

Future of Expertise

*Jim Spohrer, Terri Griffith, with input from the ISSIP Leadership team and the ISSIP community
Based on June 29, 2022 event <https://issip.org/future-of-expertise-jun-29th/>
Final Version 1 (as of July 8, 2022)*

*The International Society of Service Innovation Professional is a non-profit (ISSIP.org).
Service innovations improve win-win interaction and change in business and society.
Service is the application of resources (e.g., knowledge) for the benefit of another.
Responsible actors give and get service to grow and share knowledge/expertise.
Draft Report started April 28, 2022*

In this whitepaper, 112 position statements and views on the future of expertise are distilled to 10 predictions that are rank-ordered. Civilization depends on the growth and sharing of expertise. Expertise can be described as legitimized competence. Expertise is most often shared in the form of service, the application of resources (e.g., knowledge) for the benefit of another.

Ten Predictions, by 2032...

By 2032, expertise can be best described as [% agreed, based on event survey]:

1. Lifelong learning to constantly grow the breadth and depth of skills and other capabilities (T-shaped metaphor and beyond) [75% agreed]
2. People collaborating with AI (Artificial Intelligence) machines as the new normal [69% agreed]
3. Learning-unlearning-adapting to accelerating change [59% agreed]
4. Data-driven science-based development of expertise for individuals, cities, countries [50% agreed]
5. Not exactly like the past, and while impossible to predict with any precision, surely some blend of the traditional college graduate education expertise, entrepreneurial and technology-maker expertise, business, government, sports, art, media, political influencer expertise, and perhaps a few new types of expertise emerging, such as AI, as well [50% agreed]
6. Responsible actors and their AI/digital twins collaborating in trusted networks, all learning to invest systematically in becoming better future versions of themselves [45% agreed]
7. Social-emotional intelligence will increasingly be the key to success, which may include a mature corporate citizenship skill set [44% agreed]
8. Collective or swarm intelligence [40% agreed]
9. It's over; dead; simply at the mercy of vested interests, unless we find a new way to re-establish trust in true expertise (versus everyone's opinion is weighted by how much money, power, influence they have over others) [25% agreed]
10. A race to keep up with the latest in-demand "hot" skill sets [16% agreed]

The topic of “expertise” is highly relevant to ISSIP members. “Expertise” can be more fully defined as the legitimized competence or ability to achieve successful outcomes, consistently and repeated, through the application of knowledge that others validate and that others can potentially learn to apply and benefit from as well. ISSIP encourages and recognizes the development of service innovation types of expertise. These days, service innovations are often seen as people-centered and data-intensive innovations that improve business, the economy, and society. In general, service innovations improve win-win interaction and change in business and society. “Service” is defined as the application of resources (e.g., knowledge) for the benefit of another. Examples of service innovations are extremely diverse, and include new technologies (e.g., smartphone for interactions between people and organizations with offerings/apps), new business models (e.g., freemium access with either advertising or subscription upgrades), literacy (e.g., for change in capabilities and opportunities of people), democracy (e.g., for interaction and change processes in self-governance by people).

Event Summary - Eight Panelists

The recording of the event can be found on ISSIP YouTube channel. After the opening welcome, by ISSIP Executive Director Michele Carroll and ISSIP President 2022 Terri Griffith, Jim Spohrer of ISSIP acted as Moderator for the eight panelists:

Panelist 1 - Utpal Mangla (IBM): The future of expertise continues to evolve industry-by-industry across business and society driven in large part by accelerating technological change of platforms in an ecosystem model, and increasing industry-academic collaboration investment must be made.

Panelist 2 - Heather Yurko (Mastercard): The future of expertise is emergent (nine tensions explained), and new tools in industry are empowering employees to upskill into new roles and adapt to rapidly changing business needs, where diversification of talent is also a priority.

Panelist 3 - Cindy Huber (APQC): The future of expertise can be summarized as a strategic advantage for organizations that arises from talent, informed by knowledge management (KM) practices, and increasing maturity of KM practices in organizations that are the basis of industry benchmarks.

Panelist 4: Alexandra Medina-Borja (NSF): The NSF has been funding programs that both increase understanding of future of expertise at the human-machine frontier (e.g., working with robots, etc.) as well as addressing the needs of underserved populations.

Panelist 5: Haluk Demirkan (Amazon): The industry-academic skills gap is getting alarmingly wider, AI will change things little-by-little as capabilities increase, and the need for T-shaped adaptive innovators with good analytic reasoning abilities continues to be a high demand expertise for fast-paced organizations.

Panelist 6: Yassi Moghaddam (UCSC-SV): What we have learned from a series of NSF-funded projects exploring what industry skills needs of the future are, including a diagram summarizing a vast number of areas from specialized skills, to foundational skills, to mindset, to societal issues include diversity, equity, and inclusion.

Panelist 7: Terri Griffith (Simon Frasier University, Canada): The 5Ts (Talent, Technology, Technique, Target, Times) provides a lens for looking at the rapidly evolving nature of expertise in organizations, and focus on workers, not just employees, as an organization's workers are not always employees.

Panelist 8: Rodrigo Ribeiro (Federal University of Minas Gerais, Brazil): Based on studies of expertise in organizations, a framework for tacit knowledge management has been developed and continues to be refined.

Additional details about the discussion can be cleaned from the zoom chat log, which is Appendix 1 below.

Further Questions

In compiling the predictions above, and the position statement below, questions emerged. These questions are summarized below for further reflection and discussion at the ISSIP Discovery Summit on June 29th 2022. The event recording is posted to the ISSIP YouTube and the presentations are posted to ISSIP slideshare. Interested readers can watch a recording, and consult the zoom chat for the event, which is Appendix 1 below.

Individuals Acquiring Expertise: How can an individual best acquire a particular type of expertise, and are these methods likely to change in the coming decade? When is a university education best and when are alternative pathways best?

Competing for Expertise: How can companies best attract and retain expertise? What is the role of worker engagement and how can it best be nurtured by managers and senior leaders?

Defining Expertise: How is the concept of expertise defined, similar, and different for diverse types of responsible actors (e.g., individual people, businesses, universities, nations, families)?

Experts on Expertise: Who are the experts on the future of expertise? Who are the influencers? The experts on expertise increasingly see expertise as only in part embodied in individuals, and the reality is expertise as a collective phenomena across space, time, and contexts. See below about the knowledge to make a pencil.

Expertise, Specialization, and the Quantity of Knowledge: How will the rise of AI systems (that can embed collective societal knowledge) impact the nature of specialization in business and

society? In hunter gatherers days, a single individual could hold nearly all the knowledge used to survive in the world. Today, even the knowledge to make a pencil is well beyond the capability of nearly everyone on the planet. The knowledge to make a quality pencil is distributed in many specialized people and organizations who have unique access to resources needed. However, it is conceivable that a single AI system could hold the knowledge to make a pencil, and much more. Access to required “pencil” inputs could still be a challenge for a localized AI system.

Expertise Drawbacks: What are the drawbacks – or negative consequences - to having expertise? Is there a “knowledge burden” phenomena for people, businesses, universities, and countries? Do the same drawbacks apply for AI systems? Are their unique drawbacks for AI systems? How does overcoming expertise drawbacks relate to the concept of “unlearning?”

What is expertise? Take a simple task as an example to start understanding expertise. Consider an expert at the simple task of “holding one's breath.” Now think about the high performance routinely achieved, deliberate practice that got them there, and their ability to teach others that some people have. Performance norms considered: Best recorded in the world is 24 minutes, experts divers, surfers, etc. routinely achieve 3 minutes, the average person can do 30 seconds with effort on a first try, and with a day of deliberate practice (knowledge) can achieve about 2 minutes. The expert probably knows the technical word “apnea” for “holding one’s breath” as well. Deliberate practice probably including knowledge of CO2 tables, and how to build up that tolerance. Experts also know how to achieve a mental state that allows them to deal with certain types of reflexive pain or even panic. Finally, a true expert can share stories about their performance, deliberate practice, and perhaps even others they have helped train to achieve higher performance.

What about expertise for unpredictable tasks? In a world that is complex and dynamics, many tasks that an entity/actor faces are unique. For example, an astronaut, military, or emergence response - may prepare for a one time situation. Deliberate practice might help with them prepare for the category of the task, but not the specific task in context. Does a world of accelerating change, require a different type of expertise that is learning to learn in many task categories contexts? How might AI teaming/digital twins help or harm in such situations?

The future of skills, expertise, work, and outstanding service are all highly connected. Individual human expertise for a skill is developed through deliberate practice to ensure repeated high performance on tasks that are part of occupations or other productive roles in business and society that give and get service.

Position Statements and Views - A Baseline of Source Materials

Paraphrased statements and/or quotes are listed below, alphabetically by last name of person(s) or name of organization:

Accenture (2019) 7 valuable skills every entry-level applicant needs

"Seven in-demand entry-level skills and traits:

Language skills. In addition to English, fluency in one of the following languages will be beneficial: German, French, Dutch, Russian and Arabic. ...

Software and internet skills. ...

Growth mindset. ...

Innovation skills. ...

Positive attitude. ...

Teamwork. ...

Decision-making ability."

Accenture (2021) Future Skills Pilot Report: Thinking outside the box to reimagine talent mobility. Produced in collaboration with Unilever, Walmart, World Economic Forum, SkyHive and Accenture.

"The need to continually refresh skills and stay relevant for the future of work is top of mind for everyone from Fortune 500 CEOs to store clerks. This isn't simply because of rapid technology innovations and automation. The entire concept of work is evolving quickly. And the upheaval brought on by the COVID-19 pandemic further crystalized an urgent and complex global employment challenge: how to prepare people for the future of work in ways that serve individuals, businesses and communities. Solving this challenge requires an in-depth look into what it takes to upskill at scale both within and between industries, in order to maintain business resilience as well as people's livelihoods."

Adegbuyi (Newsletter Writer) in Murrow et al (2021) - Expertise is earned, not bestowed

"The command and deep understanding of a subject has been decoupled from credentialism. Experts can be born and brought up on the internet, bypassing post-secondary institutions and other centralized forms of education and knowledge dissemination."; "Formal institutional mechanisms for building and creating expertise can be complementary. But the internet has become an institution of its own that's reshaping who can become an expert, how they share their expertise, and the ways they can earn a living from it."; "And as experts increasingly use the same online channels as content creators, they can be compensated the same way: through an audience. Experts can now go direct using subscription platforms like Substack or Patreon to make a living, bypassing (or combining) traditional mechanisms for being paid for expertise, such as institutional salaries, grants, book deals, and media appearances. Knowledge-holders thus become "public experts" instead of "institutional experts," trading a higher level of visibility for a greater degree of scrutiny."

Alcoff (2021) Expertise, Value Judgments and Identity

"Our understanding of expertise is foreshortened if we assume that it is something any smart person can achieve equally about any conceivable topic. Rationality is not simply the execution of a function — it involves content, and it is this content that helps to inform judgments. Let's begin to recognize our diverse experiences as aspects of the expertise we bring."

Allison C (2009) The bar on skills and expertise is always rising, higher and higher.

*"Once upon a time knowing how to put together a beautiful presentation, use and create spreadsheets, stay connected to your inbox, and design basic web sites and applications were all considered specialized skills, but they were never a requirement for most employees. Now, most people in the interactive industry are expected to have most of these skills. And it won't be long before this is expected of people working in all industries. **The future standard of expertise will be five times, no, fifty times higher than what it is. That is the nature of progress.**"*

Anderson, Mark (ISSIP Survey) - communicating the boundaries of expertise will become increasingly important and doable.

"In the future, Experts will only be valued if they become more expert at communicating the domain boundaries of their expertise."

Banavar (2016) Future expertise as human-machine collaboration

"How will humans and machines collaborate? Guru Banavar leads IBM's worldwide research team responsible for creating the next generation of cognitive systems known as Watson. He and his team build a range of cognitive systems that perform a variety of tasks based on massive heterogeneous data – from answering questions conversationally, to extracting knowledge and discovering insights, to evaluating options for difficult decisions. These cognitive systems are designed to create new partnerships between people and machines to augment and scale human expertise in every industry, from healthcare to financial services to education."

Bohle Caronell and van Merrienboer (2019) Adaptive Expertise

"Abstract and Keywords - The increasing number of changes at the workplace created through automation, political upheavals, and new technology frequently exposes individuals to unfamiliar situations. Mastering these situations requires individuals to possess adaptive expertise. By being an adaptive expert, individuals are able to deal with novel situations and remain performing at their original level. By drawing on recent literature, the goal of this chapter is to describe what adaptive expertise is. We contrast it with routine expertise to clarify

when adaptive expertise produces superior performance to routine expertise. Subsequently we compare adaptive expertise to other expertise concepts. Following this, we describe how adaptive expertise can be developed and measured. The chapter ends with a number of recommendations of how individuals can be stimulated to develop adaptive expertise. Keywords: adaptive expertise, unfamiliar tasks, training, 4C/ID, variation of practice, risk, survey, objective measures, mental model, simulation."

Bromberg (CEO) in Murrow et al (2021) - The ivory tower is giving way to the village

"The wisdom of crowds is giving way to the "wisdom of communities." In a world of ever-greater complexity, no one person can possibly make sense of all the signals and all the noise — from a single, static vantage point. A networked group is required to adapt to this new world. It's evolution: Domains of knowledge historically governed by leading "experts" are being shaken up as the inadequacy of individuals at this new scale of complexity is revealed."; "But it can't do everything. Although a wise crowd can observe a system and discern its trajectory, it still can't build an airplane or write a decent novel. That's where the wisdom of communities comes in. The key difference is that community members coordinate with one another, while crowd members act and predict independently."

Bromwich (2021) Experts should avoid becoming either prophet or preacher.

"Professional knowledge is not translatable into political discernment. Max Weber gave particular force to this warning when, in his essay "The Vocation of Science," he warned against the passionate identification with causes that may lead a scholar to take up the mantle of the prophet or preacher."

Cassam Q (2021) Expertise and Diverse Value Systems

"Writing in 1927, the American philosopher John Dewey argued that experts are inevitably so far removed from common interests as to become "a class with private interests and private knowledge." A government that overvalues expertise, he wrote, risks becoming "an oligarchy managed in the interests of the few." This might be an exaggeration, but Dewey was right to draw attention to the dangers of excessive deference to experts. A mature and balanced view of expertise recognizes its limits. The challenge for the public has been to avoid the twin extremes of excessive deference and excessive skepticism toward experts. Despite all the hype about the death of expertise, most people are not "anti-expert." They still seek the services of an oncologist when they think they have cancer and the services of an electrician when their lights don't work. At the same time, they grasp that the pandemic has thrown up questions of policy and value that are for all of us to answer. The fact that liberals and conservatives argue about

the appropriateness of lockdowns is not proof of scientific ignorance. It is evidence that members of the public with different political allegiances can recognize a question of value when they see one."

Clifford (CEO) in Murrow et al (2021) - Distinguishing between contrarians and cranks

"The internet prizes showing, not telling, whether via a GitHub profile, YouTube channel, a Substack newsletter, or even a timestamped tweet that makes a prediction. Don't tell me you're an expert, show me. Beyond being a democratizing force — fewer gatekeepers, more participants — this has had a subtler, but even more important impact: It provides an alternative to traditional expertise that deals better with weirdness, and the world is becoming weirder."; "This raises two important questions for the future of expertise: First, how do we build better intuitions and norms around when to rely on traditional expertise and when to look further afield? Second, how do we build better tools and institutions for distinguishing "contrarian and correct" from "crank"?"

Collins, Evans, and Gorman (2007) Trading zones and interactional expertise

"Abstract - The phrase 'trading zone' is often used to denote any kind of interdisciplinary partnership in which two or more perspectives are combined and a new, shared language develops. In this paper we distinguish between different types of trading zone by asking whether the collaboration is co-operative or coerced and whether the end-state is a heterogeneous or homogeneous culture. In so doing, we find that the voluntary development of a new language community—what we call an inter-language trading zone—represents only one of four possible configurations. In developing this argument we show how different modes of collaboration result in different kinds of trading zone, how different kinds of trading zone may be 'nested' inside each other and discuss how a single collaboration might move between different kinds of trading zone over time. One implication of our analysis is that interactional expertise is a central component of at least one class of trading zone.";

Collins and Evans (2019) - Contributory and interactional expertise

"Abstract and Keywords - The research programme known as Studies of Expertise and Experience (SEE), often referred to as the "Third Wave of Science Studies," treats expertise as real and as the property of social groups. This chapter explains the foundations of SEE and sets out the theoretical and methodological innovations created using this approach. These include the development of a new classification of expertise, which identifies a new kind of expertise called "interactional expertise," and the creation of a new research method known as the Imitation Game designed to explore the content and distribution of interactional expertise. It concludes by showing how SEE illuminates a number of contemporary issues such as the challenges of interdisciplinary working and the role of experts in a "post-truth" society.

Keywords: contributory expertise, interactional expertise, embodiment, tacit knowledge, language, practice, science, democracy."

Compo (2022) Complex adaptive systems expertise will be increasingly important.

"My focus on the future of expertise is adaptive systems, where we accept there are always multiple futures and that innovations and change emerge from low-level disciplines. AI is an adaptive processes itself. <https://emergentapproach.com/>"

"Question: Is there more misinformation now than in the past? Or is it more obvious? I'm truly unsure of the answer and wonder how this can be studied."

Coravos (CEO) in Murrow et al. (2021) - Bringing the beginner's mind into healthcare

"We need a more balanced view of expertise here: one where prevailing expertise, scientific research methods, and regulatory processes can serve as a guide, not the only way. And we need one that can better support novel medical product development — more real-world evidence, faster, more proportional in applying risk vs. one size fits all — in service of the humans who could receive those life-altering treatments."; "We should instead entertain two contradictory ideas simultaneously: that both existing expertise and an openness to new methods with unexpected outcomes can, and should, coexist on a truth-seeking journey."; "I seek to cultivate shoshin (a philosophy popularized by the Sōtō school of Zen Buddhism), which involves cultivating an orientation toward wonder, openness, and lack of preconceptions when studying a subject."

Deloitte and UneeQ (2020) Meet our Digital Human Sophie - designed to elevate human experience.

"What is a Digital Human? A Digital Human is an avatar that can produce a whole range of human body language. Backed by artificial intelligence that can interpret clients' input and give back to them not just the facts they need but the appropriate non-verbal response as well. Digital Humans are AI powered human-like virtual beings that offer the best of both: AI and Human conversation. They can easily connect to any digital brain to share knowledge (i.e. chatbot and NLP). Interact using verbal and non-verbal cues — tone of voice and facial expressions. Making it possible to recreate natural human interaction at scale. Additionally, they are accessible 24 hours a day, seven days a week; never have an off day."

Demirkan (2018) - Analytical thinker and adaptive innovator

"The future of expertise is about being an analytical thinker and adaptable innovator."

"Abstract - As a result of the rapid growth of urban populations and use of smartphones, the new millennium has ushered in an age of unprecedented levels of collaborative and competitive local and global relations, constantly reshaped by advances in science, public policy, technology platforms, and open practices. The dynamic nature of these open innovation-oriented relationships is not sufficiently incorporated into and addressed by conventional education systems. Today's digital talents are still primarily siloed in functions and disciplines that were designed to meet the needs of an earlier era. Current rewards and incentives are also focused along these lines. Consequently, traditional academics are encouraged to delve deeper within their areas of specialization rather than reach out to colleagues in other disciplines to develop transdisciplinary research agendas. Across all sectors, the new digital millennium requires new types of professionals and work practices as well as new types of citizens and social practices. To help people be successful in this dynamic environment of rapidly changing smart service systems, should the education systems of the future encourage hyperspecialization, hyperflexibility, or something else? In this commentary, we make the case for an education system that encourages the development of T-shaped digital professionals and citizens—future-ready innovators who uniquely combine specialization (critical thinking and problem-solving depth) and flexibility (empathy, breadth of knowledge, skills, experience, and complex communication abilities) and who also use smart machines as assistants. This combination of personal capabilities allows for rapid formation of high-performance teams working in open innovation environments to build smarter service systems."

Dery (2021) Truth, trust, and the need for future expertise to include a story-telling skill set

"In 2018 the RAND Corporation released a report with the wince-worthy title Truth Decay. Subtitled An Initial Exploration of the Diminishing Role of Facts and Analysis in American Public Life, the 326-page white paper bemoaned a growing "skepticism about experts" in the context of an even more worrisome trend: the tendency to disregard or flatly deny "facts and analysis.""; "Sternly instructing the masses that they've got their facts wrong — "profsplaining," let's call it — is only going to play into popular perceptions of academics as ivory-tower elitists defending their cultural authority against the unlettered rabble. In the public arena, academics, especially those in the hard sciences, need to learn to convey the facts and their analyses not just accurately but meaningfully. In short, they need to learn to tell better stories. Democracy, not to mention our species' survival, hangs in the balance."

Dondi (201) - A mixture of cognitive, digital, interpersonal, and self-leadership skills, including expertise on ability to learn and understanding one's own strengths.

"To future-proof citizens' ability to work, they will require new skills—but which ones? A survey of 18,000 people in 15 countries suggests those that governments may wish to prioritize."

*"Mental flexibility - Skill group: Mental flexibility; Element: Ability to learn; Definition: The ability to learn new topics both within and outside formal learning programs; Desired proficiency level: **Individuals can quickly and independently learn competencies beyond their area of expertise.**"*

"Self-leadership skills - Skill group: Self-awareness and self-management; Element: Understanding own strengths; Definition: The ability to accurately identify areas of personal excellence. Desired Proficiency Level: Individuals know their strengths so well that they can predict challenges and can succeed even beyond their areas of expertise."

Dizon (Cofounder Startup) in Murrow et al (2021) - Technology creates experts in new geographies

"Now, access to these global, online economies means more people around the world can become "experts." But expertise is not a static thing; it must evolve over time. Those who are revered for their expertise today must continually refresh themselves and their knowledge, or their perspectives will expire."; "But these new experts all share a deep desire to learn something new, "level-up," and bring others in their communities along and up with them."

Edwards (2010) - practitioner expertise in a rapidly changing world

"Expertise as a practitioner in a world of potentially changing practices demands...stronger ties with knowledge, ways of knowing, and knowledge production than was probably the case 100 years ago."

Eghbal (Researcher) in Murrow et al (2021) - Expertise isn't changing; how we measure it is

"Technology has expanded the system of knowledge production, maintenance, and distribution that's historically been reserved for academic institutions, religious organizations, and the media. From open source developers to online creators, we are rapidly reinventing not just the nature of our knowledge systems, but how individual agents come to associate with them."; "You don't need a title to demonstrate expertise: you just need to show your work."; "Expertise isn't going anywhere: we're just finding new ways to measure and signal it. There's a lot more noise in expertise today."

Ericsson in King & Ericsson (2016) - Definition of Expertise and Downside of Expertise

Larry King interviewed Anders Ericsson on the topic of expertise. Ericsson defined expertise as an actor's repeated, high performance, on a specific task. Expertise is often the result of "deliberate practice" which builds mental representation for improvement. When asked if there is a "downside" to expertise, Ericsson answered that many "so-called" expert forecasters

with no performance record, are not held accountable. King as Ericsson if he was an “expert on expertise” and Ericsson said he was “an expert on ways to study expertise scientifically.

Ericsson & Pool (2016) – Expertise and Deliberate Practice

In the book “Peak: Secrets from the New Science of Expertise” the authors describe “deliberate practice” as different from other types of practice because it builds mental representations that are effective for developing task specific expertise.

Gardner & Marietta (2020) - Developing T-shaped Talent

“Talent development is key to organizations keeping pace with the rapidly changing social and technological developments of today’s workplace. Companies are calling for talent that possesses a mastery of discipline and systems, combined with an ability to handle cross-functional, multicultural teams, projects, and assignments. Colleges and universities face challenges in preparing students across all the competency dimensions employers demand. The T-model configures academic and professional development in a way that allows institutions to provide students with a solid foundation, one built through rich academic and co-curricular experiences that allow them to grow and adapt to the evolving workplace. The T-model comprises five key elements: mastery of academic discipline, system understanding (systems thinking), boundary spanning competencies, interdisciplinary understanding, and a strong sense of self (the ME of the T). In this volume, readers are introduced to the dynamics of the workplace that generate the need for T-professionals, followed by discussion of each of the five key elements of the T-model. Readers are then introduced to and shown how representatives from different segments of higher education infuse the T-model across the curriculum. The book’s final section offers insights from industry professionals on the necessity to grow as a T, once a new graduate enters the workforce.”

Gil (2014, 2017) and US Congress (2017) – The future of expertise is experts collaborating with AI/cognitive systems.

“Confirmation bias, loss aversion, the halo effect – inherently, humans face obstacles to making rational decisions. In the future, could purely logical cognitive computers help erase these mortal blind spots? Dario Gil explores what the future of cognitive computers looks like and considers the uneasy question: could technology ever replace humans?”

“We are guided by the use of artificial intelligence to augment human intelligence. We focus on building practical AI systems that assist people with well-defined tasks. We believe people working collaboratively with these learning systems is the future of expertise.”

Gobet (2018) – Data-Driven, Science-Based Multidisciplinary Approach

“Abstract: Much progress has been made in cognitive psychology and neuroscience in understanding the mechanisms underpinning expert behavior. Concurrently, expertise has been extensively studied in several other disciplines; in particular, sociology, philosophy, and artificial intelligence. However, there has been relatively little communication between these disciplines. This is regrettable, as many contradictions between the disciplines have been ignored and many opportunities for cross-fertilization missed. For example, psychology has focused on performance-based expertise and emphasized the remarkable feats displayed by experts, while sociology has directed its attention to the shortcomings of reputation-based experts. It is proposed that unifying forces between disciplines is the way forward for making progress in our understanding of expertise.”

The science of expertise is continuing to advance, so perhaps the prediction about data-driven science-based development of expertise for individuals, cities, and countries is happening.

Gorbis (2022) Changes needed to higher education

“The stakes have never been higher. California is an innovative, economic, and cultural powerhouse with a significant impact on higher education,” says Marina Gorbis, IFTF Executive Director. “As the fifth-largest economy in the world, the decisions California makes today in regards to higher education will have far-reaching implications for the country and the world. California could once again be the shining example of equitable, diverse, and practical public higher education envisioned in the Master Plan.”

Gorbis (2011) - Future work skills 2020: Six drivers and ten key skills

Drivers: New media ecology, rise of smart machines and systems, computational world, globally connected world, transdisciplinarity, superstructure organizations, extreme longevity

Skills: Design mindset, virtual collaboration, sense-making, new media literacy, cross cultural competency, social intelligence, cognitive load management, novel and adaptive thinking, computational thinking

Greene (2022) Greatest (still uniquely) human expertise is where to focus attention and what/how to learn in general what we are interested in learning

“A general intelligence could theoretically figure things out even if it had a tiny database. It would intuit the methodology to accomplish its task based on nothing more than its ability to choose which external data was and wasn’t important, like a human deciding where to place their attention.”

Griffin (2021) - Faster disruptions of expertise in all industries because of accelerating change and complexity growth.

Human experts can operate from anywhere (teleworkers in surgery, construction, etc.). Finding talent continues to go global (outsourcing). Legal issues associated with management expertise (hiring and firing) by algorithm. Who manages (hiring and firing) of AI digital employees, HR or CIO? AI is democratizing access to skills and expertise. End of hiring T-shaped expertise?

Griffith (2022) - Human expertise as our knowledge and tools (perhaps video-mediated, AI-augmented, self-made) forged into work practices for organizations by guilds with increasing system-savvy.

Augmentation skills are a key dimension in the future of expertise. How do we learn to think outside of ourselves such that we include powerful automations as a matter of course? Just as blacksmiths may make their own tools as part of their training and 3D printer operators often make their own custom attachments, how do we all become as experts in the tools we use and customize? Is it about the tools or the process? That is, are we on the right path if we keep in mind the 5Ts: Target (goal), Talent (ours and others), Technology (tools), Technique (processes that integrate talent and tools), Times (contexts that put technique to work in systems and organizations to hit the target)? Or, is some explicit mix of these dimensions better? Where can we look for examples? [Link to Slides](#)

Gu (Data Scientist) in Murrow et al (2021) - Tech lowers the barrier of entry to expertise, but not the bar

"I was an untrained data scientist with zero prior experience in infectious diseases, but I became known as an "expert" in COVID-19. Not that I did it alone — my model was a crowdsourced effort, because I received help and advice from countless individuals on social media. Advancements in technology and dismantling barriers to communication have enabled access to, and the ability to build on, tons of information and knowledge that were previously inaccessible."; "There is a very fine line between questioning the science and being anti-science. I've found it quite difficult to walk this line, not only for myself but for the individuals who misrepresented my work to 'prove the experts wrong.'"; "I've seen many instances where experts were unwilling to change their beliefs because the results disagreed with their priors, and it wasn't until they were presented with overwhelming evidence that they were forced to abandon their assumptions."

Guilhot (2021) Politics can corrupt both science and expertise.

"The "crisis of expertise" narrative is premised on the questionable assumption that there once existed a technocratic golden age that saw benevolent men in gray suits and thick-framed glasses rule by universal epistemic consensus. This age never was."; "The crisis of expertise is endogenous to political crisis. When the prevailing social and economic arrangements work for the majority, people do not care much about the political role of experts. But when humanity teeters on the brink of environmental collapse, is devastated by a pandemic and torn apart by economic inequalities, the technocratic curtailing of politics inevitably hits a wall."

Hagel (2021) - From the Gig Economy to the Guild Economy

"As we confront the paradox of the Big Shift, the imperative is to learn faster – that's the most effective way to respond to mounting performance pressure, while at the same time addressing exponentially expanding opportunity. By learning faster, I mean creating new knowledge through action and reflection on impact achieved. Those who master the ability to learn faster will achieve much higher impact in a rapidly changing world."

Hanuka (Illustrator) in Murrow et al (2021) - An artist's portfolio no longer speaks for itself

"But if you have something to say, do your own thing. It will create a space with a different set of metrics, defined solely in service of your artistic vision."

Hardy A (ISSIP Survey response) - complicated with a lot of trial-and-error, and corporations will play a major role in shaping the future of expertise by how they evaluate a solid contributor to a team

"The future of expertise will be driven in part by companies' willingness to quantitatively and qualitatively evaluate what makes a solid contributor to a team. Big Tech has discovered that four-year degrees don't define success, and others are following - but the amount of time it takes formal education to react to market needs with formal or informal education options is still lagging. AI analysis and solutioning must be implemented, companies must partner with industry, and standards must be set to help humans identify what it looks like to position themselves for success. Certifications are one way, but the accreditation of certifications is in doubt - especially as remote and self-paced programs are on the rise. The Future of Expertise is complicated and will be trial-and-error - as it is once the worker gets in the job that they'll see the biggest moments that expertise matters. Proficiency is one thing. Expertise is quite different."

Hemelt et al (2021) College majors can be seen a portable bundles of skills by potential employers.

"We document the skill content of college majors as perceived by employers and expressed in the near universe of U.S. online job ads. Social and organizational skills are general in that they are sought by employers of almost all college majors, whereas other skills are more specialized. In turn, general majors—Business and General Engineering—have skill profiles similar to all majors; Nursing and Education are specialized. These cross-major differences in skill profiles explain considerable wage variation, with little role for within-major differences in skills across areas. College majors can thus be reasonably conceptualized as portable bundles of skills."

Hidalgo (2022a,2022b) – Data-Driven, Science-Based Approach to Measuring/Predicting Future Development of Knowledge/Expertise for Individuals, Cities, Countries

For those unfamiliar with this work, I recommend watching the video before reading the paper. Hidalgo and other pioneers of economic complexity are pioneering approaches to the geography of knowledge. The approach they are developing is data-driven and allows predicting the future of knowledge development (e.g., "...predict technical area where a country, a university, or a scientist is going to publish in the future..."). The datasets about labor history are used to build predictive models.

Hightower (2022) - is there a downside to expertise?

"This idea that you have to be an expert before you can share your thoughts or opinions is a tool gatekeepers use to discourage people from looking behind the curtains."

Another way of exploring this idea - one can be a technical expert on a topic ("cryptocurrencies") but not an expert on the ethical or economic implications of that technology.

Hiner via email (20220518) - the future of expertise by projecting an on-going IT trend

"I like to position this trendy category with what seems to me to be its Information Technology (IT) predecessors. Those being:

- *Data Management: capture and contain the 1s and 0s of the bit/byte constructs of data.*
- *Content Management: Organizing the data into discrete chunks of content – documents, pictures, recordings, etc. – that are meta-tagged for discoverability (if only by file name).*
- *Information Management: Making a query against the Content base to answer a specific question or need in the flow of work.*
- *Knowledge Management: The first real stretch beyond the technical capability, reflecting the relative success of applying the Information and using that to inform future results.*

Now, the Future of Expertise does not portend to manage data/content/information/knowledge in any more efficient or productive ways – although the integration of Artificial Intelligence

seems to make some promises in that arena. Moreover, Expertise that has been (pre-IT) captured, contained, and disseminated largely by individuals, is now captured, stored, and accessed digitally. No longer is one person the exclusive repository of a modicum of applicable information; the person who kept great notes (Leonardo da Vinci, perhaps? Thomas Edison? You?) must graduate to being able to sort through and find relevancy amidst the deluge of data available. (This might be a key role for AI to play.) So the Future of Expertise will absolutely rely on a set of skills that enable this future interaction with data. Lifelong learning, critical decision making, problem analysis – these and more will be the horizontal bar of the T-shaped individual, while the vertical depth of expertise may well become less relevant to the contribution and value of the individual. Imagine this for a scenario:

- 1. You are on a team that has been tasked with solving a particularly recalcitrant dilemma.*
- 2. You (and your team) analyze the problem by examining previous and current episodes of the issue.*
- 3. You model various potential solutions into digital experiments (another AI-enhanced process) and innovate where gaps exist in current practice.*
- 4. You work with “clients” to test and evaluate solutions in a fluid, agile manner.”*

Hoffman (CEO) in Murrow et al (2021) - Without first principles, we need good proxies

"It used to be that “who you know” — not “what you know” — held the most value. But in the last 15 years, it has become much more important to build something than to know people: The “what-you-knows” are ascendent."; "The hard thing is figuring out who those real experts are. Here’s something I wish I had learned in my 20s: The “experts” that most people agree on are usually only experts on a very narrow subject. We should listen to them on that one subject, then, and disregard almost everything else they say."; "The first rule of thinking: At any given point in time, you should be working on at least one thing via first-principles thinking. It might take you the rest of your life. But having at least one thing to go deep on is a life well lived. The second rule of thinking: When relying on proxies — which is likely the case for over 99% of what you believe — vary your proxies. Variation increases the likelihood that the proxies end up disagreeing with each other on important truths."

Hovell, John (ISSIP Survey) and also see Sanz & Hovell(2021) - Expertise exists in the collective.

“Expertise exists in the collective”

“Question: What other English words describe the notion of expertise?”

"Abstract - Knowledge retention (KR) can be considered a broad practice within the larger field of knowledge management (KM). KM has many frameworks and maturity models to support itself, and by correlation, knowledge retention has an opportunity to create frameworks and maturity models... The framework aims to create a shared definition for knowledge retention, and the maturity model aims to create an approach for assessing a team or organization’s knowledge retention maturity. The maturity model outlines steps to increase the maturity of knowledge retention, based on data and evidence to

support action. Overall, this paper presents a vision of an ecosystem in which knowledge retention is institutionalized practice, embedded in everyone's tasks and part of the way we work."; "However, if we were to define knowledge retention today, we would not be limited to the impact of knowledge drain caused by retirements or job movements. We know now that it also reduces the capacity to innovate and co-create; it challenges an organization/team's ability to pursue growth strategies, strengthen networks, relationships and partnerships; it increases vulnerability due to the loss of memory; and it hampers a culture of collaboration and even the development of expertise. Knowledge retention is defined as an organization/team's capability to retain unique and critical knowledge, whether tacit, explicit or implicit (see Figure 1). It helps to improve the organization/team's learning, memory and performance, while avoiding knowledge drain and low employee engagement.";

Howard (Head of Community) in Murrow et al (2021) - When expertise comes from a collective

"When we think of expertise, we should think expansively. This is not to say that experts themselves should no longer be valued, but instead that value should be determined through the consensus of many. "...by promoting expertise without necessarily centering the expert. Imagine the creative potential of operating according to this principle: a collective redefinition of expertise that could also represent a collective redefinition of value."

Idowu (2021) Expertise needed for a sustainable future for all - especially youth empowerment.

Donna L. Goodman discusses the needed expertise for working with youth on sustainable future. Working with children continues to be critical - empowering youth to be positive about global collaborations.

Jack (Platform Creator) in Murrow et al (2021) - A decentralized market requires more discerning consumers

"The Big Three prestige-generating institutions — academia, news media, and publicly held government offices — have been the American Mint for Expertise over the last 200 years, conferring status and gravity to any individual who satisfies their barriers to entry."; "The 'institution' of the internet has arisen at the same time that legacy sense-making institutions have struggled with errors and botched predictions."; "For the first time in history, the power to pursue truth and make up your own mind is backed by the decentralized sum of all human knowledge, which changes the game of expertise from the bottom up."

Jackson (2021) Expertise requires balancing broad brush and nuts and bolts details.

"While the "thinker" follows conceptual strands across big, interlinked questions, the "expert" gives due attention to all the nuts and bolts that hold an answer together. A good scholar of course does both, but finding the right balance is a never-ending task."; "Who really "counts" as

an expert, and on what? This is a fruitless mission in most of the humanities, since there are close to no limits to how minutely we can define a field of knowledge."

Jana (2018) – Skills every child needs – social-emotional intelligence.

"Is the current education system sufficient to make kids succeed in 21st century? Dr. Laura believes otherwise. Her talk will ensure that you and your kids are prepared to succeed in 21 century. Laura A. Jana, MD is world's leading pediatrician, media spokesperson for the American Academy of Pediatrics, and award-winning author. With more than 20 years of experience in pediatrics, parenting, early education, public health and media/communications, she most recently served as Director of Innovation at the University of Nebraska Medical Center and has a faculty appointment at Penn State University's Prevention Research Center."

Children should and can develop social-emotional intelligence expertise at a very early age.

Johnsen & Ellis (2022) Digital twins improve deliberate practice to help achieve expertise

"Digital twin technology sparks a paradigm shift for individuals and organizations across industries." ; "Visualize the future made possible by digital twin technology. Athletes of all kinds—both professional and recreational—have training regimens tailored to their own bodies, past injuries, and activities. Data is gathered for everyone in real time to predict not only the risk of injury, but the seriousness of the injury. Gone are the days of "one size fits all" training and recovery plans. Doctors, trainers, and athletes alike benefit from an enhanced view: the digital athlete."

Building “digital twins of individuals” for the purposes of predicting buying (e.g., Amazon) or social media interests/extended scrolling times (e.g., Facebook) is already happening. The beginning of “digital twins of individuals” for the purposes of extended scrolling/watching for learning and entertainment (e.g., YouTube) and book buying/reading for learning (e.g., Amazon) is already underway. Predicting the aspirations, wants, and needs of individuals is one way that organizations can better serve individuals depends on a sort of collective or swarm intelligence as well. The engineering of better recommender systems depends on increasingly massive datasets., as well as advances in deep learning/AI.

Johnson (2019) – Stop 7 Digital Skills, and trying to keep up with in-demand “hot” skills

"Digital technologies are reshaping the workforce of tomorrow. In order to stay relevant, you need to know what you should invest your valuable time in learning the right digital skills. We've also put together a list of resources and favourite courses to help you cover the most in-demand digital skills for the future of work. Mastering them can lead to a plethora of career opportunity! Get full access to our Top Digital Skills 2020 resource: https://hubs.la/HOWkN4_0"

Top 7 Digital Skills: Artificial Intelligence, UX Design, Digital Marketing, Analytic Reasoning, Design Thinking, Cloud Computing, Digital Project Management. Become T-shaped.

Kelly (2017) & BookxBits (2017) – The Death of Expertise – Dying or just changing?

“Since the beginning of time, access to information and news has been one of the things that disturbed people on a daily basis. As Man, regardless of his culture and the time in which he lives, remains in an urgent need of knowledge and awareness of everything that happens around him, whether in his society or in the world as a whole. In the past, access to information and news was very difficult, due to the scarcity of news sources and the fact that they were under the control of certain institutions or persons. At that time, checking and verifying the truth was impossible, especially for the normal person. The ongoing debate is still raging between experts and ordinary people. When any topic is discussed, we find two contradictory parties. The first is the intellectuals who believe that the common people do not understand anything, and the other is the ordinary people who do not trust anyone who claims to be an expert. With the advent of the Internet in the twentieth century, a quantum leap occurred in the field of spreading and discussing news, science, and facts, therefore this raised the heightened conflict between the opinions of experts and the opinions of ordinary people. With the dawn of search engines such as Google and social media such as Twitter and Facebook, you can access any information in a matter of seconds by browsing Google, and Twitter brings you news from all over the world even before it is published by the most prestigious newspapers or international news agencies. This paradigm shift has placed great power and extraordinary authority in the hands of public opinion in various fields. For example, the great debates that we see on the Internet receive great attention, despite the fact that they contradict proven scientific facts. The most famous of these may be the debate about the fact that the Earth is flat, which is a topic that is attracting a wide audience on the Internet day after day, or the discussion about vaccinations given to children, and the false allegations that they are harmful and may cause the emergence of autism in children. All this is despite years of continuous scientific research to refute these misconceptions among the general public. What is more, is that the craze of social media has enabled famous people (such as media professionals and film actors) to wrongly influence public opinion about information and topics that don’t relate to them and that they do not have enough experience to speak about them in public. Bit to remember: The revolution of the Internet and social media provoked the conflict between experts and the general public, and provided platforms for the transmission of false information.”

Klein et al (2017) Why expertise matter: A response to challenges

“Five different scientific communities are challenging the abilities of experts and even the very concept of expertise: the decision research community, the sociology community, the heuristics and biases community, the evidence-based practices community, and the computer science community (including the fields of artificial intelligence, automation, and big data). Although

each of these communities has made important contributions, the challenges they pose are misguided. This essay describes the problems with each challenge and encourages researchers in the five communities to explore ways of moving forward to improve the capabilities of experts."

Krishna V (ISSIP Survey Response) - trial and error learning

"Experimentation and iteration will be more essential than ever going forward."

Lan (Executive Director) in Murrow et al (2021) - Scientific funding is broken. Metascientists can fix it.

"The current distrust of experts is part of a broader breakdown in the social contract between science and society."; "For a working academic scientist or administrator, it's a fixed pie — and a fierce competition — to grab the biggest slice. Science is being played as a finite game when it could, and should, be infinite."

Lee C (ISSIP Survey Response) - interdisciplinary skills, human-centered innovation

"The future of expertise includes interdisciplinary skills that enable human-centered innovation."

Lessig (2020) The world after coronavirus – the future of expertise

"The COVID-19 pandemic is a global crisis of unprecedented scale, with aftershocks that will be felt in virtually every aspect of life for years or decades to come. The Frederick S. Pardee Center for the Study of the Longer-Range Future at the Pardee School of Global Studies has launched a new video series called "The World After Coronavirus," in which we ask leading experts and practitioners from Boston University and across the world to explore the challenges and opportunities we will face in our post-coronavirus future."

The challenge of trust in expertise will require better institutions and governance.

Liu (Company Cofounder) in Murrow et al (2021) - Games expertise is wielded by those on the edge

"By changing the economics of expertise in gaming, virtual game worlds today can impact the real world, for the first time. With trends such as play-to-earn games, the rise of livestreaming, and the growing contingent of esports pros, players — not just game publishers! — can now

create value for the entire community and get paid. Expertise has evolved dramatically. It now comes from the edge — from bold creators and players."

MacLeod S (ISSIP Survey Response) - free online offerings

"CC-4 ocw.mit.edu -centric wiki World Univ & Sch - <https://worlduniversityandschool.blogspot.com/> - will, in offering free online STEM-centric degrees, focus further on the development of technical experts, expertise, and expertise in the spheres of human decision-making."

Marr (2011) The 10 Vital Skills You Will Need For The Future of Work.

"Since we're in the midst of the transformative impact of the Fourth Industrial Revolution, the time is now to start preparing for the future of work. Even just five years from now, more than one-third of the skills we believe are essential for today's workforce will have changed according to the Future of Jobs Report from the World Economic Forum. Fast-paced technological innovations mean that most of us will soon share our workplaces with artificial intelligences and bots, so how can you stay ahead of the curve? Start by adopting a commitment to lifelong learning so you can acquire the skills you will need to succeed in the future workplace. 1. Creativity. 2. Emotional intelligence (EQ). 3. Analytical (critical) thinking. 4. Active learning and a growth mindset. 5. Judgment and decision making. 6. Interpersonal communication skills. 7. Leadership skills. 8. Diversity and cultural intelligence. 9. Technology skills. 10. Embracing change."

McCormick (Newsletter Writer) in Murrow et al (2021)- Expertise is yours if you can prove it

"Contexts change, knowledge isn't always generalizable, and the people who project the most expertise often have the least. ... To reach a healthy, balanced place with experts, you can use a method that I use: Take their expertise as an input. Test it against your own thoughts. Test it against other experts' ideas. Then mix and match and blend and throw out and remix until you come up with your own ideas. "; "Once synthesized, the ability to then turn that information into a good story has never been more valuable. Unquestioned experts didn't really have to tell a compelling story. They were the experts, and their word was law. Now that everyone has a voice, weaving together facts, figures, and information into a clear, coherent, and compelling narrative is the only repeatable way to stand out. Obviously, stories can be used for good and bad."

McGowan and Shipley (2020) – Learn, Unlearn, Adapt

"1. The future of work, for both individuals and organizations, relies on rapid learning, unlearning, and adaptation. 2. To successfully learn and adapt, we have to be willing to let go of 'the way we have always done it' and equally, if not more difficultly, 'who we think we are.' 3. Navigating a world of rapid learning, unlearning, and adaptation requires that we become comfortable with ambiguity and vulnerability, allowing us to become champions of human potential in learning tours filled with unknowns."

These authors view is also consistent with lifelong learning, the race to keep up with in demand skills, social-emotional intelligence, collaborating with the assistance of AI, moving from I-to-T-to-X shaped in terms of responsible actors interacting in trusted networks.

McQuade et al (2007) Loss of company knowledge and expertise when employees retire.

"Abstract - Purpose - The purpose of this paper is to report on a research project, the aim of which was to identify the potential loss of company knowledge and expertise as experienced and expert employees retire. Design/methodology/approach - The methodology used in this research was based on interviewing experienced and expert people who had retired or were approaching retirement: An application of expert interviewing. The interviews were conducted in five countries, across a number of sectors and involving a range of company sizes. The work of the research team was guided by an advisory panel of people with significant, senior level industrial experience. Findings - In addition to the potential loss of technical product and process knowledge and expertise, there is a loss of expertise in interpersonal communication skill both in the company and in communication with companies and people who are suppliers and customers, in knowing the company culture and the way things are done and in the loss of maturity and stabilising influence. Research limitations/implications - The number of people interviewed was relatively small. However, the research pointed out the need for companies, both large and small, to put in place succession planning, talent management and knowledge management processes as well as training in transferable skills or soft skills. Practical implications - Management training programmes and courses need to include aspects of succession planning, talent management and knowledge management processes as well as training in transferable skills or soft skills. Originality/value - The research team and the advisory panel involved participants from five EU countries large and small, east and west, north and south, developed and developing, EU founder members and newer accession states. It involved working in five languages and cultures. Despite this diversity there was great agreement on the findings and implications.";

Mchangama (Podcaster) in Murrow et al (2021) - On bullshit: Excellence, not affiliation, makes expertise

"Hand-wringing about the evils of an increasingly egalitarian public sphere is often driven by "elite panic," in which traditional gatekeepers seem at least as concerned with the eroding authority and relevance of their own privileged access to the public than with concerns about

the common good. "; "Where does all this leave expertise? Expertise remains crucial to knowledge production, but it must reflect genuine excellence in a given field, rather than mere affiliation with institutional authority. This of course makes it difficult to navigate and discern experts from prolific tweeps, bloggers, and bullshit merchants. Genuine experts must be willing to engage horizontally with the masses and the public as active participants — defending and interacting around their expertise — rather than treating the public as mere passive recipients of their knowledge production."; "These related trends naturally lead to a new set of skills that will become crucial to navigating the modern world and becoming a genuine expert in a new paradigm: Intellectual humility (rather than know-it-all-ism); genuine curiosity (rather than reflexive, orthodox thinking); and the willingness to openly admit error (rather than defensive stubbornness or dismissiveness that masks insecurity of one's own fading authority). All this, and an acute and constantly refined bullshit detector."

McKenzie (Cofounder Company) in Murrow et al (2021) - The machine shouts — and we listen

"When self-proclaimed experts are ultimately revealed to be, at best, vulnerable to overreach or, at worst, outright charlatans, the whole concept of expertise is undermined."; "At its best, the internet has given writers the superpower of influence and readers the ability to discover the most informed and interesting examinations on any imaginable topic."

Medina-Borja A. (ISSIP Survey Response) - beyond machines and with machines.

"The future of expertise will require people with the skills that machines cannot do as well, and those to train the machines to do the jobs that they are able to perform with proficiency. This includes probabilistic thinking with incomplete information, emotional intelligence, intuition and other human cognitive and emotional skills that machines cannot imitate."

Moghaddam et al (2021) - A Proposed Roadmap to Close the Gap Between Undergraduate Education and STEM Employment Across Industry Sectors

Moghaddam et al (2018) - T-shaped Professionals: Adaptive Innovators.

Building on an earlier research (Moghaddam, Kwan, Freund, Russell, 2021), and the findings from the results of a recent research on industry's perspective on Future of Work, Learning, and Skills (both led by ISSIP and supported by the National Science Foundation), the future of expertise will require professionals who possess dexterity across dimensions of specialized skills, work practice skills, and soft skills, who develop mindsets that enable them to upskill and reskill across these dimensions, and who demand and nurture work environments that are diverse, inclusive, and equitable.

Mugar (2021) - The future of expertise in design

"Over the past couple of years, I have listened closely to conversations about how product and service design plays a role in perpetuating inequity in society. And at the heart of what I hear from practitioners and scholars is that so often, the people most impacted by design are not the ones influencing design decisions. Some of the prominent voices that have helped me explore how design practice can perpetuate inequity include the Design Justice Network and the nonprofit Creative Reaction Lab. ... Feeling this frustration myself, I decided to explore different decision moments in the for-profit design context where my expertise and authority might be reimaged and repositioned in a way that addresses designing for equitable outcomes."

Murrow et al (2021) – Redefining Expertise in the Modern Era

"“Science is the belief in the ignorance of experts,” as Nobel Prize-winning physicist Richard Feynman once said. Right now, we’re either witnessing a golden age of expertise or a crisis of expertise, depending on who you ask. It’s undeniable that technology has democratized access to high-quality information, data, and tools for research, creation, and distribution. But how do we separate the contrarians from the cranks, the signals from the noise, the skills we need and the skills we don’t? More broadly, how is expertise being redefined in the modern era? We posed that question to 20+ experts."

Nicolini et al. (2017) - Expertise as Trans-Situated

"We find that expertise occurs in many locales concurrently—each with its own trajectory and history—and that expert activity feeds upon the connections established and maintained between locales. Accordingly, expertise is not so much distributed or relational as it is trans-situated.... Human expertise always implies and presupposes some form of material or symbolic mediation (language being the mediatory tool par excellence). Through mediation, history, culture, institutions, and power are all concretely manifested in human action. Artifacts are thus not only integral in the accomplishment of expert activity, they are constitutive of expertise itself as they have the capacity to mediate onto the scene of action the history of achievements and learning, tracing and shaping their creation and refinement. In short, mediatory “tools” can be seen as accumulations of expertise that are then brought to bear on the activity that they help make possible."

Noveck (2016) - Harnessing the public's own expertise to better serve the public

"Dangerously today, we lack public institutions — a participatory bureaucracy and open parliamentary processes — that know how to tap into the collective intelligence of our communities and draw power from the participation of the many rather than the participation of the few. And, I would argue, it is the absence of those more open institutions in which we can participate as equals — this failure to create concrete, specific and workable mental models for

taking account of the views and voices and know-how – the citizen expertise — of the many disaffected people who voted..."

Nowotny (2000) To be viable in the twenty-first century, the future of expertise must rely on both its public and private forms, beginning with experiments on how the two might be reconciled

"Abstract - Relying on a powerful collective narrative through which political, legal and social decision-making is guided in the name of science, the authority of scientific experts reaches beyond the boundaries of their certified knowledge base. Therefore, expertise constitutes and is constituted by transgressive competence. The author argues that (1) changes in the decision-making structure of liberal Western democracies and changes in the knowledge production system diminish the authority of scientific expertise while increasing the context-dependency of expertise - thereby altering the nature of its predictive claims; (2) the societal distribution of expertise, while displaying emancipatory features of empowerment of citizens, also raises issues of quality control; and (3) in order to regain a balance between public and private, i.e. individual-based societally distributed expertise, future expert systems will need to adopt a longer time-perspective. The author also reflects on directions in which future expert systems might evolve."

Pamuk Z (2021) Expertise, Advisory Processes, and Healthy Distrust

"These "noble lies" showed that flawed expert communication can do serious damage to public trust. One lesson here is that experts should avoid noble lies — all lies, really. Instead, they should share clearly and openly the uncertainty and limitations of their knowledge. Yet behavioral prescriptions may not be enough to solve the problem. If public trust in scientific expertise depended on experts' never behaving or communicating badly, it would be a fragile trust. The more important question is whether advisory processes themselves can be structured differently — whether they can more effectively expose and contain individual missteps, allowing the public to reflect more critically on expert statements. Jeremy Bentham argued that trust is appropriately placed in institutions that systematize an attitude of healthy distrust.";
"Zeynep Pamuk is an assistant professor of political science at the University of California at San Diego and author of Politics and Expertise: How to Use Science in a Democratic Society (Princeton University Press)."

Panetta (2021) Need for future expertise among young people for public service

Advocating national year of service for young people to develop expertise of service to society. Young people have concerns about enjoying the American Dream, but also willingness to participate in the process of improving public service. Working in conservation, healthcare,

education, and in communities. Being able to relate to people from all parts of the country to fulfill a common mission. Work and be with diverse others.

Pearson (2017) Future of Skills

"Green technologies are creating new jobs faster than in the polluting sectors. Understanding the interactions is complex. Moving the conversation beyond simply automation. The future of work is bright. Read "The Future of Skills and Employment (2030)."

Other interaction trends besides technology (automation), urbanization, globalization, changing demographics, globalization, inequality, political uncertainty, and climate change. All these trends are interacting as change happens.

Pietsch (2017) Trust and the future of expertise - when should a society trust its experts?

"Why should the public trust experts? In the 20th century, universities were key to answering this question. The public trusted them (and governments funded them) because their credentials assured the community that the knowledge at the heart of diverse fields from medicine to engineering was regulated and authoritative. In the 21st century this is changing. 'How do you know?' is no longer answered with deference to institutions of knowledge and their credentials. Dr Tamson Pietsch asks how did we get here and what does it mean?"

Peper (Author) in Murrow et al (2021) - Unlocking expertise through storytelling

"Humanity has so much profound understanding locked inside expert silos, and narrative is a crowbar that can pry them open for the rest of us."; "Nobel Prize-winning physicist Richard Feynman had a trick for seeking out truths clouded by expertise. ... Whenever an expert was describing a complex idea, Feynman asked for a concrete example. Then he followed the example along in his mind as they built back up to the idea itself."

Petrocelli (2018) - What is the dangerous opposite of expertise? Not ignorance, but bullshitting. AKA BS-ing.

Abstract: *"Although it appears to be a common social behavior, very little is known about the nature of bullshitting (i.e., communicating with little to no regard for evidence, established knowledge, or truth; Frankfurt, 1986) and the social conditions under which it is most likely to occur. The current investigation examines specific antecedents of bullshitting, particularly examining topic knowledge, evidence for or against an obligation to provide an opinion hypothesis, and an ease of passing bullshit hypothesis. Experiment 1 suggests that bullshitting is augmented only when both the social expectations to have an opinion, and the cues to show*

concern for evidence, are weak. Experiment 2 demonstrates that bullshitting can also be attenuated under conditions of social accountability. Results are discussed in light of social perception, attitude change, and new directions aimed at reducing the unwanted effects of bullshitting."

Quinn C (ISSIP Survey Response) - intersect what we do well and what we want to do

"I think the future of expertise should be the intersection of two things: us taking what we do well and what we want to do. So we should choose to do the pattern-matching and meaning-making, augmented by tech including AI, while leaving rote activities to the tech. A more humane approach, I believe."

Rand-Hendriksen (2021) 'Gatekeeping the Work Required to Have an Opinion', and the expertise of persuasion and gatekeeping.

"The core of the problem here is not the validity of the opinion itself, but who considers themselves the arbiter of this validity. In 2012, philosopher Patrick Stokes became momentarily famous for an article titled "No, you're not entitled to your opinion" where he stated "You are not entitled to your opinion. You are only entitled to what you can argue for.""

Rayes (2022) - Mature corporate citizen, a type of social-emotional intelligence and mindsets.

1. Mindset - part of Entrepreneurial Mindset is Combined Business and Technical Mindset: Technology is changing very rapidly. Centralized IT departments are being reduced / eliminated. Operation technology leaders are hiring directly.
2. Mindset - part of Entrepreneurial Mindset is Ownership: Must learn the business quickly and act on behalf of the entire company, beyond just their own team. i.e. growing the business is everyone's job!
3. Mindset - part of Systems Thinking and Design Thinking: Simplicity: the KISS principle is well and alive. Systems are becoming too complicated, but users/ customers expect zero steps to setup/configure/manage (the best user experience is a system without a user interface)!
4. Mindset - part of Growth Mindset: Seek Feedback: seek diverse perspectives and work to disconfirm their beliefs.
5. Mindset - part of Growth Mindset: Speed and Agility in business: Take risk, fail/learn fast and be open to reverse decisions.
6. Mindset - part of Entrepreneurial Mindset is "NIH (Not-Invented-Here) is Dead"; This combines powerfully with Advanced Technology (Cloud, APIs) and Work Practice (Open Source, Open APIs, Standards): Broadly found elsewhere: Learn and use cloud & open source to speed up innovation. Not Invented Here (AKA NIH) symptom is dead!

Knowledge of open source (GitHub) and open APIs - the use of common APIs to open / expose any capabilities (small or large) to the entire company/ community.

Upskilling requires more than just an interest in and some working knowledge of the latest advanced technologies (e.g., AI, Quantum), but also an interest in and knowledge of work practices (e.g., agile, service design, open source, etc.), and mindsets (e.g., growth mindset, entrepreneurial mindset, systems thinking, design thinking, service thinking, etc.) .

Reeves (2021) Redeeming Expertise

"Recently the scholarly community and popular media have highlighted the denial of science by conservative Christians, linking a low view of scientific expertise to the United States' current cultural turmoil. Various theories are offered to explain such Christians' persistent denialism: cognitive mechanisms that short-circuit human reasoning, manipulation by media companies for profit, or a cult-like willingness of believers to accept whatever their faith leaders assert. Critics contend that the religious impulse to believe blindly without evidence is the main obstacle to a more just and sustainable world. Redeeming Expertise: Scientific Trust and the Future of the Church argues against this diagnosis, suggesting that however misguided individual conclusions about science may be, most Christians reason their way to those conclusions in the same way that non-Christians do: they rely upon trusted sources of information to guide them through an overwhelmingly expansive information landscape. Rather than heaping derision on the uneducated or unenlightened believer, Josh Reeves offers a sympathetic account of the average Christian in the pew and explains the reasons why skepticism toward mainstream science is compelling to many conservative Christians. The second part of the book then proposes a uniquely Christian defense of taking scientific expertise "seriously." Trusting experts plays an important role in a healthy intellectual life, and believers must learn how to make discerning choices. Redeeming Expertise presents a middle-ground that avoids the extremes of allowing "experts to rule" or of foregrounding populist positions that champion the intellectual superiority of laypersons. Christians who dismiss what communities of experts have discovered about our universe do so at their own peril. Unless the church can trust the best knowledge of the modern world, that same modern world will not trust the church."

Resnick et al (2019) Expertise for the future in reasoning, via expertise in argumentation

"Abstract and Keywords - This chapter discusses how learning outcomes can be improved by focusing educational systems on developing expertise in reasoning. A small but growing body of international research suggests that a wide variety of students can develop expertise in argumentation, and by extension, expertise in reasoning. Studies show that argument-based classroom talk can lead to the acquisition and retention of general knowledge, beyond the topics taught through discussion. The chapter considers how teachers develop expertise in this form of teaching, often called "dialogic," and outline some of the challenges to spreading dialogic teaching beyond elite classrooms. It looks at how systems build organizational expertise

to support dialogic teaching and learning, which involves considering the social and institutional structures within which teachers work. Finally, in a discussion of future research in this field, the chapter calls for engaging all levels of the educational system in supporting practices that will grow powerful learning."; "Keywords: classroom talk, dialogic teaching and learning, educational systems, reasoning, argumentation, organizational expertise"

Ribeiro (2013, 2017) Tacit knowledge management for organizations is possible and can build expertise, and automation is trickier than one might originally think

"Abstract - How can we identify and estimate workers' tacit knowledge? How can we design a personnel mix aimed at improving and speeding up its transfer and development? How is it possible to implement tacit knowledge sustainable projects in remote areas? In order to answer these questions, it is necessary to distinguish between types of tacit knowledge, to establish what they allow for and to consider their sources. It is also essential to find a way of managing the tacit knowledge 'stock' and distribution within the workforce. In short, a conceptual framework is needed to manage tacit knowledge. Based on previous works and 2 years of action research, this paper introduces such a framework and describes its partial application to support the pre-operational training and hiring in a large industrial plant in Brazil. Two contributions emerge from the research. First, the concept of 'levels of similarity' is introduced as a means to qualify the experience of workers and estimate the associated tacit knowledge. Second, the capability of carrying out three types of judgement properly and speedily is put forward as being a core ability of those who possess what has been called 'collective tacit knowledge' (Collins in Organ Stud 28(2):257–262, 2007). In practical terms, the results indicate the opportunity for companies to capitalize on the experience and tacit knowledge of their workers in a systematic way and with due recognition. Ultimately, positive impacts are expected in their absorptive capacity as well as in their management and human resources systems, accident prevention, productivity and the development of sustainable projects in remote areas."

"To this end, I analyze the attempt of automating human perceptual skill in industry through a "case study": the automation of a ball mill. If automation is successful in replacing human beings and their bodies, the sociological view is correct and the phenomenological is wrong—and vice versa. As so happens in good debates, however, neither side is completely right or completely wrong. By showing that the automation of human perception is not philosophically defensible in both pure "embodied" and "embedded" versions of expertise, I put forward a middle ground embodied version of expertise that is also sociological."

Ribeiro (2014) The role of experience in Perception.

Why do two people looking at the same perceptual scene may see different things? Why do different things stand out for individuals with distinct sets or degrees of experience? The answer is that the distinct ways by which two individuals synchronize with a given practice lead them to perceive different things when experiencing the same perceptual scene. On the other hand, the context in which perception takes place may lead the same individual to sense different things

within the same given scene. In sum, assuming a perceptual scene, the claim is that what is perceived changes according to individuals' experiences and the circumstances.

"Abstract - Merleau-Ponty's phenomenology of perception comprises two main levels of analysis: the description of the general foundation upon which all human perception occurs and that of the lived, situated aspects of perception, as experienced by individuals. These 'structural' and 'situated' accounts of perception assume, respectively, the existence of a pre-personal body, which all human beings possess in principle, and of a historical body, which is the product of an individual's 'synchronization' with the world. A comprehensive and faithful description of human perceptual experience must contain, simultaneously, the general, structural, individual, and situational elements involved in perception. It has also to show the ways in which these elements impact each other, leading to distinct outcomes. I propose, here, a situated account of perception that fulfills these requisites while confirming Merleau-Ponty's insights and descriptions empirically, through cases of perceptual skill and learning in a large industrial plant near the Amazon rainforest in Brazil."

Robbins (Dean) in Murrow et al (2021) - The trouble with recognizing expertise? We can't distinguish great teachers

"The best scholars are those who have a single-minded focus, strive to learn everything about that thing, and change how we see it. To paraphrase the famed Swiss psychologist Jean Piaget: If you work to become an expert in one thing, however narrow, you gain the ability to be an expert in anything — you've trained your brain to organize knowledge effectively."

Rouse B (ISSIP Survey Response) - too many thoughts to list, but read my blog

"blog.billrouse.com"

For example: *"FOUR BOOKS I HIGHLY RECOMMEND - Posted on March 14, 2022"*

"Top of the list is Andy Norman's Mental Immunity: Infectious Ideas, Mind-Parasites, and the Search for a Better Way to Think (Harper, 2021). How can we cope with misinformation and disinformation about politics, health, etc.? Building on the thoughts of Socrates, Plato, Aristotle, Descartes, Hume and, more recently, William James and C.S. Peirce, he crafts a philosophical and pragmatic prescription for cognitive inoculation. Reading his book feels like taking a graduate course from a compelling instructor. I hope I passed."

Saxena & Srinivasan (2013) and Saxena & Gupta (2021) - methods of harnessing expertise will develop and become widespread in use

"The method of harnessing expertise to make it available and effective is in craftwork stage at present. It can develop into a tested method (decision cycles) that is in widespread use, and that method itself evolves by self-examination."

"Refs:

1. Making Organizations Smarter https://link.springer.com/chapter/10.1007/978-1-4614-6080-0_9
2. The Analytics Asset <https://www.igi-global.com/chapter/the-analytics-asset/260660>"

"This chapter deals with how to propagate an "analytics culture" in the organization. Such a culture is required to enable the successful use of analytics, and its absence retards or stalls the use of analytics. You may think that companies would naturally embed analytics into their work culture, but think about it—analytics people come from a mathematics and quantitative background but everyone does not, and many of those with a quantitative backgrounds let those skills and approaches fall into disuse as their day-to-day work teaches them to get by without."

"We can treat analytics as a multi-discipline profession because the body of knowledge required for analytics has become extensive, and businesspeople have started to designate teams and departments as being specialists in analytics. An ecosystem of service providers has evolved for this profession, including conferences, degrees, consulting services, certifications, etc. Analytics is best understood as an organizational asset that is used to improve decision making and execution. This chapter outlines the analytics landscape and aims to help organizations gain a shared understanding of issues that must be addressed to plan, build, and use the analytics asset."

Shimada K. (ISSIP Survey Response) Education and skilling strategy will change.

"See the online report on future talent from the Global Federation of Competitiveness Councils (Pope & Melo 2021)."

"No one can overestimate the importance of developing future-ready talent. As nations worldwide transition to knowledge-based economies, talent has become one of the world's most valuable resources and a hallmark of competitive countries and organizations. Multiple studies show that economies grow when there is an enabling environment for people to develop and deploy their full productive potential. Recently, talent development has occupied a central stage due to an accelerated transformation in the job market that can decisively alter the nature of work. The advancement of digitalization, automation, and Artificial Intelligence (A.I.) has already impacted nations and businesses worldwide and will have lasting effects on the ways people work, teach, and learn. Estimates show that by 2030, as many as 375 million workers, roughly 14 percent of the global workforce, may need to switch occupations. Just in China, up to 54 million people will need to transition roles by 2030.3 A.I. will disrupt millions of jobs and create new ones, often in better-paid positions."

Singhal (Newsletter Write) in Murrow et al (2021) - Managing people is an undervalued skill in our calculus of expertise

"But organizations and people are inherently change-averse, so knowing how to manage change is arguably a more crucial type of expertise than knowing how to execute (creatively or technically) on the change itself. Because it's easier to know what to do than how and when to

do it — and much, much harder to know how to help others do it. In my view, coaching — and with it, talent management — is the new and most valuable expertise in and across organizations in this current and coming era"

Smith Ramsey (2021) - The future of expertise and public conversation

"The power to explain and enchant comes with responsibilities."; "What does this have to do with scholarly communication? Everything. The communication of scholarship through the translation of expert knowledge from domain-specific language to the language of another domain or the vernacular serves two constituents: those who create knowledge and those who use knowledge. As currently practiced, scholarly communication often conflates serving scholarship in the advancement of knowledge with serving scholars in the advancement of individual careers. The causes for this are complex and beyond the scope of this essay. But it is important to note that this turn is a relatively recent phenomenon. Expanding our view of scholarly communication will benefit not only the public but scholarship, too.";

Spohrer, Jim (ISSIP Surevey) and Spohrer (2021) - Evolving T-shapes, eventually with AI/Digital Twins

"The T-model is evolving from T1 to T3 to T6. T1 was breadth (communication skills) and depth (problem solving skills). T3 was breadth (communication skills across diverse disciplines, systems, and cultures) with depth (problem solving skills deep in at least one discipline, system, and culture - e.g., computer science, healthcare, USA). T6 includes T3, but also breadth (communication skills across diverse advancing technologies, work practices, and mindsets) and depth (problem solving skills deep in at least one advancing technology, work practice, and mindset - e.g., AI, agile, and growth). The service science community as an emerging transdiscipline has enumerated many of the specific disciplines, systems, cultures, advancing technologies, work practices, and mindsets with an organizing framework for the evolving ecology of responsible actors (AKA service systems entities - people, businesses, universities, nations, etc.)."

"Abstract. Service-dominant logic (S-D logic) and service science provide a way for innovators and learners to look at the world differently and thereby improve quality-of-life for people over time. The continued development of service science as an emerging transdiscipline will depend on developing better measurements and tools for understanding the past and future identities, reputations, values, goals, and strategies of entities interacting to achieve outcomes. For example, Service Innovation Roadmaps (SIRs) can be thought of as an attempt to make explicit the "learning investment strategy" of responsible entities (people, businesses, regional governments) to change and become "better future version of themselves" in terms of value co-creating service interactions. In short, SIRs can help with the challenge of upskilling people in an age of accelerating technology and policy changes. All service systems, as responsible entities learning, invest in three types of activities, herein termed Run- Transform-Innovate activities.

This short paper provides context for a research direction to develop further the notions of SIRs and embrace complexity economics as a tool for advancing service science."

"1. When do you think people will own a digital twin of themselves? 2. Besides service science, what other organizing frameworks exist for T6 items (e.g., disciplines, systems, cultures, advancing technologies, work practices, and mindsets)?"

Sri in UpShot (2021) – Making the the case for having expertise in two areas, not just one.

Q: Is it better to be a top expert in one area, or have some expertise in two areas? Examples, a salesperson with coding knowledge, and teacher with animation knowledge.

Stokes P (2022) 'No, you're not entitled to your opinion', and the expertise of persuasion.

"'I'm sure you've heard the expression 'everyone is entitled to their opinion.' Perhaps you've even said it yourself, maybe to head off an argument or bring one to a close. Well, as soon as you walk into this room, it's no longer true. You are not entitled to your opinion. You are only entitled to what you can argue for." A bit harsh? Perhaps, but philosophy teachers owe it to our students to teach them how to construct and defend an argument – and to recognize when a belief has become indefensible."

Expertise in critical thinking, debate, arguing for and against propositions, and persuading people to vote, believe, or follow is a complex systems type of expertise. Consider making a machine operate properly and making a team of people "operate/perform" properly. Consider the leader of an orchestra.

Sundbo J. (ISSIP Survey Response) - traditional professional expertise and new AI-based professional systems

"Expertise will in the near future be a tension between traditional professional expertise and new AI-based professional systems: Where on the scale of human expertise to knowledge robots will augmented intelligence end?"

Taiwo OO (2021) Building expertise that is worth the cost

"The economist Jeremy B. Rudd made waves and national headlines with a recent working paper. What grabbed people's attention had less to do with the paper's technical analysis of problems in the study of inflation and more to do with how the paper began: "Mainstream economics is replete with ideas that 'everyone knows' to be true, but that are actually arrant nonsense." ... No class of experts has had more global political power in the past few decades

than U.S. economists."; "Rather than abandoning expertise, then, we should ask: What expertise could we build that would be worth the trouble? The philosophers Kyle Whyte and Robert Crease remind us what expertise is really about: trust, and the ways we can live when we've allocated it well."

Taurel W (ISSIP Survey Response) - vocational, academic, and lifelong learning remaining key

"Even with new technologies, new contents and new transfer methods the approach of dual education in vocational and academic education and also in life-long learning stays important."

Toffler and Reingold (2003) - The need for deeper management ethics expertise

"Chronicling the inner workings of Andersen at the height of its success, Toffler reveals "the making of an Android," the peculiar process of employee indoctrination into the Andersen culture; how Androids—both accountants and consultants--lived the mantra "keep the client happy"; and how internal infighting and "billing your brains out" rather than quality work became the all-important goals. Toffler was in a position to know when something was wrong. In her earlier role as ethics consultant, she worked with over 60 major companies and was an internationally renowned expert at spotting and correcting ethical lapses. Toffler traces the roots of Andersen's ethical missteps, and shows the gradual decay of a once-proud culture."

Trondsen, Eilif (via email) - a big tent approach needed

A "big tent approach" is needed to deal with uncertainty about the "future of expertise" as accelerating change and cross-cutting innovations impact diverse areas of business and society simultaneously. Specifically, technology plays both an assistive (augment) and replacement (automate) role when it comes to people's expertise in all the interaction and change processes in business and society, both at work and at home.

Skill-sets or expertise can take many forms, and I feel strongly that we need to take a "big tent approach" to it, particularly as there is considerable, and perhaps even growing, uncertainty about many aspects of the "future of expertise." We all know, and see every day, the rapid and even accelerating speed of change and growing range of technology innovation, and other forms of innovation (in business models, how best to build business ecosystems, etc). So, the nature of work, and "workplace" (or "workspace") will continue to evolve and be shaped by a wide range of technology, business and social/behavioral (and attitude/preference) issues and developments. These will all contribute to the shaping of work, work processes and the workplace/space. And to what extent, and how, will technology "augment" and/or

“replace” human workers. My view is that we must pay close attention to the interplay of technology (and especially AI, which seems to be emerging at increasing speed these days), and I hope to see productivity of all work processes increase as a result of increasingly productive, complimentary ways in which technology augments human work.

Both the “what expertise is needed?” and the “how expertise is best acquired?” are changing. In the past, disciplinary knowledge obtained and certified with a college degree was the prescribed route to lessen uncertainty about future job security and financial success. Today there are not only more choices and pathways to success (or hardship), but even the college degree pathway is requiring new types of expertise to meet the everchanging needs of employers. Specifically, lifelong learning skills are a must.

All of this also points to the increasingly important element of learning and training, not only within traditional educational institutions, but also in the workplace. But increasingly, learning must be seen as “active and experiential learning” (including more “doing/building” (and not just book learning)—including working with digital simulations and “digital twins” (perhaps within future metaverses). And learning must involve a life-long commitment, bringing formal and informal learning methods and processes together, ideally enabled by strong technology platforms that improve easy and flexible access to learning content, events and processes. And hopefully much of this will be supported by employers, perhaps in partnership with a variety of educational institutions, both traditional and new/innovative entities that find new and innovative ways to shape the learning and teaching processes. The result will hopefully result in enriching the form of learning interactions, mentorship and resulting in continuous improvement and growth in workers expertise and skill sets, across a range of soft skills that will be needed in the workplace, as well as strong “vertical”/technical/functional skill sets that will give workers confidence in what they can contribute and help them building their careers.

On the horizon, “digital twin” technologies for all people, places, and things will create a world of embedded, abundantly available, easily accessible expertise. However, even newer types of collective expertise (collective IQ, swarm intelligence) are still needed to address the growing challenges of under-served populations, environmental sustainability, political polarization, cultures of corruption, misinformation, and other UN Sustainable Development Goals (UNSDG).

van Dijk et al (2020) What makes an expert university teacher?

"Abstract: What makes an expert university teacher? Answers to this question can be found in a multitude of publications, but so far there has been little insight into what these answers have in common. More common ground regarding what teacher expertise entails is necessary for research and support of the professional development of university teachers. To this end, this study aims to find consensus regarding what constitutes teacher expertise in higher education by identifying teacher tasks. We conducted a systematic review in which 46 frameworks for teacher expertise from research and practice contexts were identified, analysed, and synthesised. Six teacher tasks were distinguished: 'teaching and supporting learning', 'educational design', 'assessment and feedback', 'educational leadership and management', 'educational scholarship and research', and 'professional development'. Additionally, the following three dimensions for task-related development were found: 'better task performance', 'ability to carry out a greater variety of tasks', and 'a larger sphere of influence'. We present and visualise these tasks and task-related dimensions for development as the UNiversity Teacher Expertise (UNITE) synthesis. The synthesis both reflects and contributes to consensus about teacher expertise in higher education, which further research can build on. In academic practice, this synthesis could support teachers' reflection on their professional development and inform faculty development programmes and career policies. Further research is required to validate the results of this study, in particular the dimensions for development. Other suggested areas for future research are to explore how development in different teacher tasks is interrelated, as well as developing and investigating tools and interventions based on the perspective and findings of this study."

Vandervelde (2020) The 5 primary skills for the future

"In a fast-changing world, what are the 5 vital skills you will need to be successful in your career? Walter will reveal how to develop what he calls your WINGS to embrace your future. Creativity is a mindset. And undoubtedly, together with a handful of other competencies, one of the last differentiators to give us an unfair advantage on digitally driven intelligence. Walter Vandervelde is a professor, speaker and author in Creative Thinking and a strong believer in the human capacity to grow and change things for the better. Therefore, he encourages people to combine lifelong learning by adopting sustainable growth skills. A future-oriented vision that he puts into practice as Project Lead Continuing Education at the Erasmus Brussels University of Applied Sciences and Arts. Creativity is a mindset. And undoubtedly, together with a handful of other competencies, one of the last differentiators to give us an unfair advantage on digitally driven intelligence. Walter Vandervelde is a professor, speaker and author in Creative Thinking and a strong believer in the human capacity to grow and change things for the better. Therefore, he encourages people to combine lifelong learning with adopting sustainable growth skills. A future-oriented vision that he puts into practice as Project Lead Continuing Education at the Erasmus University College Brussels."

The 5 primary skills (WINGS): Creativity, Critical Thinking, Personal Management, Social Intelligence, Attention Management. Lifelong learning of T-shaped professional – deep

knowledge (of rapidly changing knowledge) and horizontal skills are needed everywhere – and do not change as quickly (WINGS – Work and Industry Neutral Growth Skills). Complex Problem Solving = Creativity + Critical Thinking; Conflict Management = Social Intelligence + Creativity + Critical Thinking; Leadership = all five. WINGS skills require a mindset, and that is different how you learn knowledge skills. WINGS skills require practice, deliberate practice which develops mental representations for improvement, until it becomes a mindset (part of your personality).

Wakefield (2022) - Some Foresee Thinking Digital Twins Existing Within a Decade

"We are living in an age where everything that exists in the real world is being replicated digitally - our cities, our cars, our homes, and even ourselves. And just like the hugely-hyped metaverse - plans for a virtual, digital world where an avatar of yourself would walk around - digital twins have become a new, talked-about tech trend. A digital twin is an exact replica of something in the physical world, but with a unique mission - to help improve, or in some other way provide feedback to, the real-life version. Initially such twins were just sophisticated 3D computer models, but artificial intelligence (AI) combined with the internet of things - which uses sensors to connect physical things to the network - have meant that you can now build something digitally that is constantly learning from and helping improve the real counterpart.";
"Technology analyst Rob Enderle believes that we will have the first versions of thinking human digital twins "before the end of the decade".; *"Mr Enderle thinks that ownership of such digital twins will become one of the defining questions of the impending metaverse era.";*
"And increasingly our cities are being replicated in the digital world; Shanghai and Singapore both have digital twins, set up to help improve the design and operations of buildings, transport systems and streets."; *"Perhaps even more ambitious than replicating human organs is the race to build a digital version of our entire planet. US software firm, Nvidia, runs a platform called Omniverse, designed to create virtual worlds and digital twins.";* *"In March this year, the European Commission, in conjunction with the European Space Agency among others, announced its own plans to make a digital twin of the planet, dubbed Destination Earth. By the end of 2024, it hopes to have enough data from real-time observations and simulations to have a digital twin that will focus on floods, drought and heatwaves, alongside natural disasters such as earthquakes, volcanic eruptions and tsunamis, and provide countries with concrete plans to save lives in the face of these growing challenges."*

Ward et al (2019) Current Issues and the Future of Expertise Research

"Section V presents two chapters that address the current and future challenges of expertise research. In Chapter 49, Klein, Shneiderman, Hoffman, and Wears highlight the seeming irony that although expertise is increasingly sought out and needed in today's society, at the same time several communities have actively begun to disparage experts! They present a series of arguments that demonstrate why their criticisms are misguided and assert that the criticisms made can help the research community discover better methods for supporting experts and for developing expertise. In the final chapter, Ward, Schraagen, Gore, Roth, Hoffman, and Klein

discuss some of the future directions that the field of expertise studies might take in order to continue to allow people to thrive in a world whose complexities are ever increasing. In particular, they present a particular view of expertise focused on adaptive skill—a concept that has often been discussed but is an empirically neglected aspect of expertise research—as a potential remedy for advancing the field and better preparing individuals to cope with the uncertainties and complexities of tomorrow's society."

WEF (2021a,2021b) - aDefining moment to make skills the currency of the labour market

"The combination of the ongoing COVID-19-related global recession and increased automation in the future of work has led to a large-scale disruption of the jobs and skills landscape. While previous generations of talent could expect linear career progression and engagement in formal learning that decreases over time, the workforce of the future will be required to rapidly learn and relearn new skills as reskilling, upskilling and redeployment define the 'new normal' in the future of work. Current systems of learning and signalling job-fit do not provide the agility that lifelong learners will require, and we find ourselves at a defining moment to make skills the currency of the labour market."

"Upskilling for Shared Prosperity is a call to action. It makes the economic case for providing employees with learning and development opportunities to expand their horizons while minimizing skills gaps. The report highlights certain challenges, such as addressing the disconnect between current education programmes and the skills employers need today and in the future, but also presents upskilling's advantages, including wider social benefits triggered by the development of specific skills that will prove beneficial for the future success of the global economy. It offers recommendations for businesses and policy-makers, and shares examples of successful collaborations that can be replicated and expanded."

Weigel (2021) Expert knowledge requires infrastructure investments

"...no knowledge can be entirely neutral — if only because knowledge-making depends on an infrastructure that needs to be maintained, and sometimes fought for."

Whittall (2021) Do your workers have the skills of the future?

"People need the right skills to operate in this new, digitally enabled environment. And organizations that create strong relationships between technology and people (enabled by new skills and ways of working) are better positioned for future growth. So, how do we continually train a variety of workers in the most efficient manner possible so they gain new skills? How do we recognize transferrable skills and knowledge and ensure that people have opportunities to grow and thrive? If we don't address these questions now, the skill chasm that started during the pandemic will only widen."

"Skilling all for the future:

1. Establish a culture of continuous learning.
2. Improve skills equitably.
3. Customize for greater impact.
4. Step into the future."

Williamson (2021) - The Future of Expertise – and how universities need to change.

"The academy is expertise's natural abode — its incubator, gatekeeper, protector, and even home to some of its sharpest critics. At a time when the authority of the university is under attack — from the right, for whom trust in academe has steeply declined, and from the left, increasingly hostile toward the rubrics of meritocracy so central to academic life — renewed attention to expertise has never seemed so urgent. We asked nine scholars and writers from across disciplines to answer the question: What will the vicissitudes of the last couple of years mean for the future of "expertise," broadly conceived? Here's what they told us."

Winter (Editor) in Murrow et al (2021) - Method acting your way to expertise

"I love the idea of "method acting", but for experts, to consistently marry academic expertise and practical, local knowledge by regularly immersing themselves within the communities they seek to serve. My personal planning hero, Jane Jacobs, was a journalist by trade, and her dedication to seeking input not only from planners, but from the very people who were most affected by their decisions, made her a powerful advocate for ordinary cities."; "During my time working on charter cities — new cities that are granted special jurisdictions to accelerate economic growth — I partnered with a number of people who were developing cities from the ground up."

Worthen (2022) This is not your grandfather's MBA - reimagining expertise

*"He lamented the absence of the humanities, qualitative disciplines that "teach someone how to think in a complex adaptive system. We treat that system like something else — we silo-ise it, break it into chunks, put it back together and think it will be fine. The humanities are the only hope for thinking about things in holistic, non-quantifiable ways." **Here is the central tension of modern business education: At a time when society needs managers who can grapple with uncertainty and operate in a culture divided over basic questions of justice and human flourishing, most business schools still emphasise specialized skills and quantitative methods, the seductive simplicity of economic and social scientific models.** They often reduce the weirdness of human organisations to the tidy pedagogy of the case method, in which students discuss 15- to 20-page accounts of how an individual or a corporation handled some task or crisis."; "More than a half-century ago, the Ford Foundation report noted that "business itself is*

pulled in two directions”, needing managers with “breadth, perspective and flexibility of mind” as well as “better trained specialists”. ”

Wyman (Podcast Host) in Murrow et al (2021) - Explanation — not expertise — is our crisis

"We're not dealing with a crisis of expertise itself as much as a crisis of explanation. Far too many disciplines (most notably, epidemiology and public health over the last year) have run face-first into their inability to make the general public understand what they're saying and why. Part of this is simply a matter of training, but it's also the effect of a hubristic institutional worldview. Trust has to be earned and reinforced rather than simply assumed. In the absence of forceful and persuasive explanation, trust will inevitably dwindle."; "All disciplines have their own technical languages and ways of doing things; however, these norms often have the effect of closing off expertise from outside understanding and inspection."

Yao (2022) Learning to learn.

Advice to Parents - keep an open mind, ask what will AI do be able to do in the future, encourage kids to learn how to learn. Teachers - more invited lectures, more internships, more AI tools to do tasks. School Counselor - ask kids to design their own majors.

"Things change very quickly in the technology world. It's super important to help your kid learn how to learn instead of just honing in on specific subjects. Even in AI, we talk about software writing software. Maybe computer science skills are super important but think about what AI could potentially do in the computer science era where AI may be able to automate certain skills sets. Have your kids learn about the skill sets that will be applicable in the next 20-30 years."

Yurko Heather Yurko - Emergent Expertise

"The future of expertise will be emergent expertise - the ability to gather the knowledge you need when you need it, to make technology, people, process and data decisions - creating wisdom through human and AI partners."

"How do you shift leaders who have built their style based on their own expertise to become more collaborative and inclusive of other kinds of expertise in their solutioning?"

Survey - How it might be improved

For the ten predictions, or scenarios, can we devise a survey, to find out what other people think?

The initial survey is here:

https://docs.google.com/forms/d/e/1FAIpQLSfKwtttdMaKRnV97mkl_GrXoKTBjKIV3hNW0xAzZu_mFj6Cl6kQ/viewform

1. People collaborating with AI (Artificial Intelligence) machines as the new normal
 - a. Is AI the tool to rule all tools? People as tool users, building ultimate tool
 - b. Will responsible actors “drive/operate’ an AI that knows how to use all others tools be the ultimate service provider. Give your personal AI a goal, and it selects the appropriate tool to achieve the goal? The “gini” always ends wishing to undo the wishes. (Ref Stuart Russell book)
 - c. social media search: #robotoperator
2. Lifelong learning to constantly grow the breadth and depth of skills and other capabilities (T-shaped metaphor and beyond)
 - a. Is learning about to go 64x? People as learners, about to quantum leap ahead
 - b. Will we figure out how to make it possible to learn more faster?
 - c. social media search: ?
3. A race to keep up with the latest in-demand “hot” skill sets
 - a. Is monetization what matters? Will people want to have skills that pay the most?
 - b. In the short-term, people with less than average amount of money may seek this option. Once investments of an individual dominate their income, skills become less important (perhaps).
 - c. social media search: ?
4. Social-emotional intelligence will increasingly be the key to success, which may include mature corporate citizen skill set
 - a. Lone wolves earn less/less satisfied, than those who can run in packs.
 - b. This one seems important - re watch video
 - c. social media search: ?
 - d. exemplar position statements?
5. Data-driven science-based development of expertise for individuals, cities, countries
 - a. expertise is not just about individual
 - b. this matches service science well - responsible actors learning to invest
 - c. social media search: ?
 - d. exemplar position statement: Cesar Hidalgo’s work
6. Collective or swarm intelligence
 - a. somewhat like the above - but more a “buzz word”
 - b. individual versus collective intelligence - seems like collective will win
 - c. social media search: #swarmintelligence
 - d. exemplar position statement: ?
7. Responsible actors and their AI/digital twins collaborating in trusted networks, all learning to invest systematically in becoming better future versions of themselves

- a. Investing is the key skill, both for personal development and for income/well-being
 - b. this matches/is service science well - responsible actors learning to invest
 - c. social media search: ?
 - d. exemplar position statement: spohrer
8. Learning-unlearning-adapting to accelerating change
 - a. MacGowan & Shipley
 - b. Book
 - c. social media search: ?
 - d. exemplar position statement: MacGowan and Shipley
9. It's over; dead; simply at the mercy of vested interests, unless we find a new way to re-establish trust in true expertise (versus everyone's opinion is weighted by how much power to influence others that they have)
 - a. Chronicle of Higher Education?
 - b. Article?
 - c. social media search: ?
 - d. Is there also a book, the end of knowledge?
10. Not exactly like the past, and while impossible to predict with any precision, surely some blend of the traditional college graduate education expertise, entrepreneurial and technology-maker expertise, business, government, sports, art, media, political influencer expertise, and perhaps a few new types of expertise emerging, such as AI, as well.
 - a. This one is the obvious "all of the above, and more" option
 - b. The past, present, and future are a messy mixture and always will be
 - c. social media search: ?
 - d. exemplar position statement: Perhaps Geoffrey Moore's new book - he suggests causality is rarely clear in the emergent layers of the system hierarchy.

Concluding Remark

We are all the experts on our own life experiences and personal identity, a lifetime of challenges dealt with, celebrations of high points, memories of low points, as well as aspirations for the future.

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Appendix 1

The zoom chat of “The Future of Expertise” online chat is provided below. For further information the interested readers can watch the recording on ISSIP YouTube and see the slides on ISSIP Slideshare, which are linked to via the event blog post at <https://issip.org/future-of-expertise-jun-29th/>

00:30:33 Jim Spohrer (ISSIP Host): Welcome everyone!
00:31:24 eiliftronsen: Great to see you, Jim
00:37:51 Davide Nicolini: hallo everyone from the Innovation, knowledge and organizational Networks research unit Warwick Business school In the UK.
00:38:31 Davide Nicolini: <https://warwick.ac.uk/fac/soc/wbs/research/ikon/>
00:39:04 Michele Carroll, ISSIP Exec Director: Please take the 5-min ISSIP Survey here: https://docs.google.com/forms/d/e/1FAIpQLSfKwtttdMaKRnV97mkl_GrXoKTBjKIV3hNW0xAzZu mFj6Cl6kQ/viewform
00:39:45 Michele Carroll, ISSIP Exec Director: Link to add your perspective to the WP: https://docs.google.com/document/d/1vOEpt2juOBhL3cwu-wmG9PN8NX5GQ_6K/edit
00:40:21 Michele Carroll, ISSIP Exec Director: ISSIP Monthly Newsletter: <https://issip.org/wp-login.php?action=register>
00:40:47 Michele Carroll, ISSIP Exec Director: Upcoming ISSIP Events: <https://issip.org/2022-upcoming-events/>

Panelist 1: Utpal Mangla (IBM)

00:40:54 Jim Spohrer (ISSIP Host): Utpal: (1) T-shaped expertise continues to evolve, (2) ecosystems and distributed expertise - leverage ecosystem expertise
00:42:29 Jim Spohrer (ISSIP Host): Utpal: (3) industry and academia collaborations so graduates hit the ground running - investments being made (e.g., data science, AI/ML, etc.)
00:44:58 Wilhelm Taurel - HSD: This collaboration is already existing in the German dual System!

00:45:49 @TerriGriffith: German system is the one I look to as a great example of industry/academic work

00:47:22 Jim Spohrer (ISSIP Host): @Terri agreed - vocational training, not just traditional 4 year degree in Germany

Panelist 2: Heather Yurko (Mastercard)

00:48:13 Jim Spohrer (ISSIP Host): Heather's points: (1) Shifting workplace, workforce, nature of work, organizational culture

00:48:32 Jurij P: As Jim knows well, it is difficult (but not impossible) to really have a deep relationship between academia and industry that does not get complicated with issues of IP and open publishing

00:48:40 Wilhelm Taurel - HSD: @Jim the dual System has started in the vocational Training but has been enlarged into the academic education on Bachelor Level.

00:49:11 Jim Spohrer (ISSIP Host): Heather's (point 2) Nine tensions and emergent expertise, (3) 4 validated workforce trends.

00:49:34 Jim Spohrer (ISSIP Host): Note: slides will be on ISSIP slideshare after event - and everyone registered will get a link

00:50:31 @TerriGriffith: To @Jurij's point - happily, universities are also getting more interested (and maturing their skills) in developing joint IP

00:52:34 Jim Spohrer (ISSIP Host): Heather's point (5) new roles emerging

00:53:10 @TerriGriffith: First agreement LOL moment -- Heather nailed it: If you think you know the skills you need in the next 12-15 months, you'll be wrong.

00:53:42 Jurij P: Watching some young people evolve in jobs closely, it would be good to create a company that would manage an employee's 401(k), healthcare etc. over the course of a career.

00:53:45 Jim Spohrer (ISSIP Host): Heather's point (6) - diversification of talent supply

00:55:00 Jim Spohrer (ISSIP Host): Heather's point (7) fluid team formations - "unlocked" a talent marketplace internal to Mastercard

00:56:43 Jurij P: Again, listening to experiences from new job entrants, there is a definitive Old Person culture (and I am old) that tries to hold onto hierarchies, and isolate themselves from judgement to allow them to maintain their position

00:57:26 Jurij P: How is middle and top level management assessed in the context of this new model? It would be great to see case studies of this new world

00:57:45 Deacon Larry Hiner, PsyD: Heather - sounds like trust!

00:59:31 Wilhelm Taurel - HSD: Isn't such a Talent Marketplace model not limited to particular type of businesses (like Consulting or Prof Services)?

01:04:39 eiliftronsen: I would be curious to hear who has done what with using AI to shape the optimal personalized learning path (addressing the "so many resources (n IBM's learning platform)

Panelist 3: Cindy Huber (APQC)

01:06:02 Jim Spohrer (ISSIP Host): Cindy's points (1) strategic advantage in talent - hence importance of expertise, (2) expertise more fluid than it use to be

- 01:06:38 Jim Spohrer (ISSIP Host): Cindy's points (3) people keep less memorized in head, but asked to make more value judgments
- 01:07:44 Jim Spohrer (ISSIP Host): Cindy points (4) Next-perts, heading in a directions, but needs leadership involved in new ways
- 01:09:35 Jim Spohrer (ISSIP Host): Cindy point (5) growing and retaining expertise, more fluid than the ladder of the past
- 01:11:20 Jim Spohrer (ISSIP Host): Cindy's point (6) What KM do for experts - communities of practice leadership (efficiency of sharing)
- 01:12:41 Jim Spohrer (ISSIP Host): Cindy's point (7) teaching is the best way to keep learning
- 01:14:40 Jim Spohrer (ISSIP Host): Cindy's point (8) size of organization and culture of expertise varies a lot....
- 01:14:54 Scott GK MacLeod: To celebrate and further this great ISSIP panel, I created a new wiki school or WUaS wiki subject at CC-4 OCW.MIT.EDU wiki World University and School called 'Expertise' - <https://wiki.worlduniversityandschool.org/wiki/Expertise> (accessible from <https://wiki.worlduniversityandschool.org/wiki/Subjects>) - to which I'll add the recording of this conference, and have also added a MIT OCW Sloan School of Business talk, and a MIT Open Learning article - regarding expertise - with an invitation to wiki teach, add, curate, and grow this online wiki Expertise wiki subject, school & resource. Thanks for this timely ISSIP Expertise panel!
- 01:17:38 Jim Spohrer (ISSIP Host): Cindy's point (9) most people do not like busy work - routine, repetitive - these of course are AI targets (shifting to human judgement)

Panelist 4: Alexandra Medina-Borja (NSF)

- 01:21:05 Jim Spohrer (ISSIP Host): Alex's points (1) NSF focus on future of work at human-technology frontier - future technologies, (2) funding of new methods of training disabled workers, (3) funding of evolution of college education to prepare students for the future
- 01:23:02 Jim Spohrer (ISSIP Host): Alex's points (4) better than and/or with machines work of the future - adapting constantly
- 01:24:33 Jim Spohrer (ISSIP Host): Alex's points (5) US situation, very diverse entry level workforce - and under-represented populations in STEM jobs, pathways to undergraduate degree are changing
- 01:25:59 Jim Spohrer (ISSIP Host): Alex's point (6) Vision 2030 - "missing millions"
- 01:26:38 Jim Spohrer (ISSIP Host): Alex's point (7) life-long learning, adaptive, independent learners
- 01:27:15 Jim Spohrer (ISSIP Host): Alex's point (8) disruption - credentialing system and institution changing
- 01:27:32 Jim Spohrer (ISSIP Host): Alex's point (9) report on future has actions at the end
- 01:30:50 JST_Kazuyoshi Shimada: I am thinking about the future that a crisis in the supply of human resources will bring. If we fail to respond to this new human resource need and fail to engage many people, we may not only lose business, but we may also create many

people who want to be dependent on the dictatorship of a strong leader. We may have already begun to see this kind of movement in parts of society.

01:31:48 Davor Meersman: What Sitra in Finland is trying to do is a very refreshing take on gov funding - not just traceable but scalable and open - e.g. fair data economy initiative

01:32:00 Scott GK MacLeod: Practical examples of new approaches to STEM education?

I find this course CC-4 "CS First with Google at World Univ & Sch" -

<https://csfirst.withgoogle.com/s/en/home> - learning the Scratch programming language via projects to be timely in these regards (and it's potentially translatable with Google Translate into other languages spoken in the USA). Learning programming could be a very vital approach to learning other aspects of STEM. Other examples, Alex, All? What are some other online excellent courses to learn expertise, to gain expertise in programming or STEM knowledge? (You'll find both this free open CC-4 'CS First with Google at WUAS' course, and other related CC-4 ocw.mit.edu courses here <https://wiki.worlduniversityandschool.org/wiki/Programming> - too).

01:32:19 Davor Meersman: Technically it's parliament-operated, but one could say state funding instead of gov funding

01:32:57 Deacon Larry Hiner, PsyD: Human Worker as central focus - I love that!

01:33:29 Scott GK MacLeod: Thank you, Alex!

01:35:25 Davide Nicolini: I think Prof Ribeiro will have something to say about machines deciding about who is skilled...

01:35:58 Jim Spohrer (ISSIP Host): @Davide - agreed :-)

01:36:24 Jurij P: Can we get some concrete examples of how this expertise approach works and its impact? How do we know that there is not a separation of HR based on their field and expertise based on technology and process. Meaning HR thinks one thing and employees and their business think something else. Some companies used AI to decide who was going to be fired.

01:36:28 Jim Spohrer (ISSIP Host): people's judgement still very much needed

01:38:25 @TerriGriffith:@Jurji - I'm very much looking forward to your thoughts on what I'll be presenting

01:38:38 Wilhelm Taurel - HSD: Thanks for your informations! Have to leave.

01:39:53 Kevin Clark: At Choiceflows we are working on "embodied research" at the heart of decision support systems (DSS). Nextgen versions of this in the pipeline capture expertise from people getting ready to retire and making their life skills available for organization in the future. Moving executive information systems (EIS) from C-suite to Main Street. Q: What work do you see being done to capture and harness expertise in AI/ML/DSS/system forms?

01:42:38 Deacon Larry Hiner, PsyD: @Heather - yes on the servant leadership, especially as workers change from being "human resources" to valued members of society and organizations. Thanks for that.

01:43:42 Kevin Clark: ...follow up: and what do you see for capture of and access to expertise across ecosystems and value chains?

01:43:44 Jim Spohrer (ISSIP Host): Book coming soon - Martin Fleming "Breakthrough" - speaks to work engagement

01:46:15 Davor Meersman: The challenge in that platform-based knowledge economy is turning karma into a business model.
01:46:53 @TerriGriffith:@Davor - you provide my second rueful LOL momen
01:46:57 Ray Fisk: Thanks to ISSIP for hosting this Discovery Summit. I have to sign-off. I look forward to viewing the recording of this entire program.
01:46:58 Cindy Hubert: Thank you, Jim and panel!
01:47:02 Heather Yurko: Thanks all~

Panelist 5: Haluk Demirkan (Amazon)

01:47:29 Haluk Demirkan: I used to work in industry for almost 12 years (in large organizations like AT&T, Citibank, and startup like Microstrategy). Then spent almost 19 years in higher education. This year, I took a partial leave from University of Washington and joined a global company for almost 9 months ago. The gap between higher education vs. industry is 300% more than what I expected. And this gap is growing exponentially with very speedy technology changes.

01:51:06 Deacon Larry Hiner, PsyD: @Haluk - can you postulate as to why that is the case - industry v. academia?

01:56:58 eiliftronsen: And I think this is a global problem, with a growing gap between industry and academia

01:58:30 @TerriGriffith:@Haluk, I'll say we can work on the preparation issue by getting to tighter ties with industry. You can lead the charge!

02:02:46 Jim Spohrer (ISSIP Host): Haluk's point (1) industry-academia the gap is bigger than expected

02:04:47 Jim Spohrer (ISSIP Host): Haluk's point (2) AI is improving little-by-little

02:05:29 Jim Spohrer (ISSIP Host): Haluk's point (3) years to build these solution, some people build it,, other people use it.

02:06:08 Jim Spohrer (ISSIP Host): Haluk's point (4) many challenges with AI - smarter technologies remain - not here yet

02:07:25 Jim Spohrer (ISSIP Host): Haluk's point (5) off-shoring vs off-people (automation), not the panacea many think

02:08:20 Jim Spohrer (ISSIP Host): Haluk's point (6) augmentation is an important direction, but depends on data (clean and useful data)

02:08:50 Jim Spohrer (ISSIP Host): Haluk's point (7) T-shaped adaptive innovator person

02:10:22 Jim Spohrer (ISSIP Host): Haluk's point (8) rotation approach - for people

02:11:36 Jurij P: What is going to happen to those without data skills

02:12:31 Jurij P: the csr folks on the front line dealing with customers, the sales folks dealing with sales ?

02:13:27 Deacon Larry Hiner, PsyD: @Haluk - and then when does the course content become irrelevant? Is the half-life of "knowledge" actually 2 years?

02:14:03 @TerriGriffith:Another reason higher ed needs to have strong industry partnerships -- the approval process (Haluk says a year to a new degree program, we were just told 3(!)) -- I expect if we walked into the approval process with a team of industry leaders, the university would find a way to make it work.

02:14:20 Alexandra Medina-Borja: Yes, universities are slow and change in academia is really hard, but together with the National Academies we are trying to bring these issues to their radar and there are pockets of institutions/departments/societies that are starting to rethink their curriculums, pedagogies, etc.

02:15:19 @TerriGriffith:Triple threat: University/Industry/NSF and other governmental science centers

02:15:33 Davide Nicolini: A small provocation: what if the future problem was the opposite of what suggested by conventional wisdom ? machine learning builds on research done in the 1980s and that at the time was deemed "detached from industry"...

02:16:21 Jim Spohrer (ISSIP Host): @Davide - please say more, interesting direction

02:16:38 @TerriGriffith:@Davide - huge role for the humans in the process

Panelist 6: Yassi Moghaddam (UC Santa Cruz - Silicon Valley Campus)

02:17:16 Jim Spohrer (ISSIP Host): Yassi's points: (1) research of industry's future skills needs

02:19:58 Jim Spohrer (ISSIP Host): @Davide - can you say more about "future problem was the opposite of what suggested by conventional wisdom"

02:20:40 Scott GK MacLeod: Haluk, thank you for your timely presentation! In your new role, what ways do you see the possibilities for developing industry in new countries - rather than 'off-shoring,' with AI and expertise - and for developing new markets? Coming from Turkey, and brainstorming-wise, in what ways do you see developing new industry-academia relationships, and in the Turkish language, for example, dramatically, building on the fast pace of change in industry, and regarding cultivating T-shaped expertise in new cultures - and for example at CC-4 ocw.mit.edu -centric World Univ & Sch

<https://wiki.worlduniversityandschool.org/wiki/Turkey> - and in the Turkish language -

https://wiki.worlduniversityandschool.org/wiki/Turkish_language? Thanks.

02:23:35 Jim Spohrer (ISSIP Host): Yassi points (2) diagram summarizing a vast number of arfeas from specialized skills, to foundational skills, to mindset, to societal issues include diversity, equity, and inclusion

02:24:51 Kevin Clark: Jim, thank you for the invitation to join today. Great session! Must drop now to host a call at the top of the hour. All the best to you and ISSIP!

02:25:11 Scott GK MacLeod: Haluk, All, for example, the Academic Press at World Univ & Sch - <http://worlduniversityandschool.org/AcademicPress.html> - is planning for translation between Turkish, and English and potentially any of all 7,151 known living languages, and to publish to 1) paper and 2 to a new #wuAsVR digital format (in a realistic virtual earth, text in the sidebar) and to Physical-Digital Bookstores and Robotics' stores. How with ISSIP informed Expert-skills - and brainstorming-wise - to grow this in Turkey for example? Thank you!

02:28:41 Deacon Larry Hiner, PsyD: What if higher ed became a consultant to the lifelong learning process in industry and personal development?

02:30:01 Scott GK MacLeod: Larry, in what ways could CC-4 licensed (share, adapt, but non-commercially) ocw.mit.edu (now is 7 languages) already be a great example of this, in some ways?

02:30:20 Michele Carroll, ISSIP Exec Director: @Deacon Larry... your competency dev concierge, LLP (new meaning to the acronym) LifeLong Learning Process guide

Panelist 7: Terri Griffith (Simon Frasier University, Canada)

02:32:15 Jim Spohrer (ISSIP Host): @Terri's points (1) expertise is evolving as we work with a growing diversity of tools, (2) supporting workers in an organization (not just employees)

02:35:10 Jim Spohrer (ISSIP Host): Terri's point (2) tools changing rapidly - hiring us, or hiring us and our tools?

02:37:05 Jim Spohrer (ISSIP Host): Terri point (3) Talent, Technology, Technique, Target, Times

02:41:24 Deacon Larry Hiner, PsyD: @Scott, yes, for new knowledge and device development, to honor "expertise" and facilitate the growth without relying on specific research agendas. In terms of co-creating lifelong learning value, the institutions could be re-tooled to provide that value to society/industry.

02:42:17 Deacon Larry Hiner, PsyD: @Michelle - we may need to open that topic up more interactively in real time?

02:44:08 Michele Carroll, ISSIP Exec Director: absolutely. seeing possibilities in crafting ISSIP student projects for institutional members that cld pilot the concept...

Panelist 8: Rodrigo Ribeiro (UFMG, Brazil)

02:47:07 Jim Spohrer (ISSIP Host): Rodrigo points (1) explicit knowledge (amenable to codification) vs tacit knowledge (not amenable to codification)

02:47:49 Scott GK MacLeod: @Larry: Perhaps regarding "to provide that value to society/industry" - by local or culturally-relevant or nation states' and states' degrees and certification processes too? (Am thinking partly in terms of life-long learning in each of all ~200 countries - https://wiki.worlduniversityandschool.org/wiki/Nation_States (in countries' main languages)- as online universities for degrees, but especially wiki schools, the latter of which are ideal for lifelong learning and lifelong wiki teaching - and for individuals by teaching to wiki schools, or learning - can develop their own expertise in remarkable ways, T-shaped that is:) Thanks!

02:48:33 Jim Spohrer (ISSIP Host): Rodrigo points (2) need people to apply tacit knowledge, three types of tacit knowledge (contingent, somatic, collective)

02:49:02 Jim Spohrer (ISSIP Host): [what can be automated - a much more complex questions than it may seem on the surface]

02:49:22 Jim Spohrer (ISSIP Host): regression happens when

02:49:56 Jim Spohrer (ISSIP Host): regression happens when "you think you have automated something" - but really you have just shifted the "human judgement" to some other part of the system

02:50:45 Jim Spohrer (ISSIP Host): maybe automation can occur in microworlds, much more difficult in the real world

02:51:04 Jim Spohrer (ISSIP Host): many, many edge cases for driverless vehicles for example

02:51:53 Davide Nicolini: In future discussions, we should distinguish between:
1. skills (ascribed and used often for inclusionary/ exclusionary purposes) 2. competencies/ (knowhow which is learned, developed and shared in/across communities and via texts) 3. expertise/experts and its legitimation (or contestation) Distinguishing between these three

terms is important so that we do not talk past each other. It is especially critical if we start using machine learning to decide who is "skilled". Research increasingly shows that AI engineer focus on pragmatic issue and consider subtle distinctions as a waste of time, with the results that they build machines that embody some of our prejudices, biases and preconceptions. Would you trust an engineer to decide which "skills" make "a good leader?" or a good "team leader"? Would you trust an algorithm developed in some obscure lab in the Far East to decide who gets a US or UK visa (only skilled workers get visas in many).

02:51:57 Michele Carroll, ISSIP Exec Director: Tacit knowledge - the only resource that does not depreciate (like aged wine)...

02:53:03 Jim Spohrer (ISSIP Host): Rodrigo point (3) expertise is important, tacit knowledge cannot be written down, only people can apply tacit knowledge, a complex socialization process humans go through

02:54:10 Jim Spohrer (ISSIP Host): human judgements: relevant/irrelevant, risky/opportunity, etc.

02:57:49 Scott GK MacLeod: Thanks for this great philosophical perspective, Rodrigo! Jim, you mentioned UC Berkeley philosopher Hubert Dreyfus in Rodrigo's introduction, and he's written about expertise and skills! -

"Brothers Stuart and Hubert Dreyfus proposed the model in 1980 in an 18-page report based on research done at the University of California, Berkeley. The model focuses on four mental functions: recollection, recognition, decision, and awareness and how they vary at each level of expertise"

<https://www.cabem.com/dreyfus-model-of-skill-acquisition/>

A model for learning regarding expertise 'acquisition' is potentially helpful here in new ways - and applicable for industry!

Thanks.

02:58:49 Alexandra Medina-Borja: Wonderful insights, Rodrigo!

03:07:24 Rodrigo Ribeiro: Thanks, Scott and Alexandra - and Jim and ISSIP for organizing this event.

03:11:08 Alexandra Medina-Borja: I have to jump to my next meeting but this is super interesting. Thank you for the invitation and for a great meeting. It was a really important conversation !

03:11:44 Jurij P: Well you asked.. I hear a lot to ideas and would love to see some examples of ideas at work

03:11:55 Jurij P: a lot OF ideas

03:24:52 @TerriGriffith:Great to connect with old and new colleagues. Thank you all.

03:26:36 Michel Leonard: Thank you every one a Great meeting

