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Home Economics 5.0: In Readiness for Industry 5.0 and Society 5.0

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Abstract

The world has experienced four industrial revolutions and is edging into the fifth. Each revolution has shaped a unique social architecture. This paper describes four societies that humanity has lived through (Society 1.0–4.0) and acknowledges a fifth (Society 5.0). Corresponding, technology-driven industrial revolutions are expounded for context (Industry 1.0–5.0). The intent is to orient home economics and family and consumer science (FCS) practitioners to the technology-driven stages of human and societal development. With these insights, the profession can better position itself in the current Society 4.0 and prepare for the proposed Society 5.0—reinvent and redefine itself. Technological advances are happening exponentially and inexorably. Society is scrambling to keep up. To ensure that the profession keeps up as well, this paper traces the history of these phenomena and makes a case for ***Home Economics 5.0****.*

KEYWORDS: **HOME ECONOMICS 5.0, FAMILY AND CONSUMER SCIENCES, INDUSTRIAL REVOLUTIONS, SOCIETY 5.0, SMART TECHNOLOGIES, ARTIFICIAL INTELLIGENCE**

Introduction

The world has experienced four industrial revolutions and is edging into the fifth. Each revolution has shaped a unique *social architecture* (from Society 1.0 to Society 4.0)—how society is structured to deal with technological impact. For millennia, society has historically restructured itself to accommodate industrial revolutions that are driven by or the impetus for technological innovations. Industry creates or adopts technology so it can change its modus operandi with society subsequently adapting (Yakymchuk, 2024).

Humans, which are a necessary component of implementing modern industrial revolutions, live within societies (Melnyk et al., 2019). But most humans also live within family units, which is the purview of home economics and family and consumer sciences (FCS). This paper describes four societies that humanity has lived through (Society 1.0–4.0) and acknowledges a fifth (Society 5.0). Corresponding industrial revolutions are expounded for context (Industry 1.0–5.0). The intent is to orient home economists and FCS practitioners to the technology-driven stages of human and societal development. With these insights, the profession can better position itself in the current Society 4.0 and prepare for the proposed Society 5.0. By tracing the history of these phenomena (see Table 1), a case is made for Home Economics 5.0.

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Table 1 Evolution of Industry, Society, and Home Economics/Family and Consumer Sciences

	Birth of Humans	**13,000 BC**	**End of 18th Century**	**Latter Half of 20th Century**	**21st Century Onward**	
Industrial Revolution (Technological Advances)	No Industry	No Industry	**Industry 1.0** (1740–1850) *First Industrial Revolution* Steam and water powered machines, coal, factories, mechanization, railways **Industry 2.0** (1850–1950) *Second Industrial Revolution aided by Technological Revolution; the Age of Science and Mass Production* Electricity, oil, refrigeration, assembly lines, nuclear power, analog computers, automobiles, telephones, radio, television, national transportation infrastructure	**Industry 3.0** *Information/Digital Revolution* Personal computers, the Internet, fax machines, emails, listservs, Information and Communication Technology (ICT), electronics, e-commerce, merger of telephone networks and computer networks, knowledge economy, service economy	**Industry 4.0** *Exponential Technological Fusion* Smart technology, connectivity and computational power, artificial intelligence, automation, Cyber-physical systems (CPS), robotics, the Internet of Things (IoT), advanced engineering, block chains	**Industry 5.0** *The Human Touch* Social-cyber-physical systems (SCPS) to ensure interaction between and integration of machines and humans; adaptive cognitive manufacturing systems (ACMS) (high degree of machine autonomy; immersive technologies; metaverse; data personalization to ensure equity; robots and cobots; a wisdom manufacturing architecture
Societal Adaption to Technological Advances	**Society 1.0** *Hunter-gatherer Society*	**Society 2.0** *Agrarian Society*	**Society 3.0** *Industrial Society*	**Society 4.0** *Information Society*		**Society 5.0** *Super Smart Society (Creative Society)*
Home Economics Inception and Evolution	Not Founded	Not Founded	**Home Economics 1.0** Founded in 1909 in response to Industry 2.0	**Home Economics 2.0** Evolved with the times during the 60s–late 90s but faulted for being too technical, expert-oriented, and complicit in uncritically perpetuating capitalism and consumerism	**Home Economics 3.0 (almost called 4.0)** IFHE 2024 challenge to update to deal with Industry 4.0 Become AI literate; critically and responsibly embrace digitization; become resilient; and advocate for the respect of humans, home, and family vis-á-vis smart technology	**Home Economics 5.0** 2025 challenge to update to deal with Industry 5.0 and Society 5.0 Augment the profession's existing philosophy, theory and knowledge, and competencies with Industry 5.0 and Society 5.0 imperatives

Society 1.0: Hunter-Gatherer

Succinctly, preindustrial Society 1.0 was called the *Hunter-Gatherer Society*. It began with the birth of human beings more than six million years ago. Life was nomadic. People were one-with-nature and in a perpetual fight for survival—"the struggle for life, the struggle to feed [foraging] and [find] temporary accommodations" (Gülen et al., 2024, p. 56). Although there are no written records of the early stages of this society (prehistoric), archeologists have studied past and contemporary hunter-gather societies (e.g., Indigenous, tribal peoples) and discerned that they were highly social, despite their geographic mobility. They had three tiers of social networks: immediate household, a cluster of closely related households, and the wider camp that congregated with other camps when resources were bountiful (Dyble et al., 2016).

It is hypothesized that this tiered social network contributed to the cooperative relationships vital for a foraging economy as well as for protection, marriages, cultural enrichment, and societal stability (Dyble et al., 2016). Foraging economies require a lot of land (seasonal roaming) and water sources. People tend to make decisions that maximize energy outlays as they seek wild plants, animals, birds, and fishes for subsistence (i.e., produce enough for their own use but not for trade). In addition to foraging (i.e., using what is available in the natural environment), gathering "requires expert knowledge of where plant resources can be found, when they will be best to harvest, and how to prepare them for consumption" (Brellas & Martinez, 2024, p. 135).

Technologies driving Society 1.0's structure included fire, the wheel, stone tools, fishhooks, bone implements, needles and awls, bow and arrow, spears, daggers and knives, hand axes, scrapers, snares, string, leather straps, slingshots, blow darts, tanning techniques, mortar and pestle, smoke curing, and primitive weaving (interlacing grass, stems, and tree branches to create baskets and shelters) (Lee & Daly, 1999). Preindustrial dependence on craft production prevailed. Craft work (often involving creative artwork and self-expression) produced, among other things, decorative and symbolic beading; clothing; accessories; bedding; furniture; storage containers (pottery, barks, wood, and grasses); cooking implements; and embellished tools and weapons (Yao et al., 2024).

In Society 1.0, labour was often divided by gender with men hunting and women gathering, but gender roles were not rigid and could vary within and between cultures. Because finding and preparing sufficient food was so challenging, group sizes in Society 1.0 tended to be small. The presence of elders and children (both less able to contribute) influenced foraging and gathering endeavours. Societal members measured wealth not in terms of material accumulation (too cumbersome to move around) but in generosity and one's ability to share (Brellas & Martinez, 2024).

Obviously home economics did not exist during Society 1.0 having not been founded until 1909 (Brown, 1985). But knowledge of what this society looked like provides valuable context for ensuing societal architectures as humanity moved through inexorable technological advancements. Also, modern-day foraging societies still exist (e.g., the Inuit, the Ayoreo, the Awá, and the reindeer herders of Siberia) (Survival International, 2024) thus affording home economists and FCS practitioners opportunities to experience them and their everyday lives.

Society 2.0: Agrarian

About 15,000 years ago, around 13,000 BC, Society 2.0 emerged—the *Agrarian Society*—wherein humans transitioned from a nomadic lifestyle and foraging/gathering economy. Technology driving the emergence of Society 2.0 included domesticated animals (especially beasts of burden such as horses, oxen, mules, and donkeys); hoes; sickles; plows; irrigation systems; fences; seed drills; seed saving; horse-related technology; horse-drawn threshing machines; water-powered flour mills; windmills; and more advanced weaving (and knitting) to make cloth, clothing, ropes, and sails from harvested cotton and flax fibers and shorn wool (Mazoyer & Roudart, 2006).

Society 2.0's economy was based on growing, producing, and maintaining farmland and crops. People established settlements with permanent buildings, developed irrigation techniques, planted crops, employed husbandry (bred animals and crops), and built fences while still foraging and gathering some food and resources from the land (Gülen et al., 2024; Keidanren, 2016; Langlois, 2001).

The extended family was the main production unit. Children learned and worked at home with multiple generations. Schools were not common until the end of this Era. The division of labour was such that men mostly worked the fields, and women supported the household and family unit so the family unit could be self-provisioning while also producing enough to give to overlords. As before, gender roles were not rigid and could vary within and between cultures. Serfdom (i.e., workers were tied to a particular estate often in indentured labour) and slavery were common (Littek, 2001; Moravec, 2008).

Social life unfolded in increasingly complex communities and statehood (i.e., independent cities or nations) compared to a nomadic existence. To accommodate this agriculture-based economic model, a literate governing class emerged with standing armies guided by strict religious tenets and assumptions of divine right (i.e., kings received their authority from God). This elite ruling class lorded over the poor, illiterate masses (i.e., peasants and serfs) who farmed the land (Gülen et al., 2024; Keidanren, 2016; Langlois, 2001).

Agrarian societies often exhibit larger populations than nomadic societies (due to improved food sources), a combination of farm life and town life, and more leisure time in concert with technological advances such as writing, printing, and musical instruments. Disease epidemics increased due to infections in crowded towns and cities. This society was the first to witness urban poverty and unemployment with associated social ills (e.g., crime and violence) (Cohen, 1989). Some city states flourished (i.e., an independent sovereign city that is separate from the nation) (e.g., Venice). With half of their population engaged in nonagricultural activities, some of these cities managed to become commercial societies (Cohen, 1989).

Indeed, modern-day agrarian societies (where less than half of the population is engaged in agricultural activities) tend to have a significant industrial sector (Cohen, 1989; Richerson & Vila, 2001) (e.g., Indonesia, India, Peru, Pakistan, and African nations). Although home economists did not live through Society 2.0 per se, contemporary majority world (developing world) home economists and FCS practitioners work in modern-day Agrarian societies that have "variable admixtures of industrial technology" (Richerson & Vila, 2001, p. 6–95).

Society 3.0: Industrial

Society 2.0 basically lived on until the end of the 18th century when Society 3.0—the *Industrial Society*—arose and evolved in response to the First and then Second Industrial Revolution: Industry 1.0 (1740–1850: coal, steam, and waterpower, and mechanization) and Industry 2.0 (1850–1950: science, electricity, and mass production). Attendant technology emergent over time included water and steam power, coal, railways, oil-based power, mechanization, electrification, refrigeration, the conveyor belt, manufacturing, and mass production.

Industry 1.0 pulled society away from agriculture toward factories. Industry 2.0 (aka. the Age of Science) was characterized by a plethora of one-of-a-kind technological innovations that were protected and encouraged by patents. Patents enabled ubiquitous inventors to profit from their work, which bolstered rapid industrial and economic progress. Industry 2.0 generated myriad new technologies employed in industry and homes: the typewriter, the telegraph machine, telephones, the refrigerator, light bulbs, the radio, the vacuum cleaner, the combustion engine and automobiles, and horse-and electricity-powered street cars (beginning of mass transportation).

These technological advances sped up industrialization and changed home life forever. Factor in World War I, and industry, family life, and society 3.0 changed profoundly. In the society that evolved to keep up with Industry 2.0, women started working outside the home (in factories, domestic service, teaching, and nursing); children worked in factories; men worked in factories instead of in agricultural work; families had to buy products and services instead of producing them themselves; and schools were established to educate students for the factory-based workforce. Factories were not safe, and most overcrowded urban centers lacked potable water, hygiene, sanitation, adequate housing and nutrition and were rife with crime and filth. The women's rights and suffragette's movements started as did unions and labour rights (Moravec, 2008).

Still in Society 3.0, but arising from World War II, technology continued to evolve giving us television, movies, synthetic rubber, nuclear power, radar, penicillin, jet engines, analog computers, national transportation infrastructures, motels, an inexpensive housing boom, new fibers and textiles, and skyscraper architecture to accommodate industrial city populations and commerce (Suciu, 2020). Society 3.0 (the Industrial Society) continued to restructure beyond World War II in the years leading up to Industry 4.0 (Information Revolution) and the necessity of Society 4.0—the Information Society.

This overlap manifested in the Baby Boom generation (1946–1964), which eventually replaced the Silent Generation in the Post World-War II workforce and society. In the 1970s and 80s, both parents tended to work with women doing so by necessity and choice (to deal with hyperinflation and feminism, respectively). Too many people worked multiple jobs. The latchkey kid phenomenon took hold, wherein working baby boomers' children were underparented and undernurtured. Families eventually became smaller as birth rates continued to decline during and after the 1970s Baby Bust. Young people started to delay marriage and starting families. Single parents increased as did childless couples. Cities grew, and agricultural and rural locales began to shrink (Moravec, 2008; Muller et al., 1991).

To continue, due to declining birth rates and an attendant slowly shrinking workforce, immigration and associated diversity mushroomed toward the end of Society 3.0 and continues today. National economies began to operate within the neoliberal globalization context, which exacerbated the have-and have-not world with exclusion, injustice, and inequalities. Free trade became the mainstay of national and global economies to the detriment of human rights, labour rights, women and children's rights, and the environment. The pace of technological and societal change accelerated exponentially but with declining returns (e.g., stress, illiteracy, threats to privacy and security, and the bane of consumerism and nonhuman-centered globalization). Individuals, families, and communities suffered (Moravec, 2008). And this was before the invention of computers, the Internet, social media platforms, and the Information Society.

Home economics and FCS lived through Industrial Society 3.0 and beyond having been founded in 1909 in response to the vagaries of Industry 2.0 (Brown, 1985). The profession gained century-long experience engaging with societal transformation in the face of two industrial revolutions—Industry 1.0 and 2.0 (see Table 1). However, in the early 1990s (the tail end of Society 3.0), home economics was faulted for being too technical in nature (insufficient interpretive and critical practice), too expert oriented instead of viewing families as partners, and too complicit in uncritically perpetuating capitalism and consumerism (Brown, 1993). She intimated that we had failed to keep up with the times to the unintended detriment of individual, family, and community well-being, strength, and resiliency.

Society 4.0: Information

At the end of the 20th century (just 25 years ago—2000 onward), the *Information Society* (Society 4.0) emerged out of the Industrial society. We currently live in the Information Society, which is barrelling forward with smart technology. The Information Society moniker reflects societal restructuring in the early 1990s that was driven by Third Industrial Revolution technology focused on information, which had become an economic commodity. Technology at the time included the computer; the MS Windows operating system; the Internet; email, dial-up modems, listservs, fax machines, Information and Communication Technology (ICT) (analog, wireless, and digital); the merger of telephone and computer networks enabling personal computers, mobile phones, and cable and satellite television; the service economy; and the knowledge economy. Telework (telecommuting) and telemedicine became mainstream in the 2000s (Gülen et al., 2024; Keidanren, 2016; Saxena et al., 2020; Strivemindz, 2023).

Society 4.0 started out in an era of information distribution made possible due to ICT advancements. Manufacturing and industrialization still occur but in tandem with the buying and selling of information, knowledge, and services (Mavrodieva & Shaw, 2020). As with Society 3.0, Society 4.0 appears to be straddling two industrial revolutions, which means it must restructure to accommodate both industrialization and digitization.

The technological influence of Industry 3.0 (1960–1990s—the Information/Digital Revolution) on Society 4.0 lingers with augmentation. Streamlined laptops, iPads, tablets, and smart phones now have astounding computing power (Strivemindz, 2023). But Industry 4.0 (2000 onward—what I am calling the *Exponential Technological Fusion Revolution*) is about all of that as well as advanced digitalization, artificial intelligence (AI), automation, robotics, the Internet of Things (IoT), smart technology, and Cyber-physical systems (CPS) (to be discussed) (David, 2016; McGregor, 2022b; Yao et al., 2024). Although still called the Information Society, this is far beyond the mere selling and distribution of information and knowledge, which was avant-garde at the time.

Foremost in Society 4.0, not only are technological advances happening extremely rapidly, but they are also being fused together instead of standing alone like in the First and Second Industrial Revolutions (Yao et al., 2024). For example, the automobile, radio, and telephone were invented around the same time, followed by the computer, the Internet, and satellites, but they were not combined (fused) into a vehicle until decades later. Industry 4.0 is all about furthering industrialization by fusing separate technologies as soon as they are invented and sometimes intentionally invented to enrich fusion. Several pivotal technological advances make this fusion possible and even imperative for Industry 4.0 to flourish.

To begin, digitization refers to converting analog data (e.g., mass, length, time, color, current, temperature, and voltage) to 1s and 0s (digits) and using digital technology to both store and process these data and communicate and even interpret attendant information (Digital Adoption Team, 2024). AI is a branch of computer science focused on developing intelligent machines that can simulate human cognitive abilities (e.g., learning, decision making, problem solving, perception, and communication) (Bliwise, 2018). Automation refers to applying technology (including robots and cobots) to achieve output and industrial outcomes with minimal human input. The intent was to bolster human capital by freeing humans from mundane, repetitive, boring, and error-prone tasks, so they can engage in more creative thinking, work, and innovation (Agrawal et al., 2023).

The IoT connects various things via a computer network, builds highly advanced systems using these connected things, and integrates "several of these diverse systems so they can coordinate and collaborate with each other" (Government of Japan, 2015, p. 14) (e.g., smart appliances, fitness monitoring, and healthcare monitoring).

> What makes a technology 'smart' is its ability to communicate and work with other networked technologies [thereby] allowing automated or adaptive functionality as well as remote accessibility or operation from anywhere. … Smart technology refers to the integration of computing and telecommunication technology into other technologies that did not previously have such capabilities (Campbell, 2019, p. 1).

Finally, Industry 4.0 involves Cyber-physical systems (CPS), or physical systems connected to the cyber world via computer algorithms (i.e., set of rules or instructions to complete calculations and other problem-solving operations) (Yao et al., 2024). Examples include smart cars, smart appliances, smart electrical grids, airplanes (autopilot), and smart medical devices for health and fitness monitoring. A jog is no longer solitary if one is wearing a Fitbit. CPS mechanisms tightly integrate users with the Internet (Suh et al., 2014) thereby creating "'smart networks' capable of functioning without human participation" (Melnyk et al., 2019, p. 381). CPS is "a hyper-connectivity revolution" (Saxena et al., 2020, p. 359).

Unfortunately, a paradox has emerged in Society 4.0. The more that people are in contact with each other via technology (i.e., hyperconnected), the less they are connected as human beings. Ironically, society is social but not in a healthy or sustainable way. Society 4.0 has become a combination of mass personalization, mass customization, and mass automation (Yao et al., 2024). The world is rife with, what can be, debilitating human immersion in ubiquitous social media platforms, virtual reality (VR) gaming and gambling platforms, augmented reality (AR), online shopping, and so on. Personal well-being and safety, family dynamics, and community engagement are threatened due to social isolation and inadequate socialization into responsible use of these technologies.

As well, job security is threatened due to automation and robotics. Personal privacy, identity, and financial security are threatened due to insecure and abused digital and cyber connections. And Education 4.0, created for Society 4.0. cannot adequately deal with Industry 4.0's lingering economic, social, and personal issues or provide requisite skills for 21st century learning (i.e., critical thinking, collaboration, communication, and creativity) (Yakymchuk, 2024). Education 4.0 was designed to advance Industry 4.0 (Makrides, 2021) (including STEM—science, technology, engineering, and mathematics), but it failed society with its overly strong commitment to technological savviness to the exclusion of the human factor. The latter are now captured in the STEAM movement with A meaning arts and humanity, so STEM education can better address real-world problems with a creative, accountable human face (Gülen et al., 2024).

Yakymchuk (2024) elaborated further on challenges that Industry 4.0 has triggered for Society 4.0.

> The boundaries between everyday life and the world of digital technologies are blurring … new rules and a particular social contract are being formed, which can provoke social (digital) inequality and excessive control by the state or transnational corporations. It is also clear the challenge of replacing hundreds of millions of job places with automated systems and artificial intelligence, but also the question of the readiness of educational systems to prepare personnel for the new realities of the new economic system (p. 176).

In effect, the society that has emerged in the short term (over the last quarter century) to cope with the exponentially advancing Fourth Industrial Revolution is not working right now. It is too dependent on Big Data (stored information generated using smart devices) and AI to the exclusion of human input, perception, and interpretation (Mourtzis et al., 2022; Yao et al., 2024). Many governments are now dependent on Big Data patterns to "tell people how to lead and optimize their lives … Digital technologies and data science are used to weave the very fabric of sociality and to shape societies" (Helbing, 2016, pp. 1–2). Previous assumptions that AI would overcome human imperfections were flawed. AI is not neutral, rational, or impartial (Helbing, 2016).

Instead, both AI and Big Data have severe limitations, and profound, unintended side effects that are challenging, some say threatening, society (Helbing, 2016; Yao et al., 2024). This is unfortunate because the vast amount of data now generated is just too much for humans to handle. People now depend on AI to analyze and transform it into easy-to-understand data while uncritically assuming that the upfront information was correct and unbiased (Mavrodieva & Shaw, 2020).

Home economics and FCS practitioners barely had time to grapple with the Second Industrial Revolution (industrialization and mechanization) before they were shoved into another and then another in rapid succession, respectively: Industry 3.0 (computers) followed just a few years later with Industry 4.0 (information and smart technology). Technological advances are happening exponentially and inexorably. Recently, the International Federation for Home Economics (IFHE) (2024) coined the neologism *Home Economics 3.0* to spearhead its initiative to convince home economists to reboot and update, so they can deal with Industry 4.0.

IFHE (2024) likened this to a software update justified because "we live in an era characterized by the integration of digital technologies, artificial intelligence, internet of things and automation" ("Home Economics 3.0" section). An updated home economics would (a) critically and responsibly embrace digitization, (b) be both AI literate and resilient to help others be the same and (c) advocate for human behavioural changes that align with technological changes (Börries et al., 2024). IFHE's call for action is timely as neophyte Society 4.0 is truly struggling. But more significantly, Home Economics 3.0 may not be enough as society is concurrently facing a looming Industry 5.0 and the imperative for yet another restructuring to Society 5.0 when Society 4.0 has barely taken root.

Society 5.0: Super Smart

Indeed, just 15 years into the 21st century (2015), a call emerged for Society 5.0—the *Super Smart Society*—which does not exist yet but is envisioned as a response to a nascent but inevitable Industry 5.0 (a marriage of machines and humans in the metaverse). The Super Smart moniker reflects two things: (a) the ubiquitous prevalence of smart technologies and (b) a society designed to be smart about dealing with how it is affected. The Japanese government coined and conceptualized Society 5.0 ten years ago (Government of Japan, 2015; Gülen et al., 2024; Keidanren, 2016).

Society 5.0 pushes back against the pervasive negative side effects of Industry 4.0 and anticipates Industry 5.0 (Government of Japan, 2015; Gülen et al., 2024; Shiroishi et al., 2018; Yao et al., 2024). The Japanese presumed that, in addition to digitization being a technological innovation, "digitalisation is a philosophical movement that aims to ensure the efficient interaction of people with machines and robots in accordance with [humans'] demographic, economic and sociological structures" (Gülen et al., 2024, p. 57). They also called Society 5.0 "artificial human" (Gülen et al., 2024, p. 57) to convey the idea that technology will be used with a human touch to ensure that people get what they need (i.e., equity instead of equality). "Super smart societies have to treat technology as innovations that work for the benefit of society, not as a threat. [Through] a collaborative relationship between super smart machines and humans, a fair [equitable] and sustainable society is envisaged" (Gülen et al., 2024, p. 58; see also Mourtzis et al., 2022).

To that end, Industry 5.0 (the *Human Touch*) will initially use Web 4.0 technology and Industry 4.0 technology (to be discussed) to add a human dimension to overcome the alienation created by Industry 4.0 (Gülen et al., 2024; Saheal & Mohammad, 2025; Saxena et al., 2020; Yakymchuk, 2024). The Fifth Industrial Revolution will

> augment digital transformation with a more meaningful and efficient collaboration between humans and the machines and systems within their digital ecosystem. The partnership of humans and smart machines marries the accuracy and speed of industrial automation with the creativity, innovation, and critical thinking skills of humans (Generative AI, 2022, para. 1).

Society 5.0 does not exist yet, but those who envisioned it wanted to create a social-cyber-physical production system (SCPS) to augment existing CPS (Mourtzis et al., 2022; Yao et al., 2024). This social augmentation "takes into account both technical and human factors of production [and enables people to] investigate manufacturing systems from the perspective of a social-technical view" (Yao et al., 2024, p. 236). The latter respects the interdependence of social (human) and technical aspects of a society or system and emphasizes that both aspects

must be optimized together to achieve positive outcomes (Pasmore et al., 1982). Society 5.0 is intended to work with smart technologies (a rich blend of physical and digital worlds) to create "a sustainable, inclusive and human-centered society" (Mavrodieva & Shaw, 2020, p. 4; see also Mourtzis et al., 2022).

Indeed, the negativity driving Society 5.0's conceptualization arose from the fallout of the *disruptive, fused technologies* used to advance Industry 4.0, which caused unintended dehumanization (Mourtzis et al., 2022). To elaborate, Web 4.0 and Industry 4.0 technologies significantly disrupt (interrupt or disturb) and then alter the way business, consumers, governments, and societies operate (McKinsey & Company, 2022). This intentional disruption is why contemporary society is especially challenged.

Principal examples of disruptive technologies include (a) connectivity and computational power (e.g., the Internet; cloud technology [on-demand access to databases, storage, and computing power housed on a global network of servers instead of in-house]; and blockchains [i.e., secure distribution of assets on the Internet]); (b) artificial intelligence (AI) (i.e., machine learning and deep learning that mimics human learning and reasoning); (c) human-machine interactions (e.g., VR, AR, robotics, and IoT—real-time information exchange between humans and machines); and (d) advanced engineering (e.g., 3-D printing, nanotechnology, and renewable energy technologies—biomass, geothermal, solar, wind, perovskite solar cells, and floating solar farms) (McKinsey & Company, 2022; Smith, 2022).

In short, Society 5.0 is a response to

> the creation of the internet of things, the active use of artificial intelligence (AI), the tremendous progress of biotechnology, the creation of new materials with unprecedented properties, the leading role of cyber-physical systems, the implementation of the control functions of cloud technologies, etc (Melnyk et al., 2019, p. 381).

When Society 5.0's architecture is successfully structured, it will

> be a human-centered society in which economic development and the resolution of social issues [triggered by Industry 4.0 technologies] are compatible with each other through a highly integrated system of cyberspace and physical space. [It will be] a society that is sustainable and resilient against threats and unpredictable and uncertain situations, that ensures the safety and security of the people, and that individual to realize diverse well-being (Japanese Cabinet Office, 2024, para. 1).

Mavrodieva and Shaw (2020 continued, explaining that Society 5.0 will take "Industry 4.0 a step forward [by] depicting a data-driven economy and society—a Super Smart Society, with a focus on individual needs and capabilities" (p. 3). By merging physical space with cyber space, more precise and personalized data can be collected leading to improved decision making and problem solving with humanity at the core. "This process is expected to change the way society functions in all areas of human life" (p. 3). This includes merging human touch with smart technology in several key sectors: health care, agriculture and food, finances, disaster management, energy, manufactured goods, services, city infrastructures, and supply chain logistics (Mavrodieva & Shaw, 2020). Mourtzis et al. (2022) added trade, religion, justice, transportation, military, tourism, entertainment, media, sustainable environments, and governance.

Japan envisions its Society 5.0 to be in place by 2030 and encourages other nations to follow suit (Gülen et al., 2024; Mavrodieva & Shaw, 2020; Mourtzis et al., 2022). A transition to Society 5.0 is especially needed given the *metaverse* nature of Industry 5.0 (Yao et al., 2024). Metaverse means beyond the universe or beyond the familiar physical realm to a blend of physical reality and VR (i.e., an immersive feeling of being real in a computer-generated space but without physical or sensory involvement). Think of the movies *Enders Game* and *Ready Player One* as well as VR gaming, training, and therapy. The metaverse is possible due to a combination of AI, blockchains (for digital security) and 3D visual technologies. Regarding the latter, augmented reality (AR) allows users to interact with the virtual and real world, but VR completely immerses users in a computer-generated place only. The metaverse is thus the Internet of Place (IOP) (Accenture, 2025) versus the Internet of Things (IoT).

The metaverse also "generates digital replicas of real spaces called digital twins" (Accenture, 2025, para. 1; see Yao et al., 2024). The metaverse, where the digital world mirrors the physical world, is navigated using avatars aided by *immersive technologies*: (a) wearable devices (e.g., headgear, handsets, body gear, treadmills, and steering wheels); (b) screens, projections, consoles, and apps; and (c) immersive workplace and learning platforms (e.g., Microsoft Mesh). Avatars simulate social interactions in online environments for any number of reasons including social interaction, gaming, therapy, training, and manufacturing (Accenture, 2025; Lutkevich, 2023).

Industry 5.0 is understandably concerned with the *industrial metaverse*, whereby avatars are used along all aspects of the value chain to improve products and services, efficiency, and profits. "The industrial metaverse, blending cutting-edge tech with a human-centric approach for Industry 5.0, is now a reality" (Martínez-Gutiérrez et al., 2024, p. 1), but it is still in its early inception stages as far as its industrial potential. Yao et al. (2024) explained that instead of using technology to liberate workers' physical labour (via automation and robotics), Industry 5.0 will use technology to liberate workers' mental labour (via avatars, and cobots—collaborative robots working in tandem with humans) (see also Mourtzis et al., 2022).

In short, with Industry 5.0, "the Internet is moving to the Metaverse" (Yao et al., 2024, p. 248). Instead of the IoT (connecting things to the Internet), the Industry 5.0 metaverse "realizes the interconnection of humans, machines, things and the environment" (p. 248). "Machines/computers, things/environment and humans coordinate with one another" (p. 242). In an amazingly humanized evolution, the Industry 5.0 metaverse construct thus accommodates the social augmentation of the Cyber-physical system (yielding SCPS) and connects it to sustainability, human-centric systems, and resilience (Yao et al., 2024).

This new approach will be feasible through a *wisdom manufacturing architecture* (Yao et al., 2015, 2024), which is an aggregate of (a) smart manufacturing (smart factories); (b) cloud manufacturing (resources packaged as services available through the cloud); (c) socialized enterprises (using social networking to help employees, customers and suppliers interact); and (d) intelligent manufacturing (applies AI) (Yao et al., 2015). This visionary industrial architecture addresses the relationship among "knowledge, intelligence, creativity/innovation, learning and wisdom [leading to the integration of] things, computers and humans, ubiquitous artificial and collective intelligence, as well as explicit and tacit knowledge" (Yao et al., 2015, p. 1291).

Ground-breaking wisdom manufacturing "is a hypernetwork composed of a physical network (IoT) [Internet of Things], a cyber network (IoS) [Internet of Services], a social network (IoP) [Internet of People] and a linking network (IoCK) [Internet of Content and Knowledge]" (Yao et al., 2024, p. 240). Metaverse-related technology is in the early stage of concept formation and very incomplete, but it has been happening for more than a decade (Martínez-Gutiérrez et al., 2024; Yao et al., 2024). Society 5.0 must somehow be ready, and so must home economics/FCS.

Home Economics 5.0

It becomes increasingly clear that IFHE's (2024) Home Economics 3.0 challenge may not be enough. Coming to grips with Industry 4.0, while ignoring Industry 5.0, is not tenable because both are happening at the same time at an inexorable pace. But endeavouring to overhaul on both fronts would be a massive update for the profession. Or would it? Home economics and FCS practice comprises three dimensions: philosophy, theory and knowledge, and competencies/skills (Kieren et al., 1984). Applying this model suggests that updating the profession is feasible if the will is there—Home Economics 5.0 is possible. We already have competencies that can be augmented. Our philosophy has been articulated if not implemented. And knowledge (theory and content) can be gained and evergreened.

Theory and Knowledge

Although a daunting task, learning about Industry 4.0 and upcoming 5.0 is a doable thing. It is a matter of critically accessing, reading, and processing information about these two industrial revolutions and their effect on society. This exercise would augment and replace aspects of existing home economics theory, knowledge, and content. A primer on that new information, which can be mentally processed to become knowledge, was presented in this paper.

We must also keep abreast of Japan's Society 5.0 initiative to see if other nations get on board and to what extent. What might this society look like in different nations? Also, are there other visions or versions of Society 5.0 instead of Japan's Super Smart Society? For instance, Mourtzis et al. (2022) called Society 5.0 the *Creative Society*, one that is evolving from a response to Industry 4.0 (AI-supported smart manufacturing systems and CPS) to Industry 5.0 (SCPS, and adaptive cognitive manufacturing systems) (ACMS). Compared to smart manufacturing, cognitive manufacturing "can recognise, assess, plan, predict, optimise, react, adapt, and enhance their operation with some degree of autonomy, make decisions, and execute actions to achieve objectives analogous to real-world cognitive behaviour in a changing environment" (ElMaraghy & ElMaraghy, 2022, p. 7442).

Mourtzis et al. (2022) reasoned that anyone can become super smart, but building Society 5.0 (the Creative Society) in the face of a profoundly different industrial and manufacturing model (cognitive in nature—acquiring knowledge through thought, experience, and the senses) will require a three-pronged effort involving (a) diverse people's (b) imaginations and (c) creativity. For the time being, until ACMS and the metaverse solidify at the industrial level, "Society 5.0 can be viewed as a human-centered Industry 4.0 environment" (p. 11) focused on resilience, sustainability, and equity (Mourtzis et al.).

Competencies

Competency wise, home economists and FCS practitioners tend to have a healthy roster of practice skills that are germane to engaging with both Industry 4.0 and 5.0 and attendant societal restructuring (Society 5.0): interdisciplinary thinking, integrated and holistic thinking (ideally integral thinking), communication, problem solving, decision making, management, leadership, collaboration and cooperation, research, analysis, planning and development, a learner-centered pedagogy, advocacy and lobbying, reflective practice, a global perspective, cultural competence, capacity building, resiliency (i.e., recover, adapt, and thrive when facing change and challenges) and the all-encompassing critical science approach (Alexander & Holland, 2020; Keiren et al., 1984; Lead FCS Education, 2018; McGregor & McCleave, 2007; Nickols et al., 2009).

To this century-long roster they should especially develop their digital literacy, and AI literacy. In addition to being able to "use software or operate a digital device, [digital literacy] also includes a large variety of complex cognitive, motor, sociological, and emotional skills" (Osterman, 2012, p. 5). Digital literacy involves (a) basic computing and internet navigation skills; (b) critical thinking, creativity, comprehension, and critical reflection (cognitive skills); and (c) the emotional-social skills to deal with social media computing (Eshet-Alkalai, 2004). AI literacy entails both (a) recognizing, understanding, using, and critically evaluating AI applications; and (b) effectively communicating and collaborating with AI (Laupichler et al., 2022).

Home economists and FCS practitioners should also master (a) complex decision making (i.e., involves multiple stakeholders, factors, uncertainties, and trade-offs); (b) technological literacy (i.e., use, manage, comprehend, and assess technology); (c) systems analysis (i.e., study a system to aid in technical decision making); and (d) understanding big data, which are extremely large, complex, and constantly changing data sets (arising from smart device and social media usage) that are not easily managed or analyzed (Schmitt, 2024; Scully, 2023; World Economic Forum, 2023).

But doing so would help us unlock deep insights that can be used to identify trends, spot anomalies and divergence, determine root causes of issues, improve outcomes, augment client and customer insights to personalize practice, and calculate risks. Other benefits of understanding big data include gaining a competitive advantage, improving client and partner service, focusing and targeting interventions, promoting available services, improving decision making and problem solving, and bolstering efficiency and effectiveness (SAS Institute, 2025; Schmitt, 2024; Scully, 2023; World Economic Forum, 2023).

Philosophy

It is the philosophy part that may need work. It is not so much that we need to update our philosophy but rather implement it. For nearly 50 years, elements of our philosophical armour have been evolving but are not yet solidified into a ready-to-wear vestment. We tend to resist philosophizing. Intrepid home economists, Brown and Paolucci (1979) (see also Brown, 1980) acknowledged this resistance but persevered nonetheless and laid the foundation for a powerful belief system to guide our practice, regardless of what the world looks like.

They gave us a mission statement that was ahead of its time. It built on neologisms they had borrowed or created (i.e., newly coined expressions for sophisticated intellectual constructs): (a) systems of action (technical, interpretive, and critical); (b) practical perennial problems; (c) moral values reasoning; (d) practical reasoning; (e) valued ends instead of given ends; (f) three metascientific perspectives (modes of inquiry): analytical/empirical science, interpretive science, and critical science; and (g) the human condition, which is far beyond well-being (Brown & Paolucci, 1979). A respondent to their new definition of home economics added transdisciplinarity (Kockelmans, 1979) (see also Brown, 1993). Colleagues have since provided plain-language versions of these constructs to make them more accessible and palatable (e.g., Alexander & Holland, 2020; Hultgren & Coomer, 1989; Johnson & Fedji, 1999; Kieren et al., 1984; McGregor, 2007, 2014, 2022a, 2023; Vaines & Wilson, 1986; Williams et al., 1990).

International colleagues have subsequently added even more threads to our philosophical vestment: family ecosystems, human ecology, transdisciplinarity, transdisciplinary human ecology, complex adaptive systems, integral specialist, expert novice, home economics literacy, carnivalesque (temporarily turn the world upside down to expose domination), home as habitation and protection, life world and Being-in-the-World, thoughtful practice (knowledge in action), Aristotelian human action in everyday life, dialogics (meaning) as well as dialectics (synthesis), answerable for creating an act as well as responsible for an outcome, and qualities of living (dynamics of being alive) versus quality of life (static) (see McGregor, 2020).

In an overall synopsis, McGregor (2020) proposed five overarching philosophical ideas to take us forward. With our new raison d'être being "human action in everyday life as it impacts the human condition" (p. 53), she recommended (a) assuming that individuals and families are in a relationship with the World not just within their unique family unit. We should thus (b) be humanistic oriented as well as family oriented, (c) be focused on the dynamics of forces at play for being alive as well as on more controllable processes, (d) view the home as a mediating space that we work through—a means to an end with that end being an improved human condition, (e) and be concerned with 'human action in everyday life' as well as our longstanding focus on well-being and quality life.

Conclusion

We must make sure that both preprofessional socialization and professional development (PD) initiatives (via higher education and professional associations) continually educate and update us for the current and upcoming industrial revolutions and attendant societal restructuring. Home economics was founded to deal with the vagaries of the Second Industrial Revolution (early 1900s). We have persevered for more than a century through two other industrial revolutions with a fifth looming. Going forward is a given, but we must be ever vigilant of staying current—philosophically, theoretically, and pragmatically—because families and society are forever changing.

As I write this, the Godfather of AI and winner of the 2024 Nobel Prize for Physics (Geoffrey Hinton) predicted that "the odds of AI wiping out humanity over the next three decades" are even higher than expected—up from 10% to 20% (Milmo, 2024, para. 1). Home economists and FCS practitioners' involvement in creating Society 5.0 is imperative because the human side of the exponential smart technology juggernaut—the individual, family, and home side—may be decimated. This is unthinkable. Our involvement will require (a) augmenting our longstanding collection of practice competencies with (b) updated knowledge and theories about Industry 4.0/Society 4.0 and Industry 5.0/Society 5.0 and (c) a genuine commitment to making our rich and comprehensive philosophical rhetoric a reality—we need *Home Economics 5.0*.

Society 5.0 will be a technological society comprising independent and smart systems managed and directed by AI in real time, on the Internet and in the metaverse—the new frontier. In such a society, it will be vital that humans, who will be increasingly dependent on technology, can communicate with each other as well as AI (Aberšek & Aberšek, 2020). Creating Home Economics 5.0 to deal with this reality will require unprecedented restructuring of our own professional culture, philosophy, and body of knowledge (BOK). We will have to wrestle with putting family first over technology (would this be a losing proposition?) or positioning families, so they have power relative to AI, and smart and adaptive-cognitive technologies.

That said, if we can invent ourselves to confront Industry 1.0, we should be able to reinvent and redefine ourselves in the face of Industry 5.0 and help create Society 5.0. Graham (2023) distinguished between reinvent and redefine, and we will need both. Reinvention is a choice, a bold declaration of our autonomy as a profession (self-governance). It involves emerging anew as a self-liberated profession free of old ways of doing and being. To reinvent, we must embrace uncertainty with the certainty that we can create a new, updated version of ourselves. Redefinition involves each practitioner self-authoring and assuming a new identity as the reinvented profession authentically journeys through Society 4.0 toward Society 5.0 as Home Economics 5.0.

Questions for further discussion

1. I report in another article that I found only 15 papers in our literature about AI and home economics (the last two years). Most were commentaries not research papers. We are not engaging with this issue yet. Do you agree with the assumption herein that the scenario laid out in this paper is a pressing issue for the profession? Explain your position.

2. Do you agree with the assumption herein that the profession can transition into this future by augmenting its current philosophy, knowledge, and practice repertoire? If not, what do you think must happen for us to engage with this juggernaut?

3. Had you ever heard of Industry 5.0 and Society 5.0? How do these prospects resonate with you, and how do you think you will engage with this looming economic and societal transformation? What should the profession do?

4. Arrange for a study circle with this article as background reading. Discern your colleagues' positions on this issue and share with the group to inform a follow up study circle perhaps leading to action.

5. Do you agree with my proposed version of Home Economics 5.0? If not, what do propose it would look like (assuming you think we need 5.0)?

6. Work with colleagues and prepare a course outline that can be used around the world in home economics programs to orient preprofessionals to this issue.

Biography

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