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MISQE Insight: On the Inevitability of Citizen Development

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EDITORS' COMMENTS

MISQE Insight: On the Inevitability of Citizen Development

Introductory Comments

Over the past decade or so, the notion that nonprofessional IT people within organizations can accomplish important digital tasks on their own has become increasingly prevalent. These people have become known (since a 2009 research report by Gartner analyst Eric Knipp)¹ as “citizens,” and their activities as “citizen development”—though today citizens do more than develop applications. Application development is still a focus—usually at the individual or departmental level, and often with “low code/no code” software,²—but citizens also automate business processes, analyze data, create AI models and build mobile apps. They have become a new driving force in applying information technology to the objectives of businesses and organizations. For many reasons, citizen-created technologies and information systems are at the core of our digital future.

Once derided as “shadow IT,” applications, automations and AI models developed by amateurs are powering substantial components of organizations. IT organizations that were once unalterably opposed to citizen development have begun to encourage it. As companies seek to digitalize much of their operations, they increasingly realize that a large population of IT amateurs is essential to their success. Though some companies still resist significant citizen development, it seems inevitable in the long run.

Definition of Citizens

A “citizen” in this context is someone who develops applications of information technology outside a formal information technology group

within an organization. It is rarely a formal title, but rather an informal description or persona. There are various versions of citizens, including “citizen developers” (typically using low-code/no-code application development tools), “citizen automators” (using robotic process automation tools or other automation systems), “citizen data scientists” (who develop sophisticated analytical or machine learning models) and “citizen data engineers” (who use data management tools to manipulate data). As other professional roles using technology emerge, it is likely that there will eventually be citizen versions of them.

Our definition of “citizen” with regard to information technology is similar in some ways to Brook Manville’s and Josiah Ober’s notion of citizens in Athenian democracy. They wrote:

“Underpinning all the achievements [of that society] was a system of governance based on personal freedom, collective action, and an open, democratic culture. Athens was at heart a community of citizens—a ‘politeia,’ to use the Greek word—and each of those citizens had both the right and the obligation to play an active role in the society’s governance.”³

Just like Athenian citizens, technology-focused citizens need community, freedom and responsibilities. Citizen developer communities are critical to individuals’ ability to learn about new technologies and build on the work others have already accomplished. Freedom comes into play because being a citizen with information technology is a voluntary activity; it doesn’t work well to force people to undertake it. And there are multiple different citizen activities from which to choose. Responsibility and obligation in the citizen technology user context involves adhering to guidelines and guardrails for effective technology use, and being transparent about the technology capabilities a citizen has developed and how it was done. Developing technologies and systems may not be a citizen’s only or even

1 The Gartner report is proprietary, but the research is described in Taft, D. T. “Gartner: ‘Citizen Developers to Deliver 25% of Apps by 2024,’” *eWeek*, October 23, 2009, available at <https://www.eweek.com/development/gartner-citizen-developers-to-deliver-25-of-apps-by-2014/>.

2 Novales, A, and Rubén, M. “Fueling Digital Transformation with Citizen Developers and Low-Code Development,” *MIS Quarterly Executive* (22:3), September 2023, pp. 221-234, available at: <https://aisel.aisnet.org/misqe/vol22/iss3/6>.

3 Manville, B. and Ober, J. “Beyond Empowerment: Building a Company of Citizens,” *Harvard Business Review*, January 2003, available at <https://hbr.org/2003/01/beyond-empowerment-building-a-company-of-citizens>.

primary job, but it's a role that needs to be taken seriously.

As we've suggested, citizens generally hold jobs outside of IT organizations. They occupy an almost infinite variety of primary roles—doctors, marketers, supply chain analysts, financial analysts, entrepreneurs, human resource specialists, researchers, product developers etc. But all of these jobs now involve information generation, manipulation and consumption. In many cases, citizens do more than create technology and manage information for their own jobs; they take on that responsibility for their department or business unit. Thus citizen-developed technologies can be used by one person (in which case they may not need a lot of governance or controls) or multiple people (when they probably require a bit more oversight).

Citizens may move in and out of IT-related organizations over time. IT groups may realize that they would benefit from a citizen perspective in the creation of IT systems. Earlier, these business-focused IT employees were referred to as “business systems analysts.” Today, they take on other roles. For example, in data science groups (which may be in IT or in other parts of a company), professional data scientists were at one time the only real job role. Now, however, there are intermediary or hybrid roles that are increasingly found within data science projects and products. They may include data product managers, translators or citizen data scientists. These people can develop or help to create data science models with citizen-level skills, and can also oversee some of the operational and people-related changes that are required to make data science successful.

Why Citizen Activity Is Growing

A driver of the inevitability of citizen development is change in technology. Programming technology has become easier to use over time, and many professional programmers already draw from code repositories for much of their projects. Robotic process automation and other automation tools were always point-and-click, drag-and-drop activities, but vendors have added even more easily mastered versions of their tools for citizens. Automated machine learning systems have made

it possible for amateurs to generate machine learning models. Generative AI systems can write code, analyze data and also train and execute machine learning models—all from only a short natural language prompt. In many domains, then, technology has become more citizen-oriented.

At the same time, citizens have become more technology-oriented. Virtually every resident of advanced economies today uses powerful technology on a daily basis—at the very least, downloading and using apps of multiple types on a mobile phone. Online and inexpensive courses in multiple aspects of technology abound. While there remain some forms of detailed knowledge about IT development that are not possessed by amateurs, the gap between them and professionals is shrinking. A chief information officer at a large insurance company once told me that in meetings between IT managers and business stakeholders, it is increasingly difficult to distinguish members of the two groups.

In addition to the increased supply of tech-oriented citizens and citizen-oriented technologies, the demand arising from traditional IT/business conflicts is also still at play. Business discontent with IT backlogs and the pace of IT development is a perennial issue, as is the communication gap between business stakeholders and IT professionals. While these factors haven't necessarily worsened, the broad digitalization initiatives within companies may have decreased the willingness of citizens and their managers to tolerate them.

To quantify the level of discontent, a 2021 survey of about 1,000 “business decision-makers” (sponsored by a citizen-oriented technology vendor), found that:

- The average backlog for planned IT projects is three to 12 months, and the situation is worsening as business project demand outstrips IT budget growth
- 55% of respondents say business units already do more than IT organizations to procure or develop new applications
- 53% of business decision makers believe the volume of applications built or sourced by non-IT business units will increase over the next 12 months.⁴

⁴ *IT's changing mandate in an age of disruption*, Economist Intelligence Unit report sponsored by Appian, available at <https://impact.economist.com/perspectives/sites/default/files/itschangingman>

Opposition from IT Groups Is Receding

One of the primary barriers to citizen technology development has been resistance from IT groups. Today, however, many IT groups are realizing that citizen development has many positive attributes, including reducing demand pressure and IT development backlogs. Indeed, Gartner, the research firm that coined the term “citizen developer,” defines it as someone who develops applications “using tools that are not actively forbidden by IT.”⁵

Some IT organizations go much further than specifying appropriate citizen tools. Large organizations like Lego, Siemens, AT&T, Shell, Deloitte, PwC, Johnson & Johnson and many others have citizen development initiatives underway that involve training, guidelines and code or data exchanges to build citizen capabilities. These are all either sponsored or supported by IT organizations.

A major European automotive manufacturer, for example, has an ambitious citizen development program underway. It is training 80,000 office workers in digital skills, including a module on citizen development. The citizen efforts are led by the IT organization. The manager who runs the program, when asked why the firm wants more citizen development, simply replied that many departments want to develop IT solutions and there just aren't enough IT resources to develop them. The automotive manufacturer's citizen development program has been running for six years—primarily with automation technologies—and there are roughly 300 citizen automators who have been building and maintaining robotic process automation bots. But now the automotive company is also encouraging low code/no code development of individual or departmental applications.

However, the automotive company hasn't been able to find a citizen data science toolset that is sufficiently capable and easy to use, so it is assembling its own platform for data science development by citizens. The company is hoping that the “educational boost” from its training initiative will increase substantially the

numbers and types of citizen development. For the foreseeable future, however, there will be an option to order automations and apps from a “delivery factory” run by IT professionals. The automotive company's IT leaders feel that it's important for citizen development to remain a voluntary activity.

Making Citizen Development Safe and Effective

Of course, citizen development can cause problems and create risks. It's important for IT organizations—or whichever group is primarily overseeing citizen activity—to institute approaches and policies to make citizen-developed activities effective and safe. It's common to refer to such approaches as “governance,” but that term is only a part of what organizations need. “Enablement” is perhaps more appropriate because it encompasses all activities designed to make citizen-developed tools work well. As described briefly below, enablement consists of three components: governance, guardrails and guidance.

Governance: This is the term typically used to describe how organizations ensure safe systems and data. It has not been a popular term with many business people; who wants their work to be governed? But it is sometimes necessary, particularly when citizen systems or models have a negative impact on transactional systems of record, or when they use key data elements and modify them in ways that create “multiple versions of the truth.” Companies in highly regulated environments will also be concerned about analytical or AI systems that use personally identifiable data in ways that may not be private or secure. Approaches to governance may involve mandatory reviews by the IT organization or, at the least, appointing a manager within the citizen's organization to perform data stewardship activities. One insurance company, for example, has a citizen automation tool that automatically alerts the IT organization when a new application is created. And a healthcare provider's approach to governance is to automatically identify any data that might be of interest to external regulators.

Guardrails: Companies may also try to build in automated or semi-automated guardrails that make it easy to do the right thing with citizen

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⁵ *Citizen Developer*, Gartner Glossary, available at <https://www.gartner.com/en/information-technology/glossary/citizen-developer>.

technologies, and difficult to do the wrong thing. Examples of guardrails include data catalogs or libraries in which clean and official versions of data are stored and made accessible, application program interfaces (APIs) to transactional systems that are read-only, and repositories of code, automation programs or machine learning features that have been tested and can be easily re-used. AT&T, for example, has an extensive program of citizen automation and data science with an extensive automation code library and a voluminous feature store for machine learning models.⁶

Guidance: Citizens also need guidance on whether the applications they develop are safe and effective, and how to master new technologies. Some companies offer individual guidance to citizens; for example, Mayo Clinic's AI Enablement organization encourages employees with ideas for AI applications to talk with a professional about the idea and how it might best be developed. If there are regulatory or technology infrastructure issues with the proposed application, the citizen is informed about how best to proceed. Other organizations offer regular community meetings of citizens to discuss new technologies and how best to use them. Wolters Kluwer, for example, has an "Addicted to Learning" series that teaches citizen developers, automators and data scientists about new technologies that are relevant to their jobs and the company.

With this multifaceted approach to enablement, organizations can build citizen capabilities while ensuring a low level of problems with the tools they use. Moreover, the concept of "enablement" is much more appealing to citizens who just want to get their work done and do not view a heavy governance hand as positive. Enablement activities signal respect for citizens rather than control.

Generative AI Is the Future of Citizen Development

Though generative AI has been in the public eye for less than a year, it already seems apparent that it will be a very common interface to

⁶ Davenport, T. H. *Citizen Data Science And Automation At AT&T*, Forbes, January 30, 2023, available at <https://www.forbes.com/sites/tomdavenport/2023/01/30/citizen-data-science-and-automation-at-att/?sh=72a820f21b32>.

software for code generation, low code/no code development, automation offerings, and analytics and machine learning. It may even replace the need for some of these programs; the "Advanced Data Analysis" tool within GPT-4 can create machine learning models (by generating Python code) that rival those from specialized machine learning software. The only barrier to supporting many different business tasks with sophisticated technology will be the ability to express what one wants to accomplish in simple language. Even that barrier may be eased as generative AI systems develop conversational approaches to prompting.

Citizen development already seemed inevitable, but generative AI will hasten the trend. Companies should begin now to prepare by educating citizens about the possibilities that generative AI offers them. Generative AI and the systems it controls or interfaces with will need clear access to high-quality data—both structured and unstructured—to perform data analysis and create applications and models. Thus, data preparation and ongoing curation is another important preparatory activity. And because generative AI is likely to lead to a substantially larger number of citizens in most organizations, organizations should prepare for a greater degree of enablement activities to ensure the quality and ease of citizen development.

It may be that generative AI is the final straw that breaks the model of most IT development being done by professionals. There is little doubt that advanced levels of IT expertise will continue to be necessary, but the bulk of it may be devoted to guidance and oversight of citizen development. Active involvement by IT leaders in building citizen capabilities will undoubtedly make the movement more successful in organizations. Some IT professionals may find this a distasteful future for their profession, but others are likely to welcome and thrive in it.

About the Senior Editor

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Tom Davenport is Distinguished Professor of IT and Management at Babson College, fellow at the MIT Initiative on the Digital Economy and senior advisor to Deloitte's AI and Data Practice. His most recent book is *All In on AI*. He has written 22 other books and over 300 articles for

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