Towards a citizen development andragogy: Low-code platforms, design thinking and knowledge-based dynamic capabilities

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Abstract

Addressing the ongoing deficit in technical skills and talent necessitates an effective management approach that can harness the power of accelerating innovation. In response to the challenge, this paper presents a comprehensive learning model called Citizen Development Andragogy (CDA), specifically tailored for adult learners. CDA is an integrative learning framework, designed for an array of academic programs from micro-credentialing to four-year degrees, which combines leading-edge technology, such as low-code tools and platforms and generative AI, design thinking for creativity, and the institutionally oriented, knowledge-based dynamic capabilities (KBDC) model. Additionally, CDA is epistemologically rooted in the individually focused constructivist learning theory, providing a consistent structure that caters to the learning needs of working adults, enhancing their ability to conceive, design, build, and implement digital solutions. The andragogical learning theory is designed for adult learners and has important implications regarding teaching and program differences for reaching traditional aged college students, emerging learners, versus more seasoned individuals. Emerging strategic components conveyed in this paper – via a discursive style – represent some first steps towards considering and building a citizen development andragogy. An initial CDA framework conceptualization is detailed in this paper, which explores its theoretical constructs, practical considerations, current limitations, and it also shares insights from early implementation efforts, and presents a variety of potential future research avenues. Importantly, the paper emphasizes CDA's role as an accessible gateway for introducing citizen development into adult education and upskilling programs. In a broader societal context, citizen development, facilitated by CDA, can serve as a vital influencer for larger 'citizen' involvement movements like citizen scientists, human rights observers, and environmentalists. As such, an effective, scalable CDA prototype has the potential to yield meaningful benefits, empowering individuals, and organizations to achieve impact on an unprecedented scale, ultimately benefiting society at large.

Key words

citizen developer, andragogy, low-code no-code, design thinking, constructivism, knowledge-based dynamic capabilities

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Introduction

A confluence of technology, tools, knowledge, and need for innovation is emerging to support integrating a citizen development andragogy into higher education degree programs and employee upskilling efforts. A wave of automation is being unleashed on society with widespread and potentially

profound impact, through what is often called the Fourth Industrial Revolution (4IR) as first coined at the World Economic Forum (WEF) (What is the fourth, 2016). Indeed, digital bots and agents already are being deployed as frontline customer and technical support. Additionally, standardized industry-vertical data structures with detailed metadata specifications are being agreed to; and, when coupled with modern application programming interfaces (APIs), enable a myriad of model-based automations to be created without having to write code. Even legacy software users are not immune, as point-and-click screen capture technology, robotic process automation (RPA), enables recording of workflows for automating. Most recently, generative AI models, like ChatGPT, are in the spotlight demonstrating some startling capabilities that are being incorporated into low-code, no-code (LCNC) platforms allowing even non-programmers to build sophisticated natural-language AI agents (Alston, 2023), promising a surge in state-of-the-art bots, if not automated copilots (Microsoft, 2023). The age of dynamic, knowledge-based competition for individuals and organizations alike, is truly upon us.

Successful individuals will need to exist in the creases between the domains where automation thrives to carve out niches of value (Metrolho et al., 2020)—so they can leverage their organizational and process knowledge to become architects of digitalized solutions rather than being replaced by them. A possible response is to facilitate a critical mass of 'citizen developers' who traditionally would rely upon IT for solutions, but instead, creatively, and effectively harness technology to solve meaningful problems all by themselves. Employees possess valuable customer acumen—institutional and operational process knowledge that needs to be effectively unbridled—and the emergence of low-code technologies provide tools for nonprogrammers to do meaningful development work without extensive coding skills, if any. This enables individuals to creatively contribute their own hard-earned, empathetic customer understanding and deep institutional insight in entirely new ways, acting as user/designers (Garud et al., 2008)—wielding their own, personalized knowledge-based, dynamic capabilities—which may enable them to ride this 4IR wave of automation. But this future is not certain, as one merely needs to look back on automation's impact on manufacturing during the third industrial revolution for a stark reminder (Devaraj et al., 2017). Over a career that will span decades, it is clear individuals will need to develop a digital mindset and an ongoing, lifelong technical literacy (Allen, 2020)—so they can leverage their hard-earned, inimitable customer understanding and empathy, and organizational and process proficiency—to solve pressing problems and to conceive new innovations, novel solutions, and the products and services of tomorrow. Individuals and society alike must prepare, like never before, for the fact that technology forever flows, but rarely, if ever ebbs. The disruption this latest wave of automation brings is likely to be particularly acute and widespread.

It is no surprise, then, that individuals around the world are worried about the impact of automation on jobs and income inequality (Wike & Stokes, 2018); yet distressingly nearly four-in-ten workers do not believe they, personally, are receiving adequate training in important digital and technology skills (What 52,000 people, 2022). Simultaneously, in striking fashion, the WEF estimates that "almost one-third of all jobs worldwide, are likely to be transformed by technology in the next decade" (Zahidi, 2020) and they advocate for a "Reskilling Revolution" (Hummelgaard, 2020) to upskill a billion people by 2025. Furthermore, WEF claims that technical and vocational skills are underemphasized in education systems (Strategic Intelligence, 2020), just when they are needed most by current and future workers. The sad fact is that this disconnects, or misallocation negatively affects individuals, organizations, and their communities. It also signifies important missed opportunities for organizations to contribute positively to society through entrepreneurial ventures, initiatives, and advancements that can result from recognizing—and then developing—knowledge-based, dynamic capabilities, KBDCs (Kaur, 2019). Given pressures on higher education, from skepticism of the value proposition to unfavorable demographics, savvy educators and administrators will move to serve this emergent societal need and embrace new

populations of learners, through innovative collaborations and structures—from CIS and management departments on the for-credit side, to non-credit upskilling, retraining and lifelong learning units.

Contemplating Citizen Development Andragogy

The rapid advancement of digital technology is outpacing the ability of employers to onboard and upskill their workforce, leading to a shortage of skilled workers, while there is a simultaneous surge in demand for business applications (Grisenthwaite, 2020). IT professionals are overwhelmed with development requests, and a cadre of citizen developers could free up these strained professionals, allowing them to focus on important high-level, high-code projects (Bridging the App, n.d.). At a personal productivity level, citizen developers readily can use these new tools to solve their own problems and to gain the confidence and competence needed to work on more comprehensive projects (Johannessen & Davenport, 2021). Businesses and institutions are making substantial investments in programs and courses helping learners to update their skills, yet less attention has been given to how these skills are taught in this new economy (Ferreira & MacLean, 2018). Allen (2020), meanwhile, sounds the alarm that academic disciplines, especially business management programs, must determine how to develop requisite digital mindset and tech literacy in learners without "cast[ing] aside the theories and knowledge that serve as the foundation" of the discipline. How to add without subtracting?

Novel empowering technologies from low-code programing platforms to generative AI models herald the onset of an age where the potential of technology and management advances finally can be realized—or democratized—for everyone and not reserved just for the tech savvy. To harness the promise of low-code technology, a novel paradigm for instructional design and delivery of content seems warranted—one that bridges the skills gaps, empowers, and motivates learners in an informed, if not enlightened fashion that helps them to seize the opportunity to ride this tide of automation. An objective of this manuscript is to put forth an instructional construct with implications *ad rem*. Accordingly, in contemplating citizen development andragogy, we are guided by principles associated with effectively teaching and motivating adult learners and applying the same towards developing a resolute teaching structure and research paradigm.

Against this backdrop, we submit that the means to effectively manage changing technological demands—if not leverage the accelerating innovation for strategic competitive advantage—organizations must attend to the ongoing deficit of technical skills by helping create individuals with the ability to conceive, design, build and implement (digital) solutions; all of which requires adequate tools and training, an innovative or design-thinking orientation, and significant knowledge management capabilities. If achieved, employees can become 'innovation assets,' able to derive innovative ideas, products, and processes (Kesting & Ulhoi, 2010, p. 66). Specifically, we posit that citizen development, facilitated through low-code platforms, while encouraging and supporting design thinking in learners, can be a potent combination. Furthermore, when integrated with a Knowledge-Based Dynamic Capabilities (KBDC) inspired approach to managing and leveraging the resultant knowledge, collectively, these elements can help meet evolving technological and business challenges.

We consider these issues discursively, due to the complexity and number of ideas and their relationships. Our goal is to facilitate exploration, encourage innovative and critical thinking as we draw upon literature on contemporary strategic management concepts and utilize them from a technological lens. This helps to reveal many practical issues and questions, such as: What curricular design changes might be needed, program-wide and within individual courses? What instructional design choices can help to deliver these best? What training and support will instructors need? What partnerships—internally within universities and colleges, and externally with businesses, community organizations, industries, et al.—can best leverage and deploy these? Admittedly, there are too many issues deserving

attention to list, let alone discuss in entirety. We find this encouraging, and something worthy to work towards understanding and then answering, while not professing completeness of consideration or vision.

Andragogy: Teaching and Motivating Adult Learners

Andragogy or "adragogy" dates to the 1800's when Alexander Knapp, a German educator, referred to "methods or techniques used to teach adults," which was popularized in the 1960s by U.S. educator Malcolm Knowles (Hayes, 2022). Andragogy is concerned with the factors of learning that specifically are important to adults as opposed to children, and this differentiation is increasingly pertinent considering how important lifelong learning has become. In the near term, programs and classrooms likely will have two distinct adult learner populations of import: (1) traditional aged (18-25) of mostly degree-seeking individuals, or "emerging adult learners" (Dachner & Polin, 2016); and (2) more "established adults," often long-time working practitioners and laborers who primarily are upskilling—and each group might perceive automation in the workplace from divergent, if not diametric perspectives, hopes and fears, while having meaningful differences in how each learns (Dachner & Polin, 2016)

In citizen development, we are seeking both populations of adult learners with the intent to use each to help influence, temper yet inspire, motivate, and support the other, thereby harnessing that a learner's knowledge is constructed, not in isolation, but rather via social or cultural interaction (Chew et al., 2008), a learning theory approach known as social cognitivism. One opportunity is an incubator-like curricular structure, under the umbrella of the emporium models, which often are used in math and statistics education. One emporium version has an open meeting space, with the technology and tools learners need, which is staffed by a skilled educator or proctor, but without a rigid instructive plan. Individuals come to the emporium to work as they choose, knowing if they need assistance, the resident expert is there to provide support. Emporium participants are encouraged to interact with each other to share ideas, technical tips, solve problems, et al. This could be an elegant educational structure for integrating traditional for-credit students with non-credit upskilling adults to capitalize on the perspective, experience, and value each brings to the learning process. Indeed, advanced learners from each group could themselves become proctors and supplemental instructors; helping to cultivate a culture of growth, respect, interesting work, and interactions, in a reinvigorating virtuous cycle. Further consideration, and related additional ideas, are discussed under implications for future application and research.

The principles that guide andragogy are (Knowles, 1984): (1) adult learners need to understand the reason behind learning something new (2) they desire to understand how to add to their base knowledge (3) they seek to demonstrate responsibility for their learning (4) they hope to make an immediate connection between learning and current problems (5) they are driven by content that is directed towards a specific problem (6) they must be self-motivated to create long-term orientation and usage. These six principles of Knowles' andragogical model provide insights into the learners' real-world needs and for meaningfully moving towards developing a robust research-backed citizen developer andragogy that is relevant to lifelong learners' ever-evolving needs. The central premise of Knowles' model is that adult students are driven by a need to know—even before participating in a learning event—that what they are learning is applicable to some aspect of their professional or personal lives (Ferreira & MacLean, 2018). Implicit in these propositions is the precept to develop an andragogical approach that helps the learners become aware of their need to know, and then aligns the instructional design to meet those needs. From the learner perspective, these principles assist them to define, plan, and evaluate their learning, thereby reinforcing their self-concepts as learners (Suanmali, 1981). Dachner and Polin (2016), systematically explore how emerging adult learners differ from older, more established ones, regarding Knowles' principles, while providing structure for how to assess and address such differences.

Allen et al. (2022), importantly, put forth an adult learning theory inspired model and note that optimal outcomes only can be achieved through integration of learning theories (e.g., cognitivist, behaviorist, humanist, social cognitivist, and constructivist); not by treating them as individual silos. Seen above, a social cognitive approach motivates the integration of emerging and established adults for emporium co-learning. Considering Allen et al.'s (2022) model for citizen development more generally, constructivism emerges as the primary applicable learning theory, with behaviorist and the afore mentioned social cognitive approaches also germane. As a result, instructors are encouraged to be less of a lecturing expert and to embrace the role of an agile facilitator: encouraging, guiding, modeling, troubleshooting, and exhorting students to develop real-world application and self-design, while also identifying and curating the resources and experts necessary for such an endeavor.

Individual motivation also plays a key role in learner success, and Vroom's model of expectancy theory (1995), is one that can provide practical insights for advancing a research-andragogic view. Per Vroom (1995), an adult learner orientated towards learning for job-related rewards will respond to the three factors of the expectancy model: (a) valence: the value a person places on the outcome of learning (b) instrumentality: the probability that the valued rewards will be received given that certain results are achieved (c) expectancy: the belief that effort will lead to desired outcomes (Vroom, 1995). A major implication is that learners are motivated to commit effort to learning if they believe it will result in pertinent, valued outcomes. Empowering employees to become citizen developers using low-code technologies to solve problems in their own work lives can influence each expectancy model factor. Understanding how best to do this, and the relative impacts different approaches can have on each motivation factor, as well as differences associated between emerging adults and established ones, are worthy of study.

Inspired by Knowles' (1984) andragogical assumptions and the practicality of Vroom's (1995) model for motivation, we endeavor to incorporate adult learning principles into a framework of citizen development andragogy. Schön (1987) proposed the notion of reflection-in-action as a practice by which a learner can make the necessary changes to existing ways of thinking to create new cognitive structures or schema. Such a reflection – emphasized in later sections through concepts of design thinking and KBDC – creates an opportunity for the learner to combine previous experience with new understanding to develop an altered, enhanced schema, which importantly, is epistemologically aligned with constructivist learning theory. Moreover, the main criterion that determines a student's readiness to learn lies in their knowing how to adapt learning to real-world situations effectively (Ferreira & MacLean, 2018). In short, can learners use what they have been taught to solve problems important to them? How to best deliver such training and then to follow-up with learners afterwards to assess their ability to solve problems in practice, are of interest and ripe for research.

To encourage effective application of learning, Knowles et al. (2014) recommend that instead of dividing learning into subjects, it should be divided into real-world situations. With this approach, the learner can be motivated to acquire personalized KBDCs that are grounded in everyday-world applications. This andragogical recommendation is in concert with the technological lens of Chui et al. (2016), who propose that to understand the potential for automation, the focus should be less on occupations and more on work activities, while providing 50 AI use case ideas in heatmap form, organized by industry and function (Chui et al., 2018). In concert, one effort we are cultivating is a collection of examples and templates that concentrate on basic workflow activities—such as data collection, data/file manipulation, communications, planning, scheduling, et al.—within discipline-based scenarios in marketing, general management, human resources, supply chain management, operations management, etc. Initially, strong scaffolding support is provided, step-by-step instructions and links to solution videos, meaning these created resources are self-contained and free of the even small

discrepancies that often are found in online help sources and repositories, which can perplex and sideline a novice tech user.

These examples can be quickly and easily deployed in targeted courses, even by instructors with no prior LCNC exposure. Instructor support ensures that even the most nontechnical new learners can self-direct to start their citizen development journey as desired. Our experience has been that each hour of LCNC instruction requires from one to three hours of initial instructor preparation, depending on their extant technical prowess, with additional self-study resources also available. Instructors can use videos created for documenting and explaining examples in the LCNC collection for their training, and for use with students, as desired. Important programming concepts such as looping, conditional branching, and data protection are integrated into these problem-focused exercises. In addition, capabilities, such as approval processes, incorporating WFAs into phone and web apps, and building AI-augmented flows are also represented. Introductory exercises are completed by all learners, individuals then can decide which additional scenarios to complete based upon their own, personal development needs.

The next section continues the discursive presentation and elaborates on the concepts of citizen development, citizen developers, and citizen development andragogy followed by a discussion on low-code platforms and the different theoretical lenses used in contemplating a citizen development andragogy. Citizen development, importantly, is applicable to business, civic, and personal contexts, meaning it has potential that is missed if viewed unidimensionally or within the business context only. As the manuscript evolves conceptually, like the above discussion, examples, illustrations, initial considerations, and research ideas are presented.

Citizen Developers to Citizen Development Andragogy

To understand the potential for citizen development, one must first know who citizen developers are, and many definitions have been proposed, often business focused. Gartner defines a citizen developer as "an employee who creates application capabilities for consumption by themselves or others, using tools that are not actively forbidden by IT or business units. A citizen developer is a persona, not a title or targeted role" (Citizen Developer, n.d., para. 1). This latter statement acknowledges that not everyone is ready to be a citizen developer and they may need training. Low-code applications provider, Quixy, offers "[c]itizen developers are individuals who are integrated into businesses as non-IT employees but are empowered by the ability to build applications to satisfy their needs" (Citizen development: Your, 2020, para. 3). Flexera One, an IT management solutions provider, defines a citizen developer as "a tech-savvy end user who has the ability to create a new software feature or application program from an approved corporate or cloud-based code base, system or structure" (para. 1). Similarly, Baumgarten et al. (2020), define a citizen developer as a "user, usually with no particular ICT [Information and Communication Technologies] background who creates applications for consumption by others (and of course by her- or himself)" (p. 2). Consultants Deloitte Touche Tohmatsu Limited, in Accelerate software development (n.d.), meanwhile, within a business context suggest a more general definition, noting that within citizen development, a citizen developer is someone "with minimal to no coding skills [using LCNC tools] to build sophisticated web and mobile applications" (para. 1). The operative aspect of these definitions is that users are the ones creating their own applications and these users can do so with little, if any, direct or ongoing support from IT specialists.

Although these definitions may be apt for businesses and their needs, the narrowness—limiting citizen developers to being employees or tied to an organization, save the last one—does not capture the true essence and scope of the promise for citizen development and citizen developers to have impact. Notice how *none* of the definitions above explicitly recognize, let alone properly take into account, the

genuine impact and influence that citizen development and citizen developers will exert on society from outside of traditional employment or business settings.

Citizen development is really one aspect or form of a larger *citizen involvement* movement (e.g., Fraisl et al., 2020), and while citizen development is apolitical or neutral in terms of user motivation, the issues of concern often will have a political or power dimension that simply cannot be avoided. Arnstein (1969) envisioned *citizen participation* as a ladder with eight discrete levels, or rungs of citizen participation in the struggle for political voice and agency. Fung (2006), expands upon this, proposing three dimensions or mechanisms of citizen participation: (1) who participates, (2) how participants communicate with one another and make decisions together, and (3) how discussions are linked with policy or public action, thereby forming, a 'democracy cube' for making decisions and evaluating efforts. Irvin and Stansbury (2004), meanwhile, provide a guide to policy makers for choosing when and how to include or encourage community participation.

An essential aspect of citizen participation regards the proclivity of a citizenship to participate, and the availability of facilitating structures to do so, known as *civic activism*, "the social norms, organisations, and practices which facilitate greater citizen involvement in public policies and decisions" (Civic Activism, n.d., para. 1); and for having an *active citizenship,* which is when "people [get] involved in their local communities and democracy at all levels, from towns to cities to nationwide activity" (Nosko & Széger, 2013, para. 1). Citizen development can democratize communication and the access to support mechanisms and structures, facilitating and encouraging the populace to attend a meeting or demonstration or to even take action for a cause. The World Bank (n.d.) adds a strategic framework for promoting *citizen engagement*—in the "fight to end poverty and boost shared prosperity in a sustainable and inclusive manner. Engaging citizens, and mobilizing communities in the process, can help bring greater transparency, accountability, and social inclusion, thus improving development results" (Strategy, para. 1). Collectively when effective, these efforts can lead to what we term *citizen empowerment*, which exists when individuals gain agency—particularly in controlling their own lives and claiming their fundamental human and civil rights—through forms of citizen involvement, including citizen participation, civic activism, active citizenship, and citizen engagement.

Citizen development can serve as a powerful catalyst for these other citizen involvement efforts and dimensions, fostering an environment where individuals are inspired and enabled to have meaningful impact in a wide-reaching and substantial manner. It is clear, then, that citizen development and citizen developers—as an actuator of citizen activism, participation, engagement, and empowerment—can have society-level, if not world-wide reach, be of value to individuals and organizations alike, while facilitating like-minded individuals and organizations to work together to understand and solve the world's problems. Individuals all over the world already are acting as citizen scientists, human rights investigators, weather monitors, justice observers, news reporters, environmental activists, amongst others (Fraisl et al., 2020) and an operational citizen development andragogy could benefit these efforts.

Considering the totality of the above, we define *citizen development* as a process or movement that empowers individuals to create digital solutions using low-code, no-code (LCNC) tools and technology. Citizen development enables citizen developers to tackle challenges and solve problems within organizations or society at large. This movement spans across business, civic, and personal contexts, allowing individuals to contribute to addressing issues that are important to their lives. We think of *citizen developers* as individuals with limited or no formal programming training, who use LCNC technology and platforms to create digital solutions that address problems meaningful to them. Citizen developers may work within a business or organization, engage in civic involvement, or follow personal pursuits, but all use their LCNC skills to tackle conditions and challenges meaningful to their lives. *Citizen development andragogy*, meanwhile, serves as the guiding educational framework and strategy that supports citizen

developers in their learning and personal development journey. *Figure 1* denotes citizen development as one of the myriad forms of citizen involvement—where citizen development is particularly adept at actuating and boosting *other* forms of citizen involvement. As the manuscript proceeds, the components, details, and relationships are discussed and referenced in context, and when complete, Figure 1 serves as a quick-reference conceptual map.

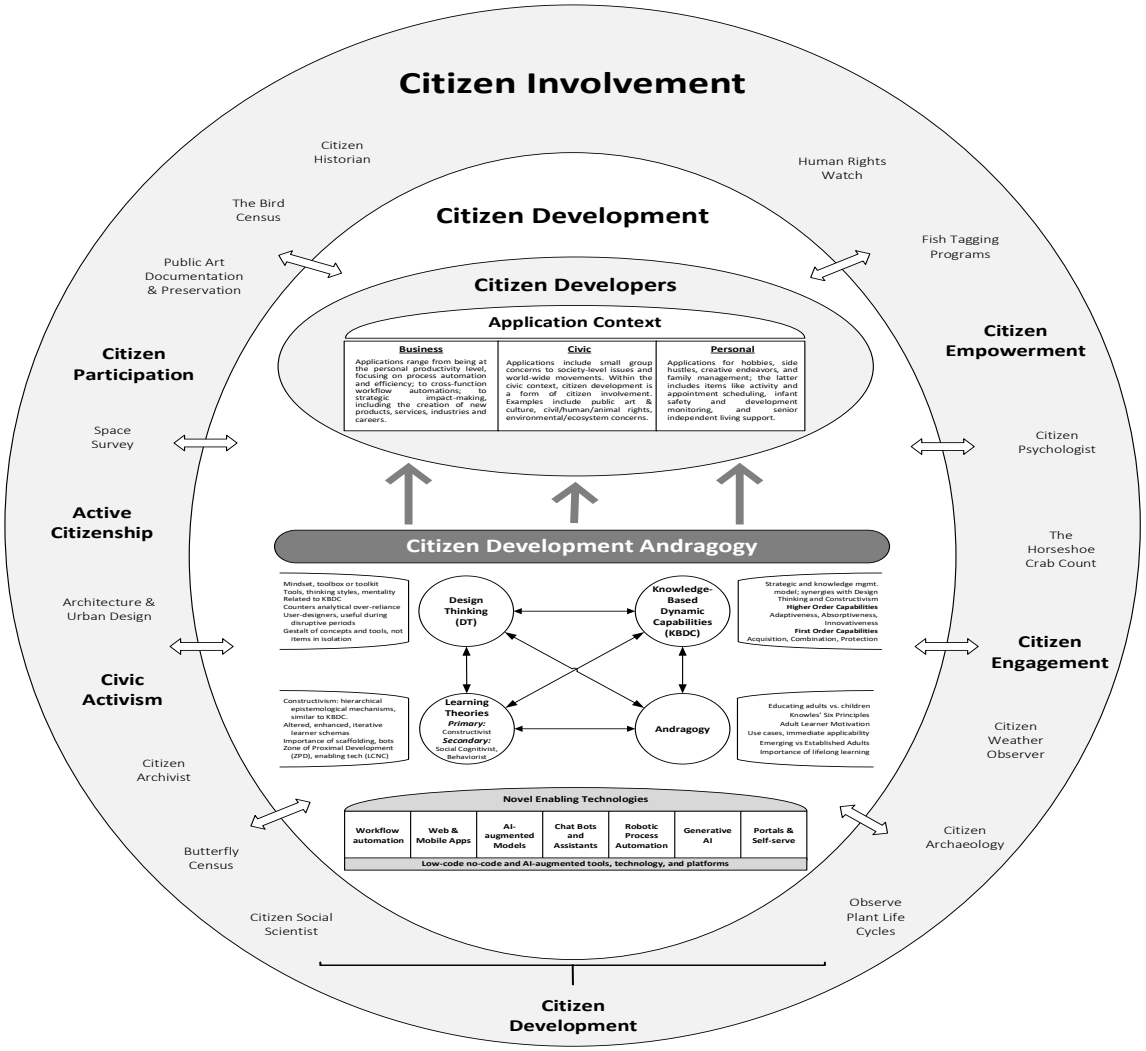

Figure 1. Citizen development is a form of citizen involvement, implemented by citizen developers, who are supported via a citizen development andragogy (CDA), utilizing novel empowering technologies, such as LCNC tools and platforms, to solve problems. CDA is conceptually derived, and it integrates adult learning and motivation models, knowledge management constructs, innovation via design thinking, and is epistemologically consistent with several, long-established learning theories (e.g., constructivist, social cognitivist)—to form a comprehensive, contemporary adult learning construct. Citizen development interacts with, and can facilitate, other involvement efforts, while the breadth of citizen involvement projects listed in the outer ring is noteworthy as it is only a small sample.

So, while citizen development is a much larger concept—indeed movement—than just for business and profits, for-profit enterprises have resources and sophistication important to learning that can be applied to the broader citizen development movement. Businesses are recognizing the value citizen developers can bring to the organization, where nurturing citizen developers is particularly advantageous because these individuals already have intimate understanding and deep intuitive knowledge of customers and the organization, its ebb and flow, and its requirements. The LCNC tools, particularly those associated with workflow automations, now enable meaningful citizen development to occur by these knowledgeable, insightful workers. Freeing employees from the requirements of routine activities can allow them to tackle high-impact, forward-looking endeavors. As Kesting and Ulhoi (2010) note, when an organization optimizes its routine, day-to-day operations, it can dedicate scarce employee and management resources to higher-order, strategic impact-making. Creating the means to free employees from their daily routine so they can attend to customers or competitive challenges can be strategic in nature. Consider next, the LCNC tools empowering such novel, strategic impact for enterprises that can also be extended to the civic and personal contexts for broad-based benefit.

Empowering Technology: Low-Code/No-Code (LCNC) Platforms

LCNC technology is an essential, novel enabler in facilitating citizen application development. According to Forrester, low-code development platforms are "products and/or cloud services for application development that employ visual, declarative techniques instead of [procedural] programming and are available to customers at low- or no-cost in money and training time to begin, with costs rising in proportion of the business value of the platforms" (Ismail, 2017, para. 5). Declarative programming systems enable developers to state or 'declare' what it is they want done, such as to find an average value, and the system determines how to do so. Effectively, this is what a spreadsheet designer does when using built-in functions, like average. In procedural programming languages, each step necessary to conduct the action must be specified by the developer. Procedural programming is used to create the spreadsheet function itself. Within a low-code environment, the citizen developer can use drag-and-drop components, process modeling and reusable modules; then connect them together to generate automations or original web and mobile applications. These low-code technologies empower employees to design and build powerful solutions, which can grow and adapt according to the needs of an organization (Everhard, 2019) and, importantly, low-code platforms have governance and data protection features too.

According to Global Market Insights, the enterprise application market is estimated to be worth more than $350 billion by 2025 (Wadhwani & Loomba, 2021). Within this market, a nascent LCNC programming movement has emerged that is projected to be worth $47 billion in 2025, accelerating to $65 billion by 2027 (Vailshery, 2021). Some major LCNC platform vendors include (Rymer & Koplowitz, 2019): AgilePoint, Appian, Catalytic, Google AppSheet, Kony, Mendix, Microsoft Power Platform, Oracle APEX, OutSystems, Salesforce Platform, ServiceNow, Zapier, and Zoho, among others.

Furthermore, low-code platforms are for everyone. Sahay et al. (2020) discuss how low-code platforms support citizen development while providing guidance on how to choose different platforms based upon features and user requirements, including a detailed taxonomy for low-code development platforms. Johannessen and Davenport (2021) reports when LCNC tools work well and when they do not, noting that personal productivity projects and small-scale automations by citizen developers are good use cases within organizations. Silva et al. (2021) advances a descriptive cognitive model for how to introduce low-code tools to various users based upon their prior programming experience. Even non-technical students and employees can get up to speed with little training. In efforts amongst our undergraduate business majors, we are pleased with how readily students can create LCNC developments. Students

create basic, yet meaningful, WFAs in a single class meeting with about 20 minutes of class time for introduction and account setup, and another 30-45 minutes to create WFAs related to file management and alert monitoring for important communications, problems we often see students having.

The LCNC model is rapidly evolving in breadth and capability where popular sub-categories include workflow automation (WFA), mobile and web app development, the creation of artificial intelligence (AI) based digital assistants and intelligent agents (IAs), and robotic process automation (RPA), amongst others, as seen in Figure 1. The WFA tools, which are mature and increasingly full-featured, represent an accessible on-ramp or gateway to citizen development, especially in the classroom or upskilling context. From basic WFAs, fledgling citizen developers can combine automations into mobile or web apps or even high-level AI/IA applications. As such, and elaborated upon in a later section, the low-code platforms also support – indeed facilitate – both the lower-order and higher-order KBDC's, which in turn, overlap and align with design thinking and established learning theory concepts. The notable harmony between low-code platform capabilities, innovation represented by design thinking and strategic knowledge management in the form of KBDC, as well as the epistemological utility of the constructivist approach to learning, gives confidence that low-code technologies will play an important organizational role going forward with meaningful societal impact.

Knowledge-based Innovation and Learning

Many Americans, if not most, believe that colleges and high schools are failing to provide adequate education; and they do not believe the education system does well in preparing students for the jobs of the future (Ford, 2018). Moules and Nilsson (2017) concur that business schools, in particular, do not prepare their students with the right skills, claiming a widening perception gap between what schools deem necessary and what employers see as vital. As instructors, we see an opportunity to address a criticism levied at higher education in that we sometimes skew too far toward extensive functional knowledge and analytical thinking at the expense of nurturing creativity, innovation, and a problem-solving mentality or mindset. The need to cover extensive course content requirements risks becoming overly rigid, thereby producing graduates ill-suited to the realities and needs of modern organizations and lifelong learning. Explore then, how design thinking is an expression of dynamic capability (Acklin, 2013; Cousins, 2018) and how it can serve as a fillip to the proposed framework as both an innovation engine and generator of knowledge and understanding.

Design Thinking

Design thinking as a curricular foundation or practical problem-solving approach requires operationalizing what are sometimes quite fuzzy concepts. Design thinking as a process (micro-process), pushes Brenner et al. (2016) to consider it emanating from the foundation of the "mind-set" principles. Their depiction is aligned closely with the Shewhart Cycle, i.e., Plan, Do, Check, Act, being represented by Needfinding and Synthesis, Ideate, Prototype. The Stanford D-School design thinking *model*, meanwhile, breaks the design thinking process into six iterative steps *viz.* understand, observe, point of view, ideate, prototype and test (Schilders & Taware, 2019).

Operationalizing these often-vague design thinking concepts can lead to competitive advantage. Consider, for example, the embracement of design thinking by Infosys, the second-largest IT firm of India. Within the Infosys Solution Approach (Schilders & Taware, 2019), the first two steps of *Understand* and *Observe* help to firm up requirements wherever the business problem itself is inadequately defined or the path forward is ambiguous. The current-state landscape and business/IT challenges, strategy and roadmap must be identified in this phase. The steps of *Point of View* and *Ideate* are where often disparate information is coalesced, considered in context of the problem statement, and then aligned with a journey

map to produce solution options, which can be further brainstormed in an ongoing working collaboration. The final two steps of *Prototype* and *Test* phase are where a solution is realized by using rapid or low-fidelity prototyping. As a result of this learning, a final product or service is defined and created, often in short order. In addition to being a design thinking groundbreaker, Infosys is also a leading company in operationalizing the KBDC model (Kaur, 2019), which is increasingly being seen as a knowledge management version of design thinking. Hence, an important insight is that for knowledge-based products and services, the KBDC model provides guidance, if not detailed models, which might help improve design thinking results—especially for the difficult to operationalize front end of the design thinking process.

In addition to seeing design thinking as a process, Brenner et al. (2016) also consider it as a "toolbox", claiming its true functional test is when the myriad of tools and methods are genuinely aligned with the respective mindset and processes employed. We believe that this alignment is now coming into focus with low-code platforms and design thinking, especially for use in higher education and upskilling programs. The combination of these three, i.e., tools, thinking, and mentality, contribute to design thinking's ability to spur innovation.

Business schools especially have been criticized for not evolving enough since after World War II, and as a result the analytical and scientific components of the curriculum have reigned over synthesis and design, while design thinking is offered as a "counterweight to analytic overreliance" (Glen et al., 2014, p. 656). Matthee and Turpin (2019) agree, advocating design thinking as a key component to improving problem solving and critical thinking skills in learners. Owen (2006) presents design thinking as a parallel to science thinking and lists selective characteristics that integrate innovation and design thinking. These characteristics include conditioned inventiveness, human-centered focus, environment-centered concern, ability to visualize, tempered optimism, bias for adaptivity, predisposition toward multifunctionality, systemic vision, view of the generalist, ability to use language as a tool, affinity for teamwork, facility for avoiding the necessity of choice, self-governing practicality, and the ability to work systematically with qualitative information. Pertinently, the author outlines design thinking's bias for adaptivity, claiming the emergence of adaptive processes in IT has reinforced a practice historically followed by progressive designers – the designing of adaptive products that fit users' unique needs.

In a management context, Brenner et al. (2016) categorize design thinking as a series of practice tools, styles of thinking and components of human mentality, the latter two referring to one's mindset, coupled to the learning process to educate future design thinkers and innovators. Similarly, Abrell (2016) describes design thinking as a combination of thinking styles, mentality components, and practices, and in the context of managerial discourse, associates it with innovation and competence used beyond the design context. The author claims that design thinking can be described as primarily an innovation process – part of the "fuzzy front end" (Abrell, 2016, p. 26) – that can be used to discover unmet needs and create new product concepts.

Tschimmel (2012) notes that conceptually, design thinking is increasingly explored in business management, where design culture and methods are being introduced into fields such as business innovation. The author claims that design thinking offers new models of processes and toolkits which help to visualize, expedite, and improve every creative process, carried out not only by designers, but in multidisciplinary teams in any kind of organization. In fact, design thinking, when looked at as an end-to-end system for problem-solving, does emerge as a unique integrating framework that has the potential for significantly improving innovation outcomes. The power of design thinking lies not so much in the individual tools and process steps considered in isolation, but in the gestalt of the tools and end-to-end process taken together (Liedtka, 2017, 2018). Gruber et al. (2015) claim there is room for much research in this regard, noting that while the role of design in products and services has been explored to a modest

extent, scholarly discourse is limited on the role of the overall experience on firm performance. The authors assert that new questions are now emerging that call for development of new conceptual frameworks and empirical work in terms of the role, impact, and application of design, not only to products and services but also to the field of management science. We agree and believe a citizen development andragogy could be one such framework for study.

Thus, it is proffered that design thinking, coupled with citizen development, encourages employees to be creative, collaborative digital problem solvers; while simultaneously supporting and encouraging the very individuals who know the customers and processes better than anyone: the employees themselves. The significance of this transformation and empowerment cannot be overstated. Indeed, Garud et al. (2008) argue that dynamic, uncertain environments necessitate "generative engagement" of users, where "…the distinction between designers and users [is] blurred." When achieved, "a community of co-designers [forms] who inscribe their own contexts into the emergent design, thereby extending it on an on-going basis in diverse and nonobvious ways" (p. 364). In other words, employees contribute valuable perspectives and creativity to product and service design that foster innovation and growth that other, less invested individuals, or automated bots, simply cannot. Research to understand and improve design thinking within citizen development seems of immense value and opportunity.

Next, consider the taxonomy of the KBDC strategic information model, which is also a form of design thinking, and how the different KBDC levels and types of capabilities can be harnessed towards building a strong, epistemological, and learning theory aligned foundation for a citizen development andragogy initiative.

Knowledge-Based Dynamic Capabilities (KBDC)

KBDC are the abilities to gain competitive advantage by leveraging base knowledge process capabilities to build higher-order dynamic capabilities (Kaur, 2023a). More formally, the tripartite capabilities of knowledge acquisition, knowledge combination and knowledge protection are known as *First-Order Dynamic Capabilities* in the KBDC framework (Kaur, 2023b). Astute organizations leverage these first-order knowledge capabilities to build higher-order dynamic capabilities of adaptiveness, absorptiveness, and innovativeness (Kaur & Mehta, 2018).

Per Kaur (2019), the dual purpose of developing *knowledge acquisition capability* is to gain new insights and to effectively garner knowledge, whereas *knowledge combination capability* includes conversion and application of the acquired knowledge. Knowledge, once acquired and combined, can become rare and inimitable with the development and implementation of *knowledge protection capability*. *Adaptive capability* includes swift synchronization and reconfiguration of resources in alignment with the changes in the competitive landscape (Kaur, 2020). *Absorptive capability* encompasses acumen to identify, acquire, and apply external knowledge towards commercialization. *Innovative capability* becomes evident when creative ideas get translated into new products and processes. Leveraging the knowledge process capabilities identified as first-order dynamic capabilities, to build these *higher-order dynamic capabilities,* truly reflects the essence of knowledge-based dynamic competition (Kaur, 2023c). LCNC platforms, it should be emphasized, are novel empowering technology allowing all employees, and not just trained developers, to meaningfully contribute to both lower- and higher-level KBDCs.

Even though the framework of KBDC has predominately been used in the literature to highlight the pivotal role these capabilities play in gaining organizational transcendence (Kaur, 2019), advocating, and supporting individuals to appreciate and develop such capabilities, toolkit, and mindset may help in better preparing them for current and future uncertainties and realities. We submit that citizen development requires KBDCs to sense, seize, and reconfigure the digital technological challenges into opportunities. Recent research presents design thinking to be an approach based on dynamic capabilities

for managing creativity and knowledge-based innovation in digital transformation projects (Magistretti et al., 2021a). What seems to lack in the current understanding is a direct or granular view of how KBDCs and design thinking, together, can facilitate citizen development. Magistretti et al. (2021a) discuss how KBDCs can support the "fuzzy front end" aspects of the design process, via combining and recombining technological and human knowledge, for digital developments generally. Design thinking, as a special kind of KBDC, favors a better understanding of customers, their contexts, and latent needs (sensing), adopting tools/methods such as visualization, storytelling, and prototyping to support rapid testing and innovation development (seizing), and steadily stimulating novel and innovative ideas, different approaches to problem solving, and idea management to cope with changing market needs and technological dynamism (reconfiguring) (Magistretti et al., 2021 b). This intersects with Garud et al. (2008) who extol the "nonobvious" design that only user/designers can achieve, and could in elegant fashion, fuse the best of the analog aspect of design thinking process to the digital dynanimism of KBDCs, for a truly novel, best-of-both-worlds combination for citizen development andragogy.

Emphatically, KBDCs—which till now have been seen as an organizational level construct—plays a critical role in operationalizing citizen development via individual citizen developers. Thus, KBDCs can serve as the means through which design thinking can be operationalized to solve the 'wicked problems' of not only organizations but also individuals and wider society through personal, business, and civic contexts of citizen development. Moreover, the need to leverage the KBDC framework is highlighted as the competitive landscape is undergoing a transfiguration to become intensely knowledge-based (van den Berg & Kaur, 2022), and in this regard, we have sought to lead our students by example through meaningful pedagogical choices and effort. Consider, then, how KBDC, typically an organizational knowledge management theory, is epistemologically aligned with constructivist learning theory, also known as constructivism. As such, we aim to deploy KBDC framework, not only at an organizational or strategic business unit level but also to reap the benefits of these meta capabilities by viewing them through the lens of an individualized learning theory—and by emphasizing them at this granularized level in novel fashion.

Constructivist Learning Theory

Underlying the conceptualization of citizen developer andragogy and considering the adult learning model of Allen et al. (2022), we draw widely from the rationale of constructivist learning theory. According to constructivism, when students are presented with new information, they will first and foremost assimilate it through their "existing schema or thought structures" (Harlow et al., 2007, p. 45). Per the authors, when learners experience cognitive disequilibrium, i.e., when they do not find a good match in their past experiences, they may well be motivated to accommodate a new understanding. Iteratively, through this process, a new schema is constructed into which the information can be subsumed, and equilibrium can be temporarily re-established. When students sense such disequilibrium, a well-calibrated intervention by a skilled educator can help learners embrace and internalize the new information, and thereby they become active participants in the construction of their own, new understanding.

Constructivism forces educators to think about the types of learners, their differences in capability and perspectives, and therefore, the need to use differentiated support approaches, a concept known as scaffolding. Shepard (2000), recounts that the entire process of becoming competent in any field (e.g., citizen development) must be divided into many small steps and learning reinforcement must be based on the accomplishment of each step. Bruner, the proponent of scaffolding theory, believed that well-executed scaffolding begins by luring the learner into actions that produce recognizable solutions, and that the acquisition of skill can be conceived as a hierarchical program [strikingly like the KBDC model] in which

component skills are combined into higher-order skills by appropriate orchestration to meet new and more complex task requirements (Wood et al., 1976). In other words, encouraging learners to become constructivists – or for our purposes, citizen developers – occurs in part through well-considered and articulated instructional and design modules. As such, learners are more heavily guided in the beginning, with responsive, adaptive pedagogical scaffolding, enabling support to be methodically applied and removed as needed throughout their development journey. New capabilities like generative AI system, ChatGPT and Microsoft's Copilot, will undoubtedly be key scaffolds of the future.

The support inherently provided within a low-code framework is a critical scaffold providing new opportunities to encourage such development in students. To the point, Chew et al., (2008) note that Vygotsky's Zone of Proximal Development (ZPD) frames the range of tasks that are too complex for a learner to master alone that can be mastered with assistance from educators. The authors highlight a simple albeit powerful principle that premises the ZPD: the quality of learner's thinking and performance is much better if the learner is guided by a more skillful and knowledgeable educator rather than working independently. This facilitating process is the essence of scaffolding and an area worthy of study regarding citizen development. Low-code platforms have extensive training, certification, and self-help capacities, and automated bots that can fulfill the role of textbook and other learning system scaffolds, expanding the ZPD, thus freeing the instructor for higher value interactions and assessment conversations, aligning with Ferreira and MacLean (2018).

Towards A Citizen Development Andragogy

Traditional college students are highly adept at utilizing technology for communication, acquiring information, and entertainment purposes. However, they frequently lack a comprehensive understanding of the complexities involved in delivering these services and applications to users, especially at scale. Through WFA activities, one schema we seek to intervene with is to achieve disequilibria in students to where they first recognize that low-code tools exist, and that they can be valuable tools to master. If this can be achieved, then we can seek to develop a new schema where students see and have confidence in themselves as actual developers who can indeed leverage low-code tools purposefully (Thacker et al., 2021). In short, we believe that a citizen development initiative could be transformative and foster the embracement of KBDC amongst learners; wherein they are able to use their knowledge of LCNC to cultivate meaningful application development capabilities and thereby become agile, relevant solutionists, regardless of current job responsibilities or college major. We see encouraging learners to become citizen developers as a mechanism to promote an individualized version of KBDC, with students as design thinkers, whereas getting students to truly see themselves as such, is a critical foundational requirement.

In citizen development andragogy, design thinking provides a toolbox, mindset, and a pathway for innovative creation. Relatedly, KBDCs are central to managing, combining, and extending knowledge. In fact, design theory and KBDC are complementary, often synchronized, and beneficial to use in concert (Kaur, 2019). These approaches, when coupled with technological advancements like low-code platforms, and particularly WFAs, provide an approachable learning vehicle to introduce citizen development to students. In short, low-code platforms provide requisite scaffolds—tools, enabling technology, and support materials—to make such an academic endeavor possible. Taken altogether, they provide educators ample opportunities and capabilities for developing a digital mindset and technical literacy in learners, through a host of curated learning experiences (Allen, 2020) to prepare for increased automation in the workplace and the new skills required (Ratcheva & Leopold, 2018) for surviving disruptive technologies. Figure 1 from earlier in the manuscript, then, graphically conveys the totality of the discursive presentation herein, of citizen development, citizen developers and citizen development andragogy. It is important to note that the emergent and evolving nature of the theories and technology

means significant empirical results gaps and limitations exist in the current state of being, which was often framed as opportunities for research in the above discussions. Such gaps are also true in the forward-looking discussion below and given the already substantiated conceptual foundation, these gaps provide opportunities for resolute researchers.

Initial experimentation with LCNC, design thinking, and citizen development, using an andragogically-focused approach has been well received by our undergraduate students. Citizen development andragogy was introduced conceptually and in concert with training on the LCNC tools in several courses. In a human resources class, for example, students built a no-code recruiting tool, while supply chain students modeled the importation process, and operations management students built an ordering and invoicing system. These efforts sought to build a base-level of technological competence and confidence, and to ensure students understood the reasoning for how the LCNC technology applied to the business need, an important andragogical principle. In a semester-long upper-division course, students were challenged to find projects important to them, professionally or personally, that could be solved via LCNC and WFAs. In concert with design thinking, students were given wide latitude in considering what to pursue, with instructor coaching, guidance, and technical support adaptively applied and removed per individual student and project need. Students discussed and presented their projects throughout the semester to further stimulate ideas and problem solving. If students had problems with their first ideas that could not be solved, offshoots or new iterations were interactively generated, as often happens in design. Students worked on projects related to their employment, side-hustles, and personal interests; automations were created linking YouTube, Discord, Twitch, Zillow, e-commerce systems, SMS messaging, calendaring/event management, and Google and Microsoft's cloud-based systems. Given such promising experiences with our traditional, for-credit students, we are enthused to extend our attention to non-credit upskilling workers, and to integrate both emerging adult learners with more established individuals for meaningful, mutually beneficial growth experiences.

Opportunities for Future Application and Research

We chose to title this article "Towards a Citizen Development Andragogy" to reflect the emergent nature of the framework, and if CDA is to be successful, it needs further theoretical development and empirical studies designed for it. While we are working on such studies, the emergent, evolving nature of the LCNC technology—and lack of penetration of LCNC in higher education *writ large*, where we are still working to secure advanced capabilities for all our students ourselves—a plethora of empirical studies simply do not exist yet.

However, the theories that form CDA do have well-established, accepted bodies of knowledge that we can and should leverage, and they provide excellent guides for possible research avenues, as proffered throughout the manuscript. Indeed, empirical investigation and ongoing theoretical development of the proposed andragogy are essential for its continued progress and ultimate success. While our small group has a few CDA studies in progress, many more are needed. It is hoped that others might be inspired by the vastness of opportunities and find the lack of empirical studies and results, an area to gravitate towards—especially given that many theories comprise CDA and how complex and nuanced those theories truly are.

To conclude this section, consider elaboration on a few forward-looking items. The incubator-like emporium—where emerging adults can readily interact with experienced workers seeking upskilling—could be coordinated or even housed with other supports, such as writing center and general tutoring services, which are readily available on college campuses. This existing support capability could be leveraged as part of micro-credentialing or employer-sponsored training programs, student populations often overlooked by higher education. Upskilling adults, as they develop themselves, will need to not

only improve their tech skills but also learn how best to communicate their ideas and suggestions, analyze performance, and impact, and build decision consensus. Hence, having services ready for written, visual and oral communication, teamwork, and analytics—formally as upskilling course options and on an ad hoc basis—could be a valuable reconfiguration of existing capabilities, as these 'supplementals' are emerging as necessary components of successful upskilling programs (Lohr, 2022). Learners initially may choose to come to the emporium for technical support with LCNC technology, whereas the emporium has additional anticipatory help in place, so as these citizen developers mature in their technical capabilities, the emporium implementation is there with appropriate services. If done well, tutoring and academic support goes from a cost center to a strategic component to wield, and in doing so, we better help individuals take control of improving their own lives.

We seek a flexible, supportive fabric, for any learner to go from a single course or micro-credential to a concentration of classes to certificate to degree, as they see fit; from whatever lifepath the learner has come to us on, to wherever they intend to go. Relatedly, note that upskilling specialist providers, naturally, see upskilling as the goal; whereas for liberal arts and business management programs, upskilling represents an accomplishment to be rewarded with additional opportunity; especially, for upskilling adults to matriculate into for-credit courses and programs. Thus, successful upskilling graduates, regardless of the initial program provider, are promising candidates for becoming for-credit students, and articulation pathways should be creatively anticipated. Similarly, new forms of professional cooperative embedment programs are possible, some that might lead to a beneficial self-reinforcing cycle, similar to the example earlier. Internships and co-op learning experiences are available, of course, but we also see novel opportunities for professionals to be embedded with students. For example, a skilled citizen developer at a local organization could serve as a specialist, attending class in person or remotely via Teams or Zoom, to offer learners technical support, encouragement, and ideas. Video conferencing into a course for an hour once a week is now feasible and much more likely to be approved by employers than when significant out-of-office time is a factor. Even more exciting, students could be matched with professionals for mentoring, using tools and apps created from LCNC technology. Significantly, partner organizations benefit by helping shape the curriculum and by having an advantage in recruiting the best students. Some partner organizations may provide a rich supply of LCNC expertise, like that just noted, while others might be a source for upskilling adult students. Large organizations may even serve as both.

Other research opportunities exist around learner motivation and the measurement of training and development efficacy. Vroom's (1995) motivation model, while apt for this application, is not the only motivation model possible or might not be the best one. Additionally, how to measure and understand which of the training approaches and methods lead to desired learning outcomes and impact is of immense importance. Similarly, per Allen et al. (2022), resolving which combinations of learning theory approaches to use across citizen development andragogy concerns, is another promising research opportunity. For each of the items, how to best reach both emerging adults versus more experienced ones adds richness to the considerations (Dachner & Polin, 2016).

Another concern for research is how to systematically incorporate LCNC and design thinking into a program's curriculum, so that they are truly integrated and not just encountered on a hit-or-miss, ad hoc basis. Allen et al. (2021) discusses the importance of such integration from a technology standpoint and provides ideas on how to integrate numerous 4IR technologies into business management education, especially when there is not established literature or curriculum. Allen (2020) and Allen et al. (2022) exhort, business management departments to lean into teaching disruptive technologies while fostering a digital mindset and tech literacy in students, or risk being obsolete; and we agree. Our experience indicates this integration will be more difficult to achieve with design thinking than with LCNC technology, as we have already successfully implemented LCNC activities in numerous courses. Design

thinking, though, is very different. For instructors not skilled in design thinking, they must first learn the basics, then how to teach others with and about it. Glen et al. (2015) provides a framework for implementing design thinking in business classes, while Zidulka and Mitchell (2014) consider how to implement design thinking as an experiential learning approach, without "unwittingly marginalizing" other forms of creativity. Especially challenging is providing meaningful feedback and assessment, where Benson and Dresdow (2014) provide suggestions. Design thinking is holistic and how to integrate it into existing, content-filled courses and curriculums is a concern, with Bower (2017) providing guidance. Like LCNC tools, can a planned map of student activities be identified across the curriculum to help in developing an understanding, if not appreciation, for design thinking in learners? Especially in programs where there might be existing upper division or capstone course(s) to provide the vehicle(s) to teach an entire course in a fully design thinking manner; can periodic design thinking experiences planned throughout the curriculum map better prepare students for such immersion?

Remember that citizen development is just one aspect of a broader 'citizen' involvement movement (e.g., Fraisl et al., 2020), which enables individuals to make an impact on a scale and scope previously unimaginable. Citizen development, then, can have world-wide reach, be of value to individuals and organizations alike, while facilitating like-minded individuals and organizations to work together to understand and solve the world's problems. Thus, creating an efficient and scalable implementation of a citizen development andragogy that is accessible to everyone could lead to substantial benefits for business, individuals, and society at large, and it stands ready for improvement and further development.

Conclusion

For the next several decades, the economic challenges facing a broad swath of humanity, will be predicated on developments in digital automation, artificial intelligence, virtual agents, et al. Individuals will need to be active self-navigators of their decades-long careers with focus and intensity to remain in value-creating positions as technology relentlessly evolves, and competition increasingly shifts in form to being knowledge-based. A citizen development andragogy seems well positioned to address such competitive challenges at both the organizational and personal/individual levels, in a manageable academic manner. And citizen development is applicable in business, civic, and personal contexts, meaning a significant scope of opportunity and scale of impact is possible that may not be obvious at first consideration.

This paper brings existing perspectives and research in legion fields like knowledge management, dynamic capabilities, design thinking, citizen development, learning theory, and low-code platforms, closer together conceptually and utilized in concert. To the best of our knowledge, this represents one of the earliest efforts to investigate complementarities amongst these distinct concepts and components and to entwine them in a common learning paradigm.

We believe that through a citizen development initiative, educators can create a welcoming approach to nurturing design thinking and to fostering the development of knowledge-based dynamic capabilities amongst learners; wherein they can use their understanding of the LCNC paradigm to become agile solutionists. In some small way, we propose that helping students—particularly adult learners and especially those without formal programming tutelage—to learn about and cultivate digital process automation and application development capabilities via LCNC tools, in concert with embracing a design thinking mindset, could be useful vehicles to be bridled and ridden for success amidst this 4IR era of disruption. To become meaningful digital developers, then, individuals need not learn to be coders, at least for a time. And, starting learners with illustrative workflow automation activities seems like a logical, if not strong first step in this development journey. From there, the students themselves will play a central role in defining their learning path and focus. In doing so, we strive to ensure that learners have a

keen appreciation, empathy, and understanding of a host of technology options and impact possibilities, in encouraging them to construct their own strong, knowledge-based dynamic capabilities to become not just citizen developers but true navigators for their own (and others) on-going success.

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