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Research Article

Building Proficiency in Generative AI: Key Competencies for Success

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The rapid adoption of generative Artificial Intelligence (GenAI) underscores its ease of use, yet research on GenAI proficiency and competencies is limited. This study uses semi-structured interviews with twenty-five expert GenAI users from various sectors to explore GenAI proficiency. The study aims to answer three questions: What differentiates proficient GenAI use? What competencies support proficient use? What benefits does proficient GenAI use provide? Three aspects of GenAI proficiency emerged: effective prompting, informed and responsible choices, and diverse, complex use. The following competencies were seen to support proficient use of GenAI: GenAI literacy, domain expertise, communication skills, metacognition, curiosity, flexibility, adaptability, diligence, and IT skills. The outcomes of proficient use of GenAI were improved productivity, higher quality output, and greater originality. This framework, grounded in real-world experience, underscores the importance of human skills, knowledge, and mindsets for proficient use of GenAI tools.

1. Introduction

The rapid adoption of Generative Artificial Intelligence (GenAI) tools like OpenAI's ChatGPT reflects their usability and flexibility[1][2][3]. GenAI tools enhance productivity across various fields, including programming, legal work, customer service, and other knowledge-intensive areas[4][5][6][7]. However, there are risks associated with uninformed GenAI use, including poorer quality output and low accuracy due to potential 'hallucinations'[8][9][10][11] and risks related to privacy and intellectual property[12][13].

Much of the discourse on skills needed for using GenAI tools has focused on prompting skills[14][15][6][16][17][18][19][20][21][22]. Prompts serve as the primary interaction form between the user and the

system. Effective prompting is crucial for achieving desired outputs[23]. There is some evidence that prompt training can enhance productivity when using GenAI tools[6]. In addition, AI literacy (the ability to understand and assess AI tools) is understood to be important when using AI tools. Drawing upon prior theory and research, researchers have suggested a wide range of potentially important skills, knowledge, and traits for proficient use of GenAI tools ranging from critical thinking[24], metacognition[25], intuition[26], technology knowledge, domain expertise, awareness of ethical and legal implications[27], integrity[28] and strategic vision[28]. However, there is a dearth of systematic empiric research exploring the competencies underlying proficient use of GenAI tools[29]. This study addresses this gap by drawing upon expert experience to systematically identify the range of attributes (skills, knowledge, and mindsets) that underpin proficient use of GenAI. Three key questions motivate the research: (1) How do users perceive effective and ineffective use of GenAI? (2) What competencies are consistently linked to effective use of GenAI? (3) What benefits are associated with effective use of GenAI?

2. Methodology

Guided by a grounded approach[6], we interviewed 25 experienced GenAI users from diverse organizations, roles, and countries (Table 8 in the Appendix) to gather insights rooted in their real-world experiences. Participants were selected for their GenAI expertise, identified through professional networks and recommendations. The interviews, which were conducted between February and August 2024, were semi-structured and lasted between 45 and 60 minutes. Participants discussed their GenAI experiences, effective and ineffective tool usage, and the competencies that supported more effective use of GenAI tools. Ethical approval was obtained to ensure compliance with the Australian National Statement on Ethical Conduct in Human Research. Thematic analysis was carried out using NVivo software.

3. Findings

The themes and connections that emerged from the interviews provided the basis for our framework of proficient use of GenAI tools (see Figure 1). We use the same structure to describe our findings but start with describing the concept of GenAI proficiency before describing the competencies[30]. Finally,

we describe how participants connected these competencies and aspects of proficiency to different types of benefits derived from using GenAI tools.

Figure 1. A framework of GenAI users' competencies, proficiency and benefits

3.1. GenAI Use Proficiency

The interviews began with participants describing how GenAI tools were used in their line of work and examples of effective and ineffective use of GenAI tools[29]. Despite participants' diverse backgrounds and work, three recurring themes emerged from their descriptions of effective and ineffective ways of working with GenAI. Two themes, effective prompting and informed and responsible choices, were explicitly identified by participants as distinguishing effective and ineffective use of GenAI. The other theme, diversity and complexity and novelty of use, emerged during the analysis of participants descriptions, rather than being explicitly identified or verified by participants.

3.1.1. Effective prompting

Effective prompting was often mentioned first, and it was seen to be crucial for obtaining focused and relevant output from GenAI tools. Participants emphasized the importance of adopting a conversational style, providing context, specifying roles, using correct terminology, and employing step-by-step prompts. An iterative approach and resetting the conversation when necessary were also highlighted as key strategies.

Themes	Illustrative Quotes
Conversational Style	"The ability to continue the conversation [...] you can manage the conversation and narrow it down and deepen it and continue the investigation during the conversation [...]." (P125)
Providing Context	"if I give it more context about my problem then it gives me better answers [...] it also needs to be relevant context" (P108)
Role Specification	"You tell it 'you're a world class copywriter and I need to communicate this'" (P116)
Correct Terminology	"Using the right terminology reduced ambiguity for the GenAI and thereby resulted in better quality output." (P108) (Also noted by P109, P113)
Step-by-Step Prompts	"Breaking complex queries into manageable parts also allowed the user more control because they could see the steps taken by the GenAI and modify them if necessary." (P108) (Also noted by P110)
Iterative Approach	"It's definitely an iterative process because the AI, no matter how well you prompted and how well you explain the context, it still has the chance to just go off target." (P110) (Also noted by P108, P109, P114, P116)
Resetting Conversation	"Whatever you realise it's in a 'death loop' [...] I just escaped [...] Just do it again. Either refresh, restart... (P118) (Also noted by P108)

Table 1. Themes and quotes related to Effective Prompting

3.1.2. Making informed and responsible choices

Effective use of GenAI also involved making informed and responsible choices about how and when to work with these tools. Participants discussed safe and unsafe practices, such as avoiding sharing sensitive data with externally hosted GenAI systems and understanding IP and ethical issues. Participants conceptualized themselves as responsible agents, guiding and monitoring the GenAI's output. They also highlighted the need for strategic decisions about which GenAI tools to use and when, based on the tools' different affordances and strengths. Responsible use, then, involves safety

considerations, strategic decisions, evaluation and identifying areas for improving of the GenAI's output.

Theme	Illustrative Quotes
Safe and Unsafe Use – data sharing	"ChatGPT itself […] obviously learns from the inputs that you put into it. So, you would definitely not want to put anything that had IP or patient information in it." (P121)
IP and Ethical Issues	"A couple of my [students who are] really nice [artistic] drawers are going 'Yeah, but what happens if I put my work up and then 'I see part of my work in a piece that's been generated?' " (P109)
Responsible Agent	"It's my responsibility to check that it's accurate, in the same way that you would with a medical student" (P121) Also noted by P109, P112
Roles of GenAI	"Most of my use is ChatGPT. And sometimes […] I go to Claude. And if I need data that I'm going to dig into, [for] its links, I go to Perplexity […] Perplexity is very convenient for this kind of academic research because […] it also gives you the links on which it is based." (P125)

Table 2. Themes and quotes related to Responsible Use of GenAI tools

3.1.3. Diversity and complexity of use: Tools and applications

Another aspect of GenAI proficiency is the diversity and complexity of use. Proficient users employed a variety of GenAI tools and used different GenAI tools across a range of work tasks. Most participants used popular GenAI tools (ChatGPT, CoPilot, Claude, or Midjourney) for standard tasks such as retrieving information, ideation, writing assistance (both generating text and reviewing it), summarizing documents, generating images, coding assistance and the like. However, even amongst our pool of expert users, we could differentiate a smaller group who were using a broader range of tools and tasks in novel and complex ways. Examples included generating mock data to compensate for limited resources (P106, P130), screening data (P108, P112) and combining multiple AI tools for improved output or handling laborious tasks typically done by a team in a shorter time. This aspect of GenAI proficiency was not described by participants but was recognised by the researchers as a

differentiating characteristic of highly proficient users of GenAI tools. These participants were also more likely to be interacting with GenAI using coding tools rather than chatbox interfaces.

Theme	Illustrative Quotes
Diversity of tools	"I'm using Copilot and GPT, but Copilot is not the same as GPT; GPT is for me the questions that are asked. A Copilot is more like 'Here are the resources. Let's work on that'. It's just we're talking about two different tools (P115)
Tools integration	"Sometimes you'll use [...] multiple AI to get what you need as well. So crafting the perfect prompt using ChatGPT and then putting that into Midjourney." (P116)
Novel tasks – creating mock data	"... one of the more fun ones I did [...] where I was working on a controversial, disruptive technology [...], I said, "hey, can we have a town hall type discussion? Can we bring in, say, 5 stakeholders who are based around this disruptive technology and we can start this conversation, and it created like someone from the meat industry, someone from public health, from someone from the public consumer, someone from lab supplies and all this and then [...] a meat farmer as well" (P106)

Table 3. Themes and quotes related to Diversity and Complexity of Use

3.2. Competencies: knowledge, mindset and skills

The competencies element of the framework is broken down into three categories: knowledge, mindset, and skills, in accordance with other competency frameworks[30].

3.2.1. Knowledge: GenAI literacy and domain expertise

Many participants spoke about the importance of understanding the specific functions, strengths, and limitations of GenAI technology. We label this theme 'GenAI literacy'. High GenAI literacy involves knowing various GenAI tools and their respective benefits and weaknesses, allowing for strategic selection and effective use.

Participants also emphasized the importance of domain expertise when using GenAI. It was crucial for both prompting the GenAI and evaluating its output. Domain expertise ensured users provided relevant context and correct terminology, leading to higher-quality GenAI output. It also allows users

to evaluate and refine GenAI output. Without sufficient knowledge, users risk producing poor or unsuitable outputs.

Themes	Illustrative Quotes
Domain expertise	"Someone who isn't experienced that maybe could increase their game a little bit; the concern would be that reliance on it, whether it would steer you down and unknown bias, if you're relying on it too much 'cause, you're never quite sure of the data set that it's being trained on, are you suddenly gonna be diagnosing way more white male western diseases " (P121)
GenAI literacy	"[...] people should have at least some moderate amount of understanding of what's going on under the surface and don't just believe it's magic. [...] 'cause, [...] that helps you understand its limitations and why it sometimes gives you bad answers [...] Whereas if you just assume it's magic and can do anything, then [..] you're more likely to take it even when it's wrong" (P112)
Domain expertise	"[...] it's knowledge, it's understanding what you're trying to achieve and the information that you're putting in. So, because [...I have] a really good knowledge background in the areas of history that I teach, when you run something through Chat[GPT], you almost know instantly if it's accurate or not, and that I think that really, really helps. "(P129) Also noted by P115, P119

Table 4. Themes and quotes related to GenAI literacy and domain expertise

3.2.2. Mindsets

Participants noted that a curious and experimental mindset is crucial for effective GenAI use. Engaging with the technology playfully allows users to understand its capabilities and limitations. Experimentation leads to better prompts and broader applications of GenAI (P106, P108, P109, P110, P111, P113, P114, P115, P116, P118). Additionally, continuous learning is essential due to the rapid evolution of technology. Practices like observing others, discussing strategies, and participating in communities were noted as important for staying updated and enhancing proficiency (P108, P109, P110, P114, P116).

Flexibility, adaptability, and creativity are also necessary for proficient GenAI use. This involves adjusting to the frequent changes in GenAI tools and integrating the technology into one's workflow.

Effective users reconceive their professional identity, redefining their roles and responsibilities with the evolving technology. Notably, some participants described changes in roles and tasks. This shift reflects a more collaborative approach with GenAI, which helps users rethink task management and the division of work.

Diligence was highlighted by some participants (P106, P112, P119, P126). Learning to perform new tasks with GenAI can be overwhelming, but diligence supports the iterative process of checking, tweaking, and revisiting tasks. Attention to detail is crucial, as 'lazy' or 'complacent' use of GenAI can lead to subpar output. Users need to invest the necessary time and effort to achieve high-quality results.

Themes	Illustrative Quotes
Curiosity, Experimentation, playfulness	"You need to have a degree of playfulness or an experimentation to engage with these tools [...] I've found it curious how short people will be with this tool and go; 'it didn't give me a right answer. I'll never use it again. But if you hire a grad lawyer and they come up and give you a bad piece of work, you don't go oh, you're sacked the next day you would go. All right. What training do we need? How can I help you? What do I need to do?" (P119) Also noted by P118
Adaptability	"[...] the rigidity of how they [others – EG] work with the tool is quite one to one. They just have this very strong rigidity like "I need to click the button and get the output", [...] or "I want to navigate something in a very hierarchical manner", and this is the opposite of how a generative agent works. It is a very inaccurate tool if you are looking for a strong hierarchy. You're not going to input one and receive output two. You put input one in, and you get output A, B, C, D, and you can put the same input in twice and you get different outputs." (P124) Also noted by P105, P125
continuous learning	"I'm online a lot and getting information from a whole range of sources. and learning about different approaches fairly rapidly, even though [...] I know that they're changing, quite evolving [...]. There's no way to stay up to date with what's going on [...] there's always more, more to learn." (P108) Also noted by P109, P116
Diligence	"You have to be diligent in assessing what it gives you and making sure that's right and true" (P112)
Investing time	"I've tried. Well, I haven't succeeded. I've given up after little while I've asked it [...] I asked ChatGPT to tell me how to do it and it came up with full instructions and I've followed them and it didn't work in. Then I gave up [...] I don't have expertise in creating plugins. I wasn't able to see why it didn't work and I couldn't fix it because I don't know enough about it. [...] the [GenAI-generated] drawing was necessary, I needed it, but where's the plug in, this kind of a nice to have and I didn't know and the drawing I knew [...]. I'll get there eventually, but with the plugin I wasn't sure whether I would actually be able to finish it. But I'll just waste my time, so pulled the pin." (P126)

Table 5. Themes and quotes related to Mindsets supporting GenAI proficiency

3.2.3. Skills

Effective GenAI users exhibit strong *communication skills*, including verbal expression, perspective taking, and information sharing. These skills help craft better prompts by ensuring clarity, appropriate information provision, and proper tone adjustment. Effective communication also involves organising thoughts and articulating ideas clearly. These abilities, essential in human interactions, are crucial for creating precise and effective prompts for GenAI systems.

Proficient GenAI use requires *critical thinking and metacognitive skills.* These include planning tasks, monitoring GenAI performance, evaluating its outputs, reflecting on the process and making decisions on the next steps.

While *programming skills* were not explicitly stated as necessary by participants, they appear to be related to using GenAI in complex, novel ways and achieving creative outputs. For instance, participants with programming skills described using APIs and endpoints to integrate GenAI with other systems to execute tasks that cannot be done through the chatbox. Nevertheless, technical skills are not a prerequisite for quality output, as other competencies can also yield high-quality results.

Themes	Illustrative Quotes
Communication skills	"They [the users] need to be [...] "personable" person, they need to be able to communicate effectively. And [...] be inquisitive, be able to extract information from people if needed. [...] they need to be able to talk to someone like a real person and be able to make that a meaningful process because if you can do that, then you can shift your thinking and talk to chatbots". (P110)
Critical thinking & metacognition	"A lot of people are using AI, including myself, to get work done more productively, faster, save time. Then you don't take the time to reflect, 'Did this work? Was it ethical? Did it do the job well? [...] what can I do better?' So having that self-reflection" (P114) Also noted by P111, P112, P113

Table 6. Themes and quotes related to −GenAI Skills

3.3. Benefits

The third element in our framework relates to the benefits of GenAI proficiency. Time savings, increased efficiency, and improved productivity were all described as outcomes of proficient GenAI use. For example, effective prompting ensures GenAI output aligns with objectives and thereby supports productivity and quality when working with GenAI tools. Domain-specific expertise leads to responsible and informed use (appropriate evaluation and improvement of GenAI output) and ultimately, higher quality work.

Metacognitive skills, like planning and reflecting, helps users to determine on when a task is appropriately handled by GenAI tools (and when it is not), also aiding productivity.

Experimentation and iteration could lead to creative uses of GenAI tools and thereby more original output. The quotes captured in

Table 7 illustrate some of the ways in which participants connected GenAI competencies, GenAI proficiency and benefits derived from using GenAI tools.

Themes	Illustrative Quotes
Time saving	To understand how it works, what it is good at and what it is not good at will save you lots of time. You know there are tasks you do in Photoshop, and you don't need the AI for that, and other tasks, you know it'll help you, so you already know what to do and how to do it. (P104)
Domain expertise ◇ Improved quality	"it's knowledge, it's understanding what you're trying to achieve and the information that you're putting in. So, because [...I have] a really good knowledge background in the areas of history that I teach, when you run something through Chat[GPT], you almost know instantly if it's accurate or not, and that I think that really, really helps." (P129)
GenAI literacy & diligence ◇ quality	"You still have to go back and make sure that it's correct as well, though. So, you have to, yeah, it could generate it in in three or four seconds. Yes. But then I have to go in and go. OK, I've now got to look at those artists and look at what it said and go, OK, is that correct? Do the research [...]" (P109)
Adding new value	"We are hoping this [...] help [the grad lawyers] move up the value chain [...]. Rather than them doing document reviews and [...] some of the more boring legal tasks than just [...] summarising and typing, they can get that done quickly and then get on to the more creative side of being a lawyer, which is really thinking about what your client problem really is and how to solve it." (P119)

Table 7. Themes and Quotes related to Benefits of Proficient Use

4. Discussion

Our study is the first to comprehensively explore and define competencies for GenAI use and different aspects of GenAI proficiency. Our research suggests that proficient use of GenAI tools is reflected in three types of behaviour: effective prompting, informed and responsible choices and the diversity and complexity of GenAI use. The importance of prompting is well-documented[14][6][16][18][19]. There has also been research pointing to the importance of responsible choices such as verifying output, sharing data carefully, and remaining accountable for the output produced with GenAI tools[6][31][32]. Additionally, there's growing evidence on the potential for GenAI to be used across multiple tasks and stages of workflow[13][33].

The competencies identified in our framework are GenAI literacy, domain expertise, communication skills, metacognition, curiosity, flexibility, adaptability, diligence, and IT skills. Although our study is the first to propose this comprehensive list of GenAI competencies, most of the skills, knowledge and mindsets that we identified are corroborated by prior research[27][28][6][18][25][24][21]. *GenAI literacy* involves familiarity with the principles and applications of GenAI tools, guiding effective prompting and responsible use. It is a form of AI literacy, associated with understanding, using, and assessing AI tools[10][34][35]. *Domain expertise*, defined as task-relevant knowledge, skills, and experience, is crucial for high-quality output. It supports effective prompting by providing relevant context and terminology and ensures responsible use by evaluating GenAI output[27][7][36][37].

Our findings also show the importance of users' *mindsets* in supporting GenAI proficiency. Participants emphasised *curiosity, experimentation and continuous learning* as crucial to effective GenAI use. Participants acknowledged that GenAI tools are fairly new and argued that the constant evolution of GenAI tools keeps these attributes vital. The inquisitive approach reflects a "growth mindset" - the belief that intelligence and performance can be improved through effort and learning[38] and has been linked with innovation in other domains[39]. *Adaptability and diligence* are other necessary mindsets for effective use of GenAI.[33] reports that 'power' GenAI users have reoriented their work patterns in fundamental ways and are 66% more likely to redesign their business processes and workflows with AI. Finally, users must maintain diligence to avoid over-reliance on GenAI tools, a finding that aligns with a large body of research which diligence enhances performance[40][41][39][42].

Specific skills also support the proficient use of GenAI tools. Effective verbal *communication skills* are crucial due to the conversational nature of GenAI which requires clear articulation, relevant contextual information and explicit instructions[18]. Metacognition and critical thinking also play vital roles, as the decision to use GenAI tools, the construction of prompts and the evaluation of output all require metacognitive processes[19]. Skills in information technology are important for complex and diverse use of GenAI tools because they allow users to integrate GenAI tools into other systems.

Regarding *benefits*, our findings align with existing literature showing that GenAI use allows more work to be completed in less time[43][4][28][7]. Other research also finds that GenAI use can increase accuracy and creativity[4][28][18].

4.1. Limitations

Our findings are based on input from GenAI users whose expertise was subjectively assessed and may not reflect objective measures. In addition, as a small qualitative study, our findings may not be representative of the population and need validation through further research. We also acknowledge that the importance of competencies like adaptability and curiosity may change over time as GenAI adoption stabilises.

4.2. Directions for further research

Future research is needed to validate the framework. Since our study captured the experiences of expert GenAI users, an important next step would be to compare expert and novice users to determine whether the three aspects of proficiency identified in our framework are sufficiently comprehensive to capture differences between expert and novice users. In addition, the proposed competencies need validating. An important issue to resolve is the relative effectiveness of AI literacy versus GenAI literacy training to support proficient GenAI use[44][45][46][47], since significant investment is being made in AI upskilling[13][41][7][36]. Another important direction for further research relates to how new workers develop domain expertise when they enter the workforce in a in a GenAI-integrated environment. Although educators understand the importance of ensuring that students learn to work both with and without GenAI tools, much of our professional development occurs in the workplace where productivity pressures may mean that workers only ever perform their work with the assistance of GenAI tools. Research is needed to determine how new workers develop the depth and breadth of expertise they need to guide and evaluate GenAI tools. Otherwise, there is a risk that humans will not remain the primary agents of critical thinking and problem-solving[48].

4.3. Practical implications

This study offers practical guidance for educators, employers, workers, and students by providing a comprehensive framework for effective GenAI use. By going beyond popular discourse about prompt engineering and recognizing GenAI's potential to hallucinate, our research expands the concept of proficiency and reveals the ongoing relevance of traditional competencies (such as domain expertise and communication skills) for working with GenAI tools. Curiosity, experimentation, and diligence are also important, pointing to the danger of over-reliance on GenAI in environments characterized high workloads and deadlines. To gain the most of GenAI tools while ensuring high quality products,

organisations will need to go beyond introducing GenAI tools and single training sessions and consider long-term strategies such as fostering communities of practice and ongoing knowledge sharing.

5. Conclusion

This study identifies key competencies needed to ensure that GenAI tools serve to improve productivity, quality and originality of output. It counterbalances prevailing discourses about GenAI tools by highlighting the ongoing importance of human skills, knowledge and mindsets in an era of GenAI-enabled work.

Acknowledgments

Appendix

A.1. Participants

	Role	Sector
P104	Owner & CEO of a design studio for mobile gaming	Creative industries
P105	Architect and head of architecture firm	Creative industries
P106	Research scientist	Science and Technology
P107	Creative director	Creative industries
P108	Research scientist	Science and Technology
P109	Teacher	Education
P110	Research scientist	Science and Technology
P111	Research scientist	Science and Technology
P112	Data scientist	Science and Technology
P113	Software engineer	Science and Technology
P114	Organisational development advisor	Science and Technology
P115	Educator	Education
P116	Organisational development manager	Science and Technology
P118	Legal practitioner	Legal services
P119	Legal practitioner	Legal services
P120	Academic	Education & Research
P121	Medical practitioner & Technology lead	Healthcare
P122	Medical practitioner & Technology lead	Healthcare
P123	Academic	Education
P124	CTO and academic	Creative industries
P125	Journalist	Media

	Role	Sector
P126	Legal practitioner	Legal services
P129	UX, design and IT professional	Science and Technology
P130	Educator and technology leader	Education
P131	AI consultant	Professional services

Table 8. Participants' professional background

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Declarations