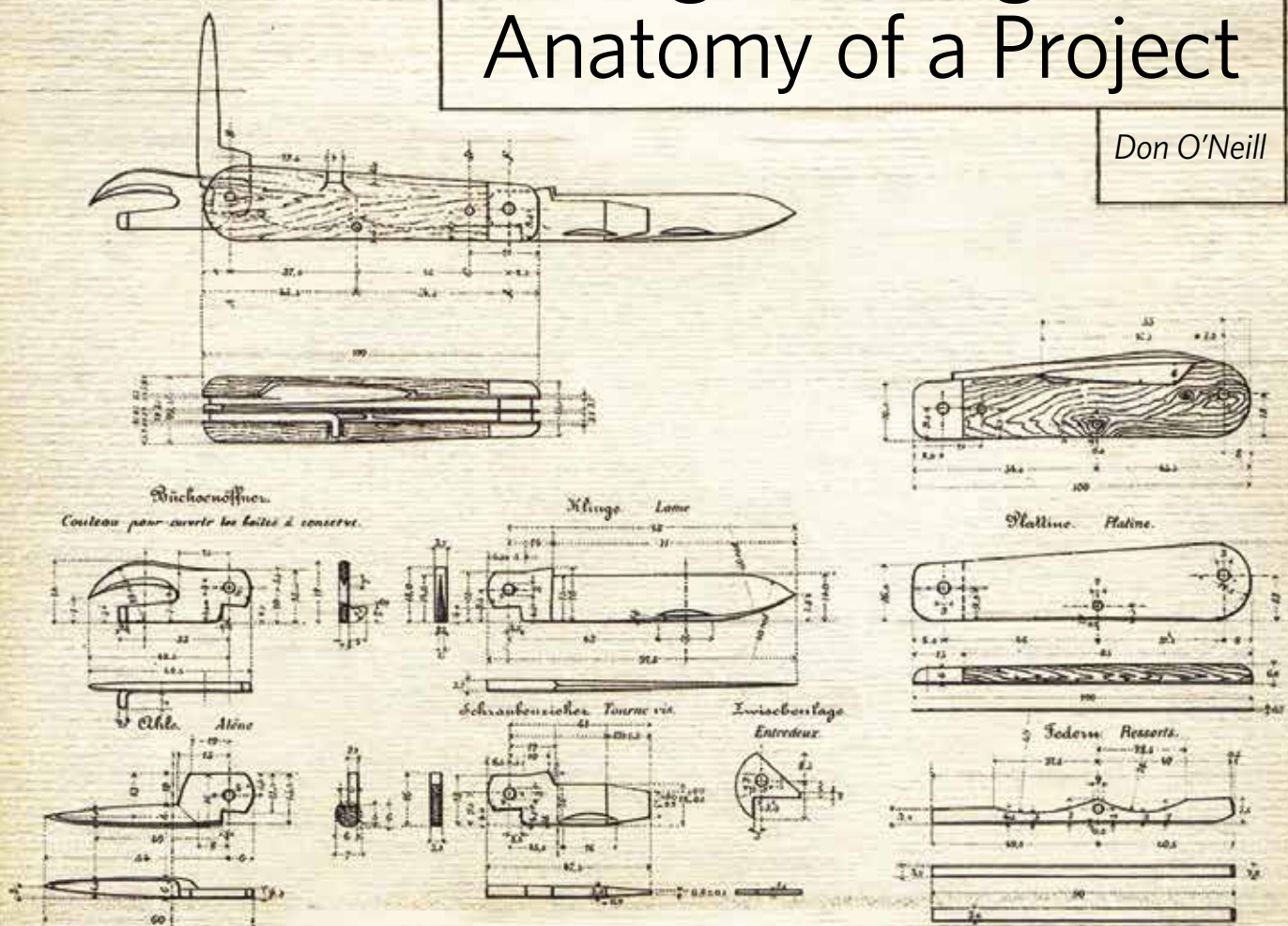


# Diagramming the Anatomy of a Project

Don O'Neill



**D**IAGRAMMING THE ANATOMY OF A PROJECT DEMANDS THE RIGHT MIX OF GENERALIST AND specialist skills, skills that combine both interconnecting parts and depth of knowledge.

Diagramming in terms of Essence alphas helps in determining the value of applicants to the organization. Essence (made up of the universals) spans the customer, solution, and endeavor. It begins by focusing on the customer in terms of alphas (essentials) for stakeholders and the opportunity value proposition. It goes on to frame the solution in terms of alphas for requirements and architecture including parts and their relationships. It finishes up by framing the endeavor in terms of alphas spanning the team, the way of working, and the status of the work itself.

With the anatomy of the project diagrammed in terms of alphas, staffing can proceed along the lines of program management experience, up-to-date technical knowledge, and project management experience. More program

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management experience is needed to understand stakeholders and the opportunity value proposition. More up-to-date technical knowledge is needed to understand requirements and the architecture of parts and relationships. The right blend of experience and technical knowledge is needed to understand the team, way of working, and work progress. If each applicant is assessed in terms of these alphas and the needs of the organization, a rational hiring policy can be established and practiced.

### Think Swiss Army Knife

Essence is the Swiss Army Knife, and the alphas are the blades that make it an all-purpose tool (Figure 1). Like the Swiss Army knife, the value of Essence lies in its usefulness.

**Why?** Whether you establish criteria at the beginning of a project or not at all, there exist industrial strength objective criteria for learning the status of a project and pointing the way forward. These criteria can be found in the Software Engineering Method and Theory (SEMAT) formulation and its Essence Kernel, the essence and common ground of software engineering.

**What?** This common ground of seven dimensions termed alphas is intended to be independent of particular methods, practices, and tools. The alphas possess the capability to reason about progress and assess status of any software project regardless of method and practice selections spanning the customer space, the solution, and the endeavor.

**How?** Simple yet powerful, these sensible alphas and their natural states of progression are actually very useful in setting expectations and guiding a project on its way and in guiding a software industry that has lost its way. More specifically, the alphas and the sequence of their state transitions include:

- Stakeholders are recognized, represented, involved, in agreement, satisfied with deployment, and satisfied in use.
- Opportunity is characterized as identified, software

needed, value established, viable, addressed, and benefit accrued.

- Requirements are conceived, bounded, coherent, acceptable, addressed, and fulfilled.
- The software system architecture is characterized as selected, demonstrable, usable, ready, operational, and retired.
- The team is selected, formed, collaborating, performing, and adjourned.
- The way of working is characterized as principles established, foundations established, in use, in place, working well, and retired.
- Work is characterized as initiated, prepared, started, under control, concluded, and closed.

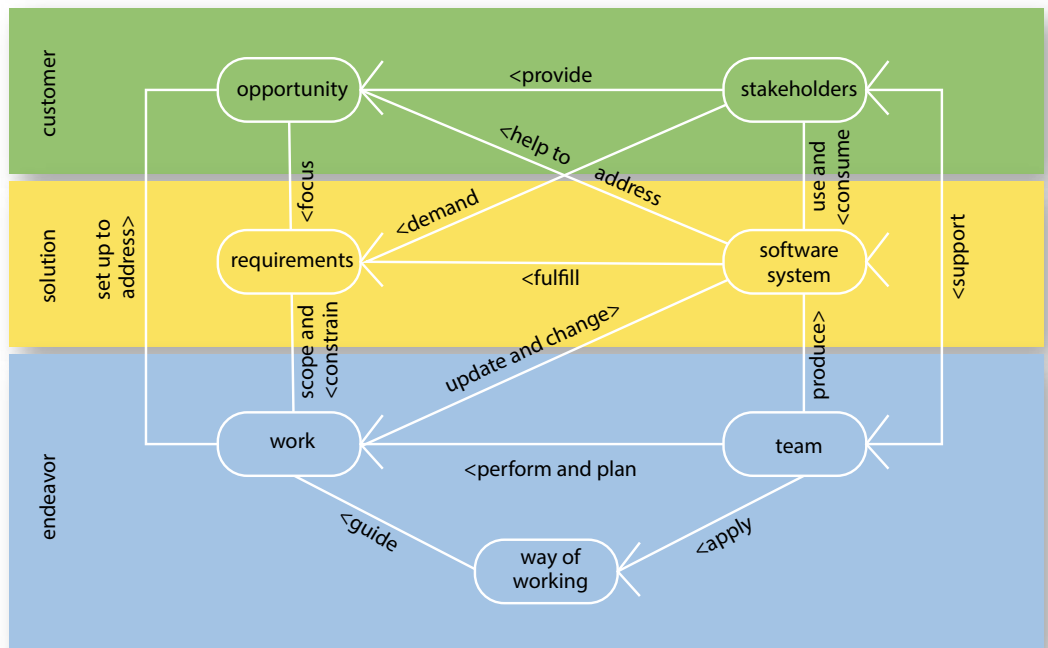
### Four Examples

Four real world examples using the Essence paradigm to good effect with senior managers facing consequential challenges are shown as illustrations of diagramming the anatomy of a project. One involves Facebook, another involves the Boeing 737 Max8, the third involves the Navstar Global Positioning System, and the fourth focuses on Coronavirus. These data analytics projects as framed are innovative, consequential, useful, and forward looking.

### Facebook

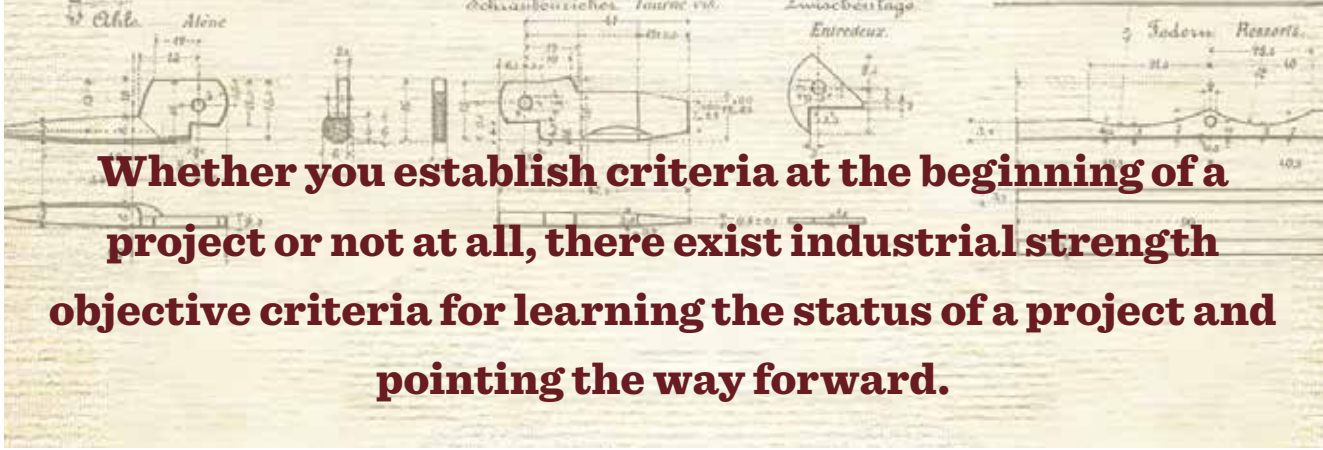
Consider the following e-mail exchange with Ed Amoroso, Facebook Board Member.

**Figure 1. The SEMAT Essence Kernel Alphas**



Source: The author.





**Whether you establish criteria at the beginning of a project or not at all, there exist industrial strength objective criteria for learning the status of a project and pointing the way forward.**

Ed,  
*It would be helpful to others, if not Mark Zuckerberg, and the Facebook Board, to frame the Facebook board recommendations more precisely in terms of stakeholders, opportunity, requirements, software system, way of working, team, and work.*  
Don

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Ed responded: ... *this is a great list.*

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Ed,  
*Here are some useful ways to adopt the items on the list in sync with your board recommendations.*

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Stakeholders include the using public, Facebook, and government oversight as involved, in agreement, and satisfied with deployment. Opportunity includes freedom and privacy in a way that restores corporate reputation through value established with viable benefits accrued. Requirements should tighten content through real-time monitoring and adherence to agreed-to standards that are bounded, coherent, acceptable, and fulfilled. The software system involves fielding a live, full-alert nerve center for policing content using demonstrable, usable, and operational Artificial Intelligence. The way of working should stop all unacceptable posts and deliver necessary consequences for failure putting in use established principles and foundations that are made to work well. The team will utilize Facebook and government in a collaborating and high performance manner. Work will be initiated, prepared, started, placed under control, and sustained.

**Boeing 737 Max8**

The Boeing 737 was redesigned with a new engine and mounting to match the recent Airbus A320 competitive entry. The new engine mounting altered the center of gravity causing the plane’s nose to pull upward and stall the engine. The Maneuvering Characteristics Augmentation System (MCAS) was intended to compensate for the lack of re-engineering.

Stakeholders include the divergent interests of the flying public and buying airlines. The public demands safety, and

the airlines demand competitive operating cost advantage. Both Boeing and the Federal Aviation Administration (FAA) tilted in favor of the airlines’ interests. Opportunity includes the flying public, which would like to take off and land without crashing under all circumstances. This was subordinate to the Boeing need to be competitive against Airbus. The Boeing 737 has a 50-year history; Airbus has a 20-year history. Consequently, Airbus A 320 was inherently better positioned to adopt changes and modernize. Requirements include managing the Angle of Attack (AOA) behavior and providing a stall escape maneuver. The software system includes MCAS designed to manage AOA behavior. The way of working demands maintaining proper separation of oversight between Boeing and FAA. Oversight was diluted by extreme collaboration. In effect, Boeing and the FAA colluded to corrupt the oversight responsibility, rendering it illegitimate. Team shortfall includes extreme Boeing and FAA collaboration, impacting FAA’s oversight responsibility. The FAA lacks the engineering capability to perform adequate oversight. Boeing engineers are retiring in greater numbers and next-generation engineers are not up to the task. Work involved a software “patch” process rather than the redesign needed.

Some questions demand answers. Just when did Boeing offer the safety options that neither of the two crashed airlines chose to purchase? Clearly Boeing suspected it had a problem when it offered the safety options. Did Boeing offer the additional safety options expecting that some airlines would decline, thereby, shifting the responsibility for any incidents to the airlines themselves?

**Navstar Global Positioning System (GPS)**

The Navstar GPS is a satellite-based radio navigation system that provides navigation data to GPS-equipped users with which they can determine their three-dimensional position, velocity, and time.

Stakeholders include military operators, weapon systems users, commercial transportation users, and public transportation users. The opportunity is intended to deliver accurate and precise navigation data that enable users in land, air, and sea to determine three-dimensional position, velocity, and time. The requirements are to coordinate the Operational Control Station composed of Master Control

Station, space segment of operational and spare satellites, Ground Antennas, and Monitor Stations. The software system spans the use of State Machines, Modules, and Programs to express Computer Program Configuration Items for Executive, Control and Display, Ephemeris, Clock, Space Vehicle Command Status, Network Control, Performance Analysis, Math Library, Space Vehicle Positioning, Mission Scheduler, Scenario Generator, and System Log. The way of working spans a concept of operations, requirements specifications, incremental design, development, and testing. The team supports land-based operations, program management, systems engineering, software engineering, and test operations. Work is tracked using monthly earned value metrics.

### Coronavirus

As an example, the Coronavirus epidemic is a common problem to address jointly, one that is outside the domain and range of software and systems-engineering experience. An attempt to apply Essence and its seven alphas to the Coronavirus challenge resulted in the following:

Stakeholders include the world's people, governments, and medical communities. The opportunity value proposition is to anticipate, avoid, mitigate, and recover from the effects

of the Coronavirus under all circumstances of use, including the necessary sharing and sacrifice among various populations. Requirements include understanding the sources of the virus, modes of transmission, speed of transmission, incubation period, death rate among various populations and specific demographic groups, and effectiveness of inoculation and quarantine protocols. Domain Specific Architecture spans research vaccination, detection, and quarantine protocols. Way of working includes vaccination and quarantine protocols. Team involves general population sacrifice in accepting vaccination and quarantine, government sharing of resources, and medical community sharing of knowledge. Work includes measuring the extent of effective vaccination, vaccination rate among various populations and demographics, and the state of quarantine protocols among various populations.

**Note:** *The maturity of a Domain Specific Architecture is determined by the breadth and depth of recorded experience on the models, methods, and paradigms used in the application domain. Breadth includes the pieces and their relationships. Depth measures the maturity of each element of functionality on a continuum including industrial standardization, integrating context, stand-alone capability, and piecemeal services.*

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