Synthesis Lectures on
Engineers, Technology, & Society

SYNTHESIS
COLLECTION OF TECHNOLOGY

Ann-Perry Witmer · Jess Mingee ·
Bernhard D. Scully *Editors*

Consilience

Learning About Ourselves by Applying Indigenous Traditions to Western Music and Technology

Springer

Synthesis Lectures on Engineers, Technology, & Society

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The mission of this Lecture series is to foster an understanding for engineers and scientists on the inclusive nature of their profession. The creation and proliferation of technologies needs to be inclusive as it has effects on all of humankind, regardless of national boundaries, socio-economic status, gender, race and ethnicity, or creed. The Lectures will combine expertise in sociology, political economics, philosophy of science, history, engineering, engineering education, participatory research, development studies, sustainability, psychotherapy, policy studies, and epistemology. The Lectures will be relevant to all engineers practicing in all parts of the world.

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ISSN 1933-3633 ISSN 1933-3641 (electronic)
Synthesis Lectures on Engineers, Technology, & Society
ISBN 978-3-031-58398-8 ISBN 978-3-031-58399-5 (eBook)
https://doi.org/10.1007/978-3-031-58399-5

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Foreword

When Ann Witmer first described the Consilience Project to me, I was very intrigued. The project, bringing together music and technology, resonates strongly with my own upbringing, raised by a professional musician and music professor mother, and a professional engineer father who himself was an amateur musician. As I finished high school, I considered the fork in the road between music and technology, choosing the latter with the study of engineering, although music has been an enduring and significant component in my life. I have been a Professor of Chemical Engineering at Queen's University for 34 years, with a cross-appointment to the Dan School of Drama and Music in recognition of my work in innovation, entrepreneurship, and creativity. I am a semi-professional musician, playing flute regularly with the Kingston Symphony Orchestra, as well as jazz in a local quartet, and I also play in an amateur adult flute choir that spans a broad range of both ages and proficiencies. This range of musical pursuits mirrors the range of discussion provided by Bernhard, Jess, Christian, Ariel, Kene, and Alexandra, and is linked to the philosophical questions: What is music for? In what contexts is participation allowed or encouraged? Who decides? How do regional musical art forms evolve? Who contributes? How does this evolution take place across vast geographical ranges, as is the case with jazz and classical music?

These questions, which we might realize more readily with music, come to mind equally with the practice of engineering, and the design and deployment of technology. To what extent does this depend on the context of problems to be solved, and designs to be implemented?

These questions lie at the heart of Contextual Engineering and underscore the importance of The Consilience Project and this book.

Being a musician provides a helpful perspective and appreciation of creativity and expression, within a wide range of musical forms and conventions. Play pick-up jazz at the annual Canadian Chemical Engineering Conference, where participants come from across Canada, and you immediately see that there is a shared understanding of form across vast geographies, from Circle of Fifths progression and 8-bar AABA jazz form or 12-bar blues, to the unspoken etiquette of improvising—"get in, do your improvisation, get out and let someone else improvise." One might ask whether there is, or should be,

a similar mechanism for this participatory co-creation within engineering. And thus, the process of consilience continues. How are pressing problems or needs in a community identified? Do the engineers involved, often coming from outside the community, take the time to understand the context? Is the identification of impactful problems to solve participatory and engaging? Is the place-based knowledge used to guide the problem and the evolution of a solution? Are placed-based knowledge-holders engaged in a meaningful way?

I have always been intrigued with the parallels between engineering and music as creative pursuits within pre-defined frames and associated cultural norms. As such, I was quite struck by the reflections of the classical musicians contributing to this book, and the rather stark perception of "social distance" between the classical music form, with all its richness, and the extent to which it's fully linked to the communities in which it is performed. This is an existential question, particularly given the statistics shared by Bernhard about the proportion of US adults listening to classical music. This concern is front of mind for many, if not all, symphony orchestras in Canada and throughout North America, and it is spurring innovative programming and performance mediums, often involving dispensing with some of the associated rigid etiquette.

The Dunin-Deshpande Queen's Innovation Center, which I helped found more than ten years ago, champions and works to build "changemaker" capacity—in social innovation and entrepreneurship—seeking to catalyze the rate at which people unlock and realize their potential to make a positive impact in the world. Our work is focused both in our region and globally. Much of the work is grounded in thinking in systems—Systems Thinking—with components and interconnections that bring together people and technology, with synergy or emergent behavior from the interaction of people and things. Human-centered approaches—contextual approaches—popularly characterized in the front phases of the Design Thinking framework—have been a core part of our approach as well, emphasizing identifying impactful problems, and the importance of engagement and understanding why people do what they do, before launching into further problem definition and solution. Design Thinking as Systems View—the recognition that ultimately, it is the interaction of people with agency, and the physical world around them, in which solutions are realized, hopefully with positive societal benefit, while mitigating negative impacts. When presented with a new management technique, one is often skeptical, asking, "Is this the latest management fad?" And certainly, there is a significant amount of hype around the Design Thinking approach. However, regardless of what one calls the approach, the essential and enduring element is the front end "contextual" approach—ethnography, observation, engagement, and insight, leading to empathy and shared understanding.

At the same time, there is growing interest in Systems Leadership, or human-centered leadership, bringing together the contextual approach with explicit strategies for building community engagement, and disciplined implementation. This is an emerging field [Kennedy School, 2018], bringing together existing methodologies.

Central to these approaches is the importance of context, emphasizing the importance of the consilience in this book.

In his reflective essay from 2010, Leo Marx reminds us of the etymology of the word "technology" from the 17th century, combining the Greek root "techne" (art or craft) with the suffix "ology" (branch of learning) (Marx, 2010). He notes that at that time, "technology" was a branch of learning concerned with the "mechanic arts." In the 1930s, "technology" became used widely to refer to an object rather than a knowledge. The emergence and evolution of computer-based technologies have further strengthened the popular use of the term as a reference to an object, often abbreviated as "tech."

The study of the mechanical arts could be more readily imagined in regional contextual ways, linking strongly to place-based knowledge and know-how. But surely this provides the context both for engineering solutions and for musical performance, the latter being shaped significantly by the nature and evolution of instruments influenced strongly by place.

The success of an engineered solution will depend on the emergent behavior that arises from the interaction of people and technology. But in popular idioms, "technology" is increasingly seen as an entity in and of itself, i.e., an object. As Marx (2010) has noted, we must be careful not to ascribe to "technology"—as an object—agency, which is ultimately a human quality. One of the lessons to be learned from Contextual Engineering is the importance of context approached with humility, acknowledging the need to work with and advance the important role of agency in the community, in individuals, and collectively, representing the context into which engineering solutions are introduced.

Part of the value of the journeys shared in this book lies in reminding ourselves to check and reflect on our own contexts. This stands out in the reflections of Bernhard, Christian, and Jess about the perceived structural constraints inherent in classical music. One might ask, who are the guardians of the genre? In what ways does classical music become part of communities, and participatory? Why has such a highly structured art form emerged?

This book provides examples having sharp contrasts between music form and community participation—amongst the Aymara people, the Mende, jazz, and the classical performances, both observed by the contributors, and in their personal reflections.

The importance of Consilience: Learning About Ourselves by Applying Indigenous Traditions to Western Music and Technology lies both in establishing in permanent form the consilience between music and engineering, and in the sharing from a diverse group of musicians and engineers of reflections on the road to establishing this consilience.

Ultimately, what leaps to mind from the journeys shared in this book is the inherent creativity in communities, whether in music or technical solutions, understood and nurtured with humility and acceptance, as an invariant and essential force, and an integral part of the human spirit. The perception of and empathy for context are surely elements that will continue to distinguish a human-centered understanding and appreciation of the world around us, in a sea of artificial intelligence and machine learning.

In closing, this book is a collection of journeys that I very much believe you will find engaging and thought-provoking, challenging your own preconceptions, suggesting new ways in which to make a positive impact in your personal and professional lives, through music and technology, and in other pursuits.

A pair of wings, a different respiratory system,
which enabled us to travel through space,
would in no way help us,
for if we visited Mars or Venus
while keeping the same senses,
they would clothe everything we could see in the same aspect
as the things of the Earth.
The only true voyage, the only bath in the Fountain of Youth,
would be not to visit strange lands but to possess other eyes,
to see the universe through the eyes of another, of a hundred others,
to see the hundred universes that each of them sees, that each of them is;
and this we do, with great artists;
with artists like these we do really fly from star to star."

Marcel Proust

La Prisonnière

P. James McLellan
Queen's University
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