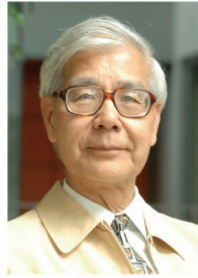


Innovation

Man-Chung TANG
Chairman of the Board
T.Y. Lin International
San Francisco, USA
Mtang@tylin.com



B.Sc. 1959, Chu Hai College, Hong Kong,
Dipl.-Ing. (1963) & Dr.-Ing. (1965),
Techn. University Darmstadt, Germany.
Structural engineer, major in bridges.

Summary

Innovation can be defined simply as “invention, improvement or incorporation” but must also offer “increase in value.” These make up four of the “I’s” in Innovation. If the invention, improvement, or incorporation does not offer an increase in value, it is only an alternative, and not an innovation. Innovation can be achieved through a process of asking oneself “*Why, why not, and what if?*”

Keywords: Innovation, improvement, incorporation, San Francisco-Oakland Bay Bridge, bridge innovation.

1. Definition

A few hundred thousand years ago, human beings lived just like animals, roaming the planet to survive. Today, there is a great distinction between how we live and how other animals live. The difference is that human beings have achieved an advanced state of intellectual and cultural development, e.g., we’ve become civilized. Consequently, we have dominated the world!

There is also a huge difference between people’s lifestyles 5,000 years ago and our lifestyles today. The difference is 5,000 years of civilization.

Human beings have the wisdom and courage to innovate; along the way, we have found ways of improving our civilization. So, civilization can be defined as a sort of accumulation of bits and pieces of innovations over the span of human evolution. Without civilization, we would still be living like animals. Without innovation, we would not even have a civilization!

What is innovation? *Merriam-Webster’s Dictionary* defines *innovation* as “to introduce something new, to effect change in the established order.” In my opinion, this definition is not complete. An innovation is a change, but, it must bring with it added value. If it does not bring any added value, it is only an alternative, not an innovation. Therefore, a discussion about innovation must start with value.

2. Value of bridges

The four basic requirements of a bridge are “safety, functionality, economy, and aesthetics.” Each of these has its own individual value, that is, the value of safety, the value of functionality, the value of economy and the value of aesthetics. An idea can only be qualified as an innovation if it increases the total sum of these values. It is the sum that is important because, in many cases, we may have trade-offs between these values. For example, we may enhance the beauty of a bridge, but at the same time spend more money to do so, thus increasing the value of aesthetics and decreasing the value of economy. We may also enhance the functionality of a bridge and, at the same time, increase the cost or affect the aesthetics.

The safety of a bridge can never be compromised. A bridge must be safe under all design conditions. Some people believe that a bridge can only be either safe or unsafe, so its value in terms of safety cannot be changed. It is true that making an already safe bridge twice as safe typically does not carry much meaning. However, in reality, safety is not an absolute term, but rather a relative one. Our design is based on reliabilities and probabilities. For example, the current AASHTO standard specifications recommend that a bridge be designed for an ultimate seismic event with an estimated return period of 2,500 years, which corresponds to a probability of an