A whole-earth approach to the future of applied geophysics

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Summary

The profession of applied geophysics is evolving rapidly. This is brought about by various internal and external phenomena that may positively or negatively impact the ways in which applied geophysicists currently work. This paper suggests a holistic "whole-earth" approach to preparing our workforce for the future, and expands on three key areas - people, practice and philosophy - in which the SEG and applied geophysical practitioners are encouraged to expend planning and effort.

Introduction

The science of applied geophysics and its innovations have increased greatly over the past few decades. Change has already and always been our constant. However, a confluence of various and often-conflicting drivers – including volatile market conditions, increasing energy demand, "demographic changes, globalization, developments in science and technology, [shifting] priorities in national and international governance, environmental damage, and changes in [social] perceptions, beliefs, values and attitudes" – has accelerated our profession's need to respond efficiently and on many fronts.

Three high-impact responses to the new energy reality - specifically in the areas of people, practice and philosophy - are built on in this talk, with concrete examples and recommendations.

Methodology

People are key to progress and always have to come first. New demographic trends indicate that the workforce is changing. Those entering geophysics are more likely to hail from non-western countries and "over the next couple of decades, the SEG membership is on trend to become about 40% female." Furthermore, applied geophysics has a huge role to play in civil and structural engineering, infrastructure design, hydrology, environmental protection, and disaster prevention and recovery. As earth problems grow and become all-encompassing, applied geophysics will attract practitioners from other disciplines. The empowerment and inclusion of all of these parties is paramount to the success of any field, but especially applied geophysics and the SEG. This talk explores implementation schemes for empowerment and inclusion towards the goals of continued relevance and innovation.

How emerging and existing geophysicists do their science is the second key, one which will require reaching outside long-established comfort zones to innovate and excel. The modern geophysical practitioner needs new skills, and these include competencies in programming, data mining and analytics, computation, engineering, business, collaborative problem-solving, communication and leadership (innovation) over and above a strong grounding in geology and geophysics (excellence). Recommendations here include analytical toolkits and soft skills training to create and drive change.

Lastly, not only is a shift required in workforce and skill sets, but also in how we think about people, practices and problems. Imposed change may force the profession of applied geophysics to innovate out of sheer survival instinct, but it is more critical for us to drive the revolution with long-range thinking before we are left behind. This involves an acknowledgment of earth systems interdependencies and deep introspection and open discussions on topics all the way from continued global energy supply to its impact on our living environments. Futures thinking exercises, and methods to bring a significant number of geophysicists and non-geophysicists together to converse and problem-solve, are discussed here.

Conclusions

The purpose of this talk is to identify and explore ways in which the applied geophysics profession and the SEG can respond to irreversible changes in workforce and membership demographics, rapid changes in energy and environmental needs, and the modernization and globalization of thought and earth problems. Additionally, through the internalization of these whole-earth learnings, our profession and Society may anticipate and drive change in the future. The topics outlined here were chosen for highest impact and meaning, as well as importance and ease of implementation. Are applied geophysics and the SEG on the right track for this transformation?