# Chapter 1
# Megatrends in Engineering and Technology Education:
## A Call for the Communicative Imagination

**Arun Patil**
*CQUniversity, Australia*

**Henk Eijkman**
*University of New South Wales, Australia*

## ABSTRACT

*Engineers and technologists increasingly have to confront socio-scientific issues and evolving communication technologies. Digital communication technologies, such as social media, are important drivers for growth and for changes in learning and in professions as well as and doing business. In the 21st century, to be a scientifically literate engineer and technologist means also to possess the communicative imagination. Thus, moving toward a future with more fully integrated social media into the world of knowledge and communication practices will be a challenging process of resolving tensions and dilemmas. This chapter presents an overview of current megatrends in communicative imagination and advanced approaches of various communication technologies in engineering and technology education. The chapter also reflects on the transformative nature of social media.*

## INTRODUCTION

In many ways, the present historical epoch probably poses the most challenging environment in which to practice and teach engineering and technology. An increasingly broad community of engineering and technology practitioners and educators confront an almost bewildering array of complex interacting pressures; globalization, ecological, social, and economic sustainability in emerging and highly complex environments and more specifically in terms of communication, the participatory world of social media and mobile technologies. Each of these has its own impera-

DOI: 10.4018/978-1-4666-0243-4 .ch001

tives but when these interact with each other they produce what Laszlo (2001) terms a 'macroshift'; a confluence of pressures for a decisive and fundamental transformation. Be it in the design of buildings or software, engineering communities find themselves increasingly at the cutting edge of these pressures. Hard systems knowledge of physics, mathematics, materials, etc. that underpins the engineering and technology disciplines are, while necessary, no longer sufficient. Engineers and technologists increasingly have to confront socio-scientific issues and evolving communication technologies. Concerns around sustainability and the recognition that engineering and technology projects may involve political and social implications are increasingly taking centre stage. In addition digital communication technologies such as social media are important drivers for growth and for changes in learning and doing business. In the 21st century, to be a scientifically literate engineer and technologist means also to possess the communicative imagination.

The theme that underpins this book is that the communicative competence of the profession is a core element of this post-modern macroshift as engineers, researchers and academics are called upon to be – or to educate newcomers to be - socially responsive, cosmopolitan practitioners adept at multi-modal communication with globally, culturally, and socially diverse stakeholders.

## THE COMMUNICATIVE IMAGINATION

For us, the defining features of the communicative imagination point to the ability to grasp two pivotal notions. First, that all engineering or technology hard skills while necessary are actually insufficient for professional practice. Second, and consequently, that the available array of expanding forms of multi-modal communication constitutes a critical set of soft skills pivotal to cosmopolitan and socially responsible professional practitioners in the 21st century. In essence, having the communicative imagination is to appreciate communication no longer as a 'soft option' soft skill set for exclusive use within engineering and technology project teams but as a key component of cosmopolitan and socially as well as ecologically and economically responsive engineering and technology education and practice.

A Chapter, *Conceptual Mapping, Visualisation and Systems Thinking in Engineering*, by Russell illustrates how systems thinking and mapping allows 'soft' interpersonal and social aspects of an engineering project to be represented and discussed alongside 'hard' technological activities. Any map or model of a complex and dynamic socio-technical system requires simplifying assumptions. Complex adaptive systems theory provides a conceptual framework for identifying the limitations from different types of simplification. This chapter has outlines examples from educational technology and from mining engineering to display how various types of conceptual map can help in clarifying, negotiating and combining different perspectives on technologies in a complex human context – to overcome barriers of specialist language and tacit assumptions.

Coll and Zegwaard in their Chapter contribution, *Enculturation into Engineering Professional Practice: Using Legitimate Peripheral Participation to Develop Communication Skills in Engineering Students*, argue that communication is seen as a key competency for new graduates and professional engineers furthermore becoming a professional engineer involves learning the mores of the profession and can be seen as a process of gradual enculturation into a community of practice. They further claim that the work integrated learning programs that involve students working alongside professional in a form of legitimate peripheral participation, aid enculturation into the professional community. Such programs are a normal part of the higher education landscape for professional training in engineering, and enculturation may be aided by the use of metacognitive strategies such as reflective practice.