Brazil and the Emerging Future of Software Engineering

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TECHNOLOGY IS TRANSFORMING our world at an accelerating pace. Massive changes are taking place in how we learn, socialize, bank, grow food, drive, generate energy, interact with government, and even wage war. Digital has come of age. We’re now a technology economy in which software is the business and disruptions come from unlikely sources. These fast-paced changes bring new value and agility to our society but more uncertainty and complexity.

Technology evolution is driven by recombination. Recombination of cloud computing, data analytics, security, new hardware devices, interactive interfaces, the quantification of the self, and AI technologies will continue, creating unprecedented applications and scientific disciplines. This revolution leads to fundamental questions that, in Peter Drucker’s words, “are not technical but human.”

As society shapes technology and vice versa, what future does society want to create through technology? What are the constraints? What are the roles of the technologist and other players? Transparency, emergence, and sustainable development are certainly part of the answer.

FROM THE GUEST EDITORS

Although this issue focuses on software engineering’s future through an academic lens, it’s equally interesting to get industry perspectives because software engineering is tightly related to practice. Given software development’s increasingly global nature, we felt that getting global perspectives of software engineering’s future was important. Along this line, we invited Claudia Melo, Ronaldo Ferraz, and Rebecca Parsons from ThoughtWorks to share their views of software engineering’s future from a Brazilian perspective.

Why Brazil? Brazil’s IT industry is large. A.T. Kearney, a consulting company, estimates that the sector employs 1.7 million people, including programmers, systems analysts, and managers. It has been growing by 6.5 percent on average annually since 2005. Of Brazil’s annual 420,000 university graduates, 25,000 are technology graduates. The industry’s export component is only a small part of the overall national industry. Brazil’s IT BPO (business process outsourcing) export market turned over US$ 2.2 billion in 2008. Although Brazilian IT still represents a fairly small slice of the global IT trade, A.T. Kearney positions Brazil favorably in its annual rankings of outsourcing destinations and IT. —Guest Editors

Reference
than people proceeding cautiously in ignorance. Technology has a significant role to play in enabling transparency for governments and their citizens as well as for organizations and their stakeholders.

**Emergence over Predictability**

Simplistic models no longer serve us in understanding the world. Operating forces are complex and interrelated and easily disturbed through unforeseen actions of multiple players. Technology harnesses the energy of those complex interactions and processes that define and sustain our world to create more technology. The whole ecosystem, including technologists, needs to develop and learn nimble approaches to deal with such complexity.

One example involves the volume and accessibility of data. Technology has lowered the entry barrier for providing data, and sources abound to the point of overwhelming people and organizations. However, data without context, reasoning, and justification is simply data. So, assessing the progress of our plans, the needs of the ecosystem, the potential of new ideas, and the impact of interactions at large requires us to understand the confidence level of that data and the conclusions derived from it.

**Sustainable Development in Countries Such as Brazil**

Such development, however, doesn’t necessarily balance all three dimensions of sustainable development—economic, social, and environmental. Developing countries have different social and economic priorities and needs, such as better income distribution, higher living standards, employment, education, and health. Technology is an integral part of the solution but also a threat. The Edward Snowden revelations are recent examples of how technology can be used to concentrate economic power and create global monopolies.

Brazil has forces that provide tremendous opportunities for sustainable development and technological innovation. It’s a world leader in agriculture; plant and animal diversity; and ecology, biology, and biochemistry. Global influencers such as Ricardo Semler and Paulo Freire and their revolutionary work on organizational design and education still inspire researchers and organizations.

However, we still see more adaptation and imitation than innovation. We believe the public sector has a fundamental role in the next several years to create policies and decision-making approaches around technology to address these pressing issues.

Marco Civil (the Brazilian civil rights framework for the Internet) is a great example of how governments can play a key role in addressing problems that lie not in law and policy but in technology. It aims to protect human rights, including ensuring freedom of speech and expression, protecting privacy and personal data, ensuring equitable access to information, and promoting an open, competitive online marketplace, partly by guaranteeing net neutrality.

**The Technologist’s Role**

Technology will continue to accelerate, changing how our societies are organized and how our lives intersect with the planet’s health. Melvin Kranzberg said, “Technology is neither good nor bad; nor is it neutral.” Its impacts can’t be predicted.
Practitioners can no longer afford to stand on the side of technology as just software creation. Advances in language workbenches, multi-location databases and file systems, and adaptive syntaxes let us tackle the growing complexity of building the planetary-scale systems required now. However, they’re insufficient to connect practitioners to the human-driven, experiential, and interrelated business nature of modern software.

Practitioners must become mediators of the process of creating a humane experience and expand their practice to draw from disciplines such as experience design, systems thinking, economics, and digital strategy. They must do what they can to mitigate the negative consequences of technology while continuing to exploit and amplify its positive impacts.

References