

The dual role of AI in enhancing and challenging skills, creativity and innovation of Michelin-star chefs

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Abstract

Purpose – This study examined the impact of Artificial Intelligence (AI)-driven technological tools in Michelin-starred restaurant kitchens on the general skills, creativity and innovativeness of chefs.

Design/methodology/approach – Following the qualitative research approach, semi-structured interviews were conducted with 23 chefs working in Michelin-starred restaurants.

Findings – The findings identify three main areas of impact of AI-driven tools: culinary skills, creativity and innovation. The findings reveal a complex relationship between AI-driven tools and culinary expertise in Michelin-starred kitchens. First, while AI-driven tools have the potential to diminish skills, they also facilitate skill development and knowledge acquisition. Chefs acknowledge AI's potential to expand creativity through new techniques, but also consider AI-driven tools a potential limiter or threat to creativity. They emphasise the need to balance the use of AI-driven tools with traditional skills. Moreover, the dual role of AI as both an enabler and a limiter underscores the need for strategic integration that inspires without compromising the authenticity of haute cuisine.

Originality/value – The study contributes to understanding how and why AI-driven tools benefit or challenge human skills, creativity and innovation, which can guide Michelin-star restaurants and their chefs in adopting AI technology.

Keywords AI-driven tools, Michelin-starred restaurant, Chef skills, Creativity, Innovation, ChatGPT

Paper type Research article

1. Introduction

The integration of Artificial Intelligence (AI) into the culinary arts is transforming restaurant operations (Berezina *et al.*, 2019), including those of Michelin-starred restaurants, affecting both chefs' skills and creative processes. This study builds upon the recent research note (Seyitođlu *et al.*, 2025a), which explored "how technological tools will influence the technical (skills) and artistic (creativity) aspects of cooking and how they can support or disrupt human chefs' competencies". While the work of Seyitođlu *et al.* (2025a) laid the groundwork, this research goes beyond it by specifically addressing the role of AI in reshaping chefs' competencies within elite kitchens, a context in which identity, authorship and craftsmanship are critically intertwined. More specifically, in response to the call to explore the role of specific technologies, such as AI, in chefs' creativity and innovation, this research investigates

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the impact of AI-driven tools on the skills, creativity and innovativeness of chefs working in Michelin-starred restaurants.

The adoption of technological tools, such as AI, is transforming labour markets across many advanced economies, especially in the USA (Acemoglu and Restrepo, 2020). While job insecurity driven by AI and automation poses a significant threat to the future of employment in the hospitality industry (Kang *et al.*, 2024), integrating technology can boost operational efficiency, enhance service quality and contribute to long-term success (Park *et al.*, 2023). Technological advancements have revolutionised the hospitality industry and continue to influence its operations, with the food and beverage segments among the most prominent adopters of such innovations (Seyitoğlu *et al.*, 2025b). Restaurants, which are vital to the industry and known for their rapid adoption of new technologies, have increasingly incorporated technological solutions in recent years (Santiago *et al.*, 2024). In this context, the increasing integration of technology has led to significant shifts in kitchen workflows, influencing food preparation, service methods and overall restaurant management (Khan, 2020). For example, Seyitoğlu *et al.* (2025b) explored the role of technology in the future of restaurant labour. They revealed the benefits, impacts and shortcomings of technological trends such as service robots, self-service kiosks, robot chefs and automated cooking systems (Seyitoğlu *et al.*, 2025b). It is evident that the impact of technology on the restaurant industry is a significant topic that warrants further scientific attention.

As more restaurants adopt AI-driven kitchen technologies for tasks such as cooking, preparation and dishwashing, a growing body of research has examined how consumers perceive and evaluate the services and products produced by these AI applications (Kim *et al.*, 2025). For instance, according to Nozawa *et al.* (2022), consumers tend to evaluate restaurant experiences more negatively when service is provided by AI, with this negative perception being stronger in luxury restaurants than in casual dining establishments. A recent study (Kim *et al.*, 2025) revealed that AI involvement in food production does not elicit negative responses to a menu, but that consumers show unfavourable responses when AI is involved in recipe creation.

From a human resources perspective, the literature is scarce on the impact of technology on restaurant labour (Seyitoğlu *et al.*, 2025b), particularly on chefs' skills (Seyitoğlu *et al.*, 2025a). In the related literature, the use of technology and its impact on chefs have been investigated indirectly (Seyitoğlu *et al.*, 2021, 2025c). The findings suggest that the use of technology (e.g. service robots, robot chefs) in restaurants will negatively affect labour, as fewer workers will be required due to increased reliance on technological tools in restaurant kitchens. Furthermore, technological tools may help address the scarcity and high cost of restaurant kitchen labour, as it is increasingly difficult to recruit qualified chefs (Seyitoğlu *et al.*, 2025c). The existing literature clearly indicates a gap in directly addressing the impact of these technologies on chefs' skills and creativity. Current studies predominantly focus on automation in terms of labour substitution and productivity, without elaborating on how AI influences the professional identities of chefs. However, the relationship between AI-driven tools and chefs' competencies in Michelin-starred restaurants remains underexplored in hospitality literature, particularly in restaurant management. There is only a research note (Seyitoğlu *et al.*, 2025a) that explains the influence of integrating technological tools on chefs' future practices, skills and creativity. To the best of our knowledge, no study has examined the impact of technology on chefs' skills, creativity and innovativeness in Michelin-star restaurants.

This paper seeks to fill this gap by exploring the complex relationship between AI-driven tools and chefs' competencies in Michelin-starred restaurants. Unlike existing hospitality research, which has largely viewed automation through a lens of labour substitution and productivity (e.g. Yeoman and McMahon-Beattie, 2024; Ivanov and Webster, 2019), this study foregrounds how AI intertwines with questions of identity, authorship and craft, thus nudging the literature in a critical new direction. Given that technological tools can threaten traditional labour roles, understanding their impact on chefs in high-pressure, high-standard environments becomes crucial. Michelin-starred restaurants, which prioritise creativity and innovation (Rita *et al.*, 2023), are uniquely positioned to face the challenges and opportunities

posed by AI. This chef-centric approach contributes both theoretically and practically to restaurant management and technology in the service industry, paving the way for future practices. Ultimately, by illuminating the complex dynamics at play, this research seeks to advance the dialogue on the integration of AI into the culinary arts and to provide practical insights for chefs and restaurant managers navigating this evolving landscape.

2. Conceptual background

Global technological advances have radically transformed business practices in the hospitality industry (García-López *et al.*, 2025). The integration of digitalisation, automation and AI-based systems has compelled an evolution in the technical and cognitive skills of employees (Willcocks, 2024). This transformation has led to the rise of the concept of “technological competence” as an integral component of professional skills. Studies on AI and labour have conceptualised AI systems not merely as tools or labour substitutes, but as a “joint actor” in decision-making processes and creative idea generation (Jarrahi, 2018; Shrestha *et al.*, 2019). This perspective offers a more nuanced understanding of how AI can augment human creativity and provides an essential theoretical foundation for examining creative practices in industries, such as the restaurant industry. For example, Jarrahi (2018) adopts a proactive and pragmatic perspective, emphasising the complementary roles of humans and AI in organisational decision-making processes characterised by uncertainty, complexity and ambiguity. According to this study (Jarrahi, 2018), while with superior computational processing and analytical capabilities, AI enhances human cognition when navigating complexity, humans provide a holistic and intuitive approach to managing uncertainty and ambiguity. This concept aligns with the principle of intelligence augmentation, which advocates for designing AI systems to enhance rather than replace human contributions.

Rather than focusing solely on traditional service delivery, professionals in the hospitality industry have become skilled experts who can effectively use technological tools, interpret datasets and manage digital processes (Kumawat *et al.*, 2025). Technological advances in restaurants, particularly in kitchen operations, have expanded chefs’ technical skills through technologies such as smart cooking systems, digital inventory management, 3D food printers and sensor-based cooking devices (Güngör and Yücel Güngör, 2024; Sharma *et al.*, 2026). Traditional culinary skills (e.g. cutting, cooking and presentation) are now complemented by modern competencies such as digital information literacy, data interpretation, process optimisation and energy efficiency (Seyitoğlu *et al.*, 2025a). Chefs’ successful adaptation to this new technological environment significantly increases both their operational productivity and their level of culinary creativity (Seyitoğlu *et al.*, 2025c). This transformation reshapes the craft-based identity of the chef. Concerns about the loss of knife skills or the weakening of taste perception are not only technical when considered within the framework of Sennett’s (2008) understanding of craftsmanship and Abbott’s (1988) professional boundary study. They point to a threat to the symbolic capital that bodily dexterity and intuitive knowledge hold for a “real chef”. Hence, AI and automation are transforming both culinary skills and the professional identity elements that legitimise the profession of chef.

Among the technologies, AI-based tools and systems are being extensively used in strategic areas such as menu planning, flavour profile analysis, sustainable ingredient selection and customer preference prediction (Berezina *et al.*, 2019; Blöcher and Alt, 2021). Particularly in the high-end gastronomy segment, within the context of Michelin-starred restaurants, these advanced technologies are positioned as tools that support chefs’ intuitive decisions (Dönmez *et al.*, 2025). From this perspective, technology may be considered not only a tool that maximises operational efficiency for Michelin-starred chefs but also a means of fostering creativity. Chefs can develop unique flavour combinations and innovative menus by leveraging AI-driven tools, demonstrating that technology can augment, rather than replace, human skills.

The impact of technology on creativity has long been a complex issue, debated between opposing forces: those who support its use and those who restrict it. On the one hand, digital

tools encourage innovative thinking by democratising access to information and facilitating collaboration; on the other hand, excessive automation risks mechanising the creative process (Ra *et al.*, 2019). Culinary creativity is a dynamic process shaped by the integration of emotional, cognitive and technical skills (Ekincek and Günay Aktaş, 2023). Research in creative industries shows that interactions with AI are reshaping concepts of originality, style and authorship and that creativity in digitally mediated environments is increasingly collaborative between humans and machines (Rashid and Kausik, 2024; Zhu *et al.*, 2024). This offers a valuable conceptual perspective on practices in Michelin-starred kitchens, where chefs are increasingly using AI-driven tools to create narratives and visualise presentation concepts. The advantages of AI-driven tools in predicting flavour combinations, analysing menu trends and interpreting customer sentiment data enable chefs to engage in more conscious and rational experimental processes (Yaiprasert and Hidayanto, 2024).

Technological advancements and the evolving creative responsibilities of Michelin-starred chefs can be better understood through fundamental theories of creativity. Amabile's componential model emphasises that creative output emerges from the interaction among domain knowledge, cognitive processes related to creativity and intrinsic motivation (Amabile, 1988). In the context of Michelin-starred restaurants, AI may strengthen chefs' domain knowledge by expanding their access to global gastronomic information and data-driven aroma insights, while also reshaping trial-and-error processes by offering numerous creative alternatives. However, over-reliance on AI can reduce intrinsic motivation and weaken the cognitive effort required to generate original ideas. Furthermore, Csikszentmihalyi's systemic creativity theory suggests that creativity is shaped by the interaction between the individual, field experts and authorities who evaluate the field (Csikszentmihalyi, 2014). From this perspective, AI may not only transform the creative capacities of chefs but also reshape the evaluation mechanisms that determine which innovations are considered "creative" in the culinary field.

Michelin-starred chefs are shaping the landscape of haute gastronomy by leveraging AI systems and co-producing with technology to support their creative visions (Madeira *et al.*, 2021; Dönmez *et al.*, 2025). For them, technology goes beyond streamlining kitchen operations; it serves as an aesthetic tool that enhances gastronomic storytelling and as a meeting point between human intuition and technological intelligence (Zoran, 2025; Spence and Velasco, 2025). In this context, examining the role of AI-driven tools in the skills, creativity and innovation of chefs working in Michelin-starred restaurants has the potential to contribute to the existing literature on hospitality management, specifically restaurant management.

3. Methodology

Using an exploratory qualitative research design, this study examined the impact of AI-driven technological tools on chefs' general skills, creativity and innovativeness in Michelin-starred restaurants. As the qualitative research approach provides a comprehensive understanding of participants' emotions, thoughts and ideas, it helps explore new and emerging issues in a field (Seyitoğlu *et al.*, 2025c). The semi-structured interview technique was implemented in data collection. The open-ended questions were developed based on related literature (see Appendix). To ensure validity and clarity, two researchers provided feedback on the semi-structured interview questions, which were adjusted accordingly. A pilot study involving three chef participants was conducted to validate the research questions before proceeding with the main study.

The research sample was selected using purposive sampling, which aligns with the research objectives. The sampling process started by identifying suitable Michelin-star restaurants and their chefs for the study. Of the 132 Michelin-starred establishments in Türkiye (13 with 1 star and 1 with 2 stars) at the time of data collection, we approached 51 chefs from 42 restaurants. However, 23 chefs from 14 restaurants agreed to participate in the study. 28 contacted chefs did

not participate in the study due to limited time and a busy work schedule. The interested participants were selected from those contacted after they were presented with the research goals. As we adopted data saturation (Glaser and Strauss, 1967) and no additional information emerged from the final participants, we concluded the sampling by interviewing 23 chefs (see Table 1) who were actively working in Michelin-starred restaurants. It is important to note that certain types of cuisine or restaurant ownership forms may have been overrepresented in the final sample. In selecting the sample, care was taken to ensure balanced representation of chefs in different Michelin categories (e.g. One Star, Two Stars, Guide Selection). However, as the Michelin Guide launched recently in Türkiye (in 2023), this balance was not possible. Besides, the fact that all participants operate in Türkiye may introduce sampling bias, as contextual characteristics specific to national gastronomic culture could influence the findings. Nevertheless, the selected group of chefs provides rich, experience-based data that is consistent with the aims of qualitative research.

Before collecting the data, one of the study authors created a video showcasing AI-driven technological tools (e.g. AI-driven robotic cooking systems, generative AI tools such as ChatGPT, AI-driven robots to assist, smart AI-powered ovens and AI-powered smart fridges with temperature control sensors) in restaurant kitchen settings using various YouTube videos. This video was then shared with the chefs before the interviews. The goal was to help the chef participants better understand AI-driven technological tools in restaurant kitchens. The interviews were conducted via an online meeting platform (Zoom). The interviews took place between March and September 2025, with 23 chefs actively working in restaurants included in one of the Michelin-star restaurant categories in Türkiye (see Table 1). The participants were informed that their interviews would be recorded, and they provided their consent to participate in this study. The semi-structured interviews ranged from 16 to 38 min. The interviews were transcribed into Microsoft Word documents, conducted initially

Table 1. Profile of chefs

Chefs	Gender	Age	Position	Industry experience	Michelin star category
C1	Male	36	Executive Pastry Chef	23 Years	Michelin Guide Selection
C2	Male	24	Chef de Partie	10 Years	Michelin Guide Selection
C3	Male	27	Chef de Partie	7 Year	1 Michelin Star
C4	Male	29	Junior Sous Chef	10 Years	Michelin Guide Selection
C5	Male	34	Chef de Cuisine	19 Years	Michelin Guide Selection
C6	Male	25	Chef de Partie	7 Years	Michelin Guide Selection
C7	Male	30	Junior Sous Chef	11 Years	Michelin Guide Selection
C8	Male	24	Chef de Partie	5 Years	1 Michelin Star
C9	Male	31	Sous Chef	14 Years	Michelin Guide Selection
C10	Male	27	Head Chef	5 Years	Michelin Guide Selection
C11	Male	26	Chef de Partie	4 Years	Michelin Guide Selection
C12	Male	48	Chef de Cuisine	18 Years	Michelin Guide Selection
C13	Male	26	Chef de Partie	6 Years	Michelin Guide Selection
C14	Male	26	Chef de Partie	8 Years	Michelin Guide Selection
C15	Male	23	Chef de Partie	8 Years	Michelin Guide Selection
C16	Male	31	Chef de Cuisine	16 Years	Michelin Guide Selection
C17	Female	24	Assistant Chef	3 Years	Michelin Guide Selection
C18	Female	23	Assistant Chef	2 Years	Michelin Guide Selection
C19	Male	45	Chef de Cuisine	16 Years	Michelin Guide Selection
C20	Male	35	Pastry Chef	13 Years	Michelin Guide Selection
C21	Male	32	Chef de Partie	8 Years	Michelin Guide Selection
C22	Male	28	Pastry Chef	11 Years	1 Michelin Star
C23	Male	26	Sous Chef	9 Years	1 Michelin Star

Source(s): Authors' own work

in Turkish and subsequently translated into English for analysis. The researchers translated the transcripts to ensure consistency and fidelity to the original responses. Acknowledging that translation can alter meaning, particularly for nuanced concepts such as creativity, skill and innovation, we employed several key practices to mitigate these risks. Multiple researchers reviewed the translations, and one author, an English-speaking academic with restaurant experience, helped identify critical culinary terms. Additionally, we consulted existing literature in both languages to enhance the accuracy of our translations.

Data was analysed using thematic analysis (TA), an appropriate method for understanding experiences, thoughts, or behaviours across a dataset (Kiger and Varpio, 2020). TA is a technique used to examine qualitative data, involving the search for, analysis and reporting of recurring patterns within a dataset (Braun and Clarke, 2006). Moreover, themes are deliberately constructed patterns or meanings derived from a dataset that address a research question, rather than merely being summaries or classifications of codes (Kiger and Varpio, 2020). Researchers may use either an inductive or deductive approach to identify themes (Braun and Clarke, 2006). Our TA analysis follows a deductive approach. However, the sub-themes emerged inductively following manual analysis by the two coders. For this study, the six stages of TA that Braun and Clarke (2006, p. 87) suggested were followed: “(1) familiarising with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report.” Using this approach, two experienced qualitative research coders independently reviewed the participants’ responses multiple times. The authors then discussed the identified themes and sub-themes to reach a consensus and finalise the findings.

Regarding the reflexive positioning, the research team comprises members with prior experience in the restaurant industry, providing valuable insights into culinary practices and the challenges faced by chefs. One team member is an academic at an international university specialising in the integration of technology into hospitality and restaurant services, enriching our understanding of global culinary practices and technology relationships. We view AI as both an opportunity and a potential threat. However, we ensured that our perspectives did not influence the interviews or the subsequent data analysis. The semi-structured format allowed chefs to share their insights freely, guiding the conversation with their experiences and perspectives.

4. Findings

This study examined the impact of AI-driven technological tools on chef skills, with a particular focus on general culinary skills, creativity and innovativeness among 23 Michelin-starred chefs. The thematic analysis of the data revealed three main areas of impact: (1) the impact on the culinary skills of chefs in general, (2) the impact on creativity skills and (3) the impact on innovation skills. For the quotes, “C” denotes a participating chef working at a Michelin-starred restaurant. Figure 1 provides a comprehensive visual representation of the emergent data structure, illustrating these central themes and their corresponding sub-themes, which will guide the subsequent presentation of our findings.

4.1 *The impact on the culinary skills of chefs in general*

This theme includes two main sub-themes: (1) potential for skill diminution and dependence, and (2) skill development and knowledge acquisition. The findings reflect a dual perspective on the role of AI-driven tools in enhancing and diminishing essential culinary skills, revealing an intricate relationship between technology and traditional craftsmanship.

4.1.1 Potential for skill diminution. Several chefs express concern that reliance on AI could erode traditional manual and sensory skills. In addition, many chefs (e.g. C4, C7, C12, C14, C15, C16, C18, C20) worry that high levels of AI-driven automation may lead to a broader decline in fundamental culinary skills, as they rely on it. The key aspects in this sub-theme are

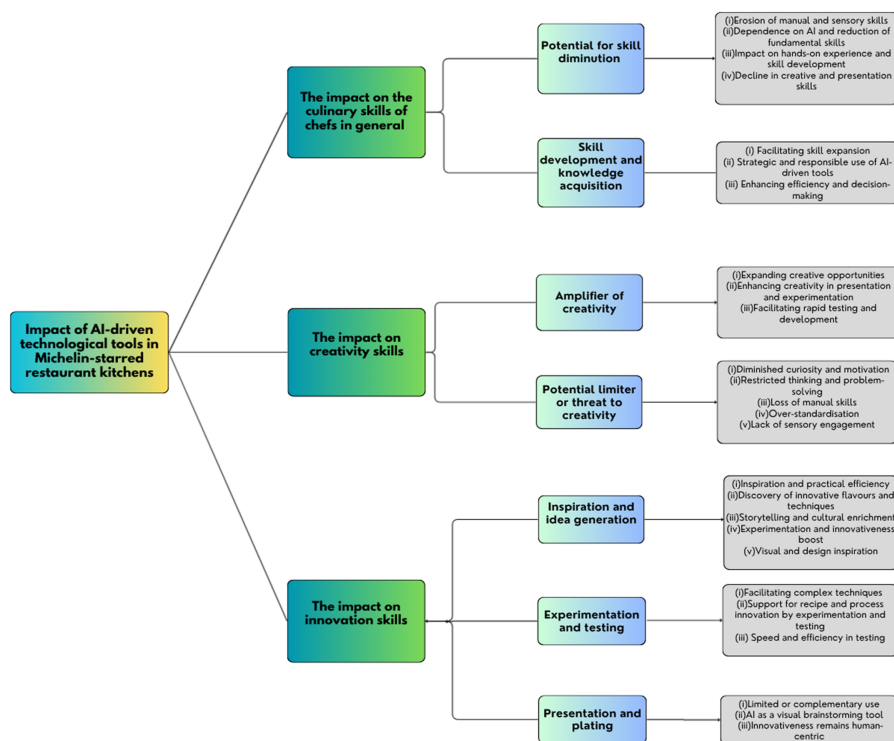


Figure 1. Impact of AI-driven technological tools in Michelin-starred restaurant kitchens. Source: Authors' own work

revealed as (1) erosion of manual and sensory skills, (2) dependence on AI and reduction of fundamental skills, (3) impact on hands-on experience and skill development and (4) decline in creative and presentation skills.

Key insights include the risk of skill erosion resulting from the automation of tasks using AI-driven tools. Several chefs express concern about a decline in manual skills, such as knife techniques and in sensory skills, such as taste. For example, C1 cautions that reliance on AI-driven robots could foster a generation of cooks less proficient in fundamental techniques. He states, “As AI technology becomes more prevalent, it will inevitably diminish the skills of chefs . . . In the future, you will no longer have to think about many things. Click a button to combine ingredients, and an AI-driven robot makes it for you. This will definitely lead chefs to laziness.” C13 also notes that depending on AI for storage and process decisions may inhibit chefs’ experiential learning, raising concerns about skill development.

Among the chefs concerned that high usage levels of AI-driven tools and automation could lead to a reduction in fundamental skills due to the creation of dependence, C14 argues that overreliance on AI could diminish chefs’ abilities in recipe formulation and presentation, which require nuanced judgment. He articulates, “If chefs use AI-driven tools excessively, they become uninspired and lose creativity.” C7 warns of the risk of diminishing traditional recipes, noting that as AI-drivenness increases, unique culinary expressions may fade. In this light, concerns shared by C12 and C18 point to how the overuse of AI tools may prevent chefs from honing their own skills and potentially lead to their decline over time.

4.1.2 Skill development and knowledge acquisition. Many chefs emphasised that AI-driven tools can benefit skill development and knowledge acquisition. More specifically, these tools

are also seen as enhancing skill development by improving efficiency and supporting knowledge acquisition. The key aspects in this sub-theme have emerged as (1) facilitating skill expansion, (2) strategic and responsible use of AI-driven tools and (3) enhancing efficiency and decision-making.

Chefs note that AI-driven tools streamline complex tasks, allowing chefs to focus on innovation and creativity. For example, C1 and C2 emphasised that using AI-driven tools in their kitchens enabled them to prepare time-efficient, high-quality meals. C1 explains that “. . . in pastry making . . . when tempering chocolate, you typically melt it, then temper it, and finally let the temperature drop. You let it cool, then retemper it. These processes take a long time, but if you purchase an AI-driven Thermomix, it tempers the chocolate with a single button press, so you do not have to do anything. You just pour it, process it, and put it away. When making crème pâtisserie, you need to separate the eggs, heat the milk, add some of the hot milk to the eggs, then add the sugar and the starch . . . With a Thermomix, you do not have to do anything. You simply put all the ingredients in the Thermomix, and it produces the crème pâtisserie directly with a single button . . .”

It is also evident that AI-driven tools should be strategically utilised in the kitchens of Michelin-starred restaurants to enhance chefs' skills. They can be used as guidance tools (e.g. GenAI) and to produce standard-quality products (to maintain the same quality). C6 notes, “When used strategically in Michelin-starred restaurants, AI tools can positively impact chefs' skills. They help ensure precision in product quality and promote standard service.” Additionally, C3, C7, C17 and C19 utilise AI-driven tools for research and decision-making, while C4 and C9 find these tools helpful in exploring new techniques and presentation ideas. As they integrate tools such as ChatGPT, they broaden their culinary expertise, demonstrating that AI can support skill development rather than replace traditional techniques.

4.2 *The impact on creativity skills*

This theme encompasses the *amplification of creative opportunities* afforded by AI tools, including the expansion of creative horizons and the facilitation of rapid testing and development. The data indicates that AI-driven tools can inspire novel dish presentations and enable experimentation with new textures, affirming their role in generating creative ideas.

AI-driven tools are perceived as both amplifiers and potential limiters of creativity. Many chefs stress that, when used appropriately, AI can expand creative horizons and inspire unique presentations and flavour combinations. Tools such as AI algorithms facilitate experimentation with textures and forms that would otherwise be difficult to achieve manually. However, concerns persist about over-reliance on AI-driven tools, which could limit spontaneous creativity and reduce the need for manual skills and sensory perception, thereby stifling personal artistic expression.

4.2.1 Amplifier of creativity. AI-driven tools as an amplifier of creativity consist of three main dimensions: (1) expanding creative opportunities, (2) enhancing creativity in presentation and experimentation, and (3) facilitating rapid testing and development. A significant number of chefs emphasise that when used appropriately, AI technology and AI-based technological tools can expand the creative horizon, enabling chefs to realise ideas that were previously time-prohibitive or physically impossible. Many chefs consider AI-driven tools as instruments that enhance the creative possibilities for the textures and forms (e.g. C3), experimentation (e.g. C14) and presentation (e.g. C15) of dishes. For example, chefs utilise 3D printers to craft edible moulds, enabling them to create personalised shapes for mousses or layered gels (C15). Additionally, AI algorithms and smart machines allow for the immediate testing of innovative flavour combinations and presentation ideas (C9, C14, C16). Visual AI tools, such as Midjourney, inspire chefs with novel plating concepts that elevate visual storytelling in the culinary arts (C15, C16). These tools can also help produce new textures and layered products that are impossible to replicate manually, thereby fostering creative experimentation (C2, C3, C18).

C14 provides a compelling example of the positive impact of AI on creativity in Michelin-starred kitchens: “Successful chefs are known for their creativity and unique presentations. AI technology can help push those boundaries further. We used to spend days on recipes through trial and error, which wasted time. Now, with AI technology, we can achieve results much faster. This allows chefs to generate numerous ideas and try different variations . . . I frequently use AI-driven recipe tools such as ChatGPT to draw inspiration from cuisines or to create spice blends, and I have used Midjourney to plan dish presentations. During my last gazpacho preparation, for instance, ChatGPT suggested wonderful fresh fruit pairings, leading me to create a dish that truly reflected my style.”

Another significant finding is that one of the chefs (C4) acknowledges AI-driven tools as inspiring, as he believes they enable chefs to quickly experiment with complex techniques (e.g. creating textures or visual effects). Besides, C12 argues that AI-driven tools enable chefs to realise their creative vision more quickly and with higher quality, achieving perfect purées and textures.

4.2.2 Potential limiter or threat to creativity. Chefs express concerns about the potential limitations and threats to culinary creativity posed by overreliance on AI-driven tools. In line with their concerns, they suggest a balanced approach in which technology supports rather than dictates creativity to prevent standardised, less authentic culinary creations. The issues they raised are related to the following topics:

Diminished curiosity and motivation: Chefs worry that excessive reliance on AI-driven tools could lessen the need for manual skills and sensory perception, which are vital to authentic creativity. This reliance may lead to reduced diligence, curiosity and motivation (C1, C13, C17).

Restricted thinking and problem-solving: The use of AI-driven tools may limit independent thinking and experimentation, making chefs less inclined to solve problems creatively (C13, C14, C16).

Loss of manual skills: Skills crucial for creativity, such as tasting and smelling, may decline as AI-driven tools automate tasks, particularly affecting less-experienced chefs (C16, C23).

Over-standardisation: There is a risk that AI-driven tools might produce monotonous or formulaic outcomes in dish design, suppressing unique, experience-driven inspiration (C14, C15, C18, C23).

Lack of sensory engagement: True inspiration is linked to sensory experiences, which AI cannot replicate; thus, genuine creativity is at risk when sensory engagement diminishes (C18, C23).

Supportive statements from chefs highlight these concerns. For instance, C16 notes, “AI-driven tools in our kitchen restrict our creativity . . . It holds you back from thinking. You do not use your brain in the old-fashioned way of thinking: ‘Let me think about this; let me put this in; what will happen?’ It really affects us because we have taken the easy way out.” Similarly, C18 remarks, “AI-driven tools negatively impact the skills of human chefs. When we constantly rely on AI, every dish ends up being similar. Creativity is the core element for us, especially in Michelin-star restaurants.”

4.3 The impact on innovation skills

This refers to the *implementation of ideas* generated through creative processes. Findings show that AI enhances innovation by supporting chefs in discovering new flavour combinations and accelerating recipe development. Through AI, chefs can streamline experimentation, ultimately enabling practical implementation of innovative culinary techniques.

The impact on innovation skills includes three main sub-themes: (1) inspiration and idea generation, (2) experimentation and testing and (3) presentation and plating. AI-driven tools accelerate research and development, allowing chefs to innovate more rapidly. Advanced equipment supports the exploration of complex techniques, while AI aids hypothesis testing and process optimisation. Despite these technological advantages, chefs underscore the indispensable role of intuition and personal experience in driving genuine innovation.

4.3.1 Inspiration and idea generation. Chefs extensively leverage AI-driven tools, such as ChatGPT, to enhance innovation, inspiration and idea generation in the kitchen. They use AI for innovative recipe ideas, ingredient exploration, technique development and storytelling, which directly stimulates culinary innovation. Overall, AI-driven tools serve as catalysts for creativity and innovation, expanding chefs' capacity for experimentation, encouraging exploration of new culinary ideas, and enriching their innovativeness in diverse and meaningful ways. The key points of chefs include:

Inspiration and practical efficiency: Chefs rely on AI to quickly gather ideas and technical insights, and to suggest novel combinations, saving time and broadening their creative horizons (e.g. C3). Moreover, AI-driven tools accelerate recipe development, menu planning and operational tasks, enabling chefs to focus more on innovation.

Discovery of innovative flavours and techniques: AI's vast datasets and pattern recognition enable chefs to experiment with unexpected ingredient combinations, fusion cuisines and scientific principles, fostering innovative culinary experiences (C13).

Storytelling and cultural enrichment: AI-driven tools can help create narratives for dishes, adding cultural depth and uniqueness to menus (C15).

Experimentation and innovativeness boost: Chefs use AI to generate multiple recipe variations from existing ingredients, explore new techniques and design visually appealing presentations (e.g. C14).

Visual and design inspiration: AI's access to global recipes, traditional practices and visual inspirations encourages chefs to learn from diverse sources, blending traditional and modern approaches to create innovative products (C7).

Some of the relevant explanations of chefs can be provided respectively as: "AI-driven tools are actually very encouraging for chefs like us to experiment with new and innovative things. Because you can try such innovative combinations that you would not think of, you think these combinations could be wonderful. You can try them, and when you do, a beautiful, innovative presentation can emerge . . . So, especially for restaurants with R&D kitchens, these AI-driven tools can be a significant part of innovation." (C14); "I used AI to create stories, which helped me create innovative presentations. We used ChatGPT to write the menu for the story of pastrami because we needed to capture some Ottoman cultural data. When we described the dish we wanted to make, ChatGPT captured the stories behind its preparation in the past, adding a touch of movement to the menu. That is how we used it to boost the innovativeness (C15)"

4.3.2 Experimentation and testing. AI-driven tools significantly enhance chefs' ability to experiment and test new culinary ideas by enabling complex techniques, supporting process innovation, and accelerating testing speed and efficiency. AI and technology significantly amplify culinary experimentation by saving time, reducing risk and expanding the range of possibilities. However, the core of originality and innovation remains deeply rooted in the chef's intuition and innovative flair. The key dimensions emerged as:

Facilitating complex techniques: Advanced equipment and AI suggestions enable chefs to explore complex textures and flavours. For example, C4 employs centrifugation and sous-vide techniques, whereas Chef 14 experiments with AI-suggested smoking methods to create innovative culinary experiences.

Support for recipe and process innovation by experimentation and testing: AI assists chefs in testing new hypotheses, optimising techniques and pairing innovative flavours. C12 and C23 highlight AI's role in suggesting experimental methods, though chefs often tailor these suggestions with their innovative skills.

Speed and efficiency in testing: AI accelerates the trial-and-error process, allowing chefs to test multiple variations quickly. C16 notes that AI enables rapid iterations, particularly for complex processes such as those involved in smoking and fermentation.

Chefs shared compelling examples of how AI tools influence their experimentation and testing processes. C14 noted, "AI-driven tools can help us a lot with experimentation and testing. When I want to try various cooking methods for meat, I find these techniques yield

incredible results. I once asked ChatGPT about smoking techniques since I only knew the traditional method involving plain coal. It suggested wetting the coals after lighting them and placing them under the meat to retain the smoke. I found that idea innovative and decided to try it. After cooking and sealing the meat, I was able to impart a unique smoky flavour by allowing the smoke to escape from the water. It worked wonderfully.” These insights illustrate that while AI-driven tools significantly enhance experimentation and testing in the culinary field, the chef’s creative instincts remain paramount in shaping original culinary expressions. This interplay between technology and human intuition is vital for fostering culinary innovation.

4.3.3 Presentation and plating. The findings revealed that AI-driven tools play a supportive role in enhancing the presentation and plating aspects of culinary art. Although AI assists with visual design and brainstorming, the final artistic touch remains a human-centric endeavour. AI supports the visual and conceptual design process in culinary arts, but does not substitute the inherent human skills required for final artistic expression. The related dimensions emerged as:

Limited or complementary use: Most chefs experiment with AI-generated images or concepts as inspiration, but the final presentation is primarily shaped by personal artistry and expertise. Chef 7 uses AI as a starting point, but the final plates are still crafted manually, whereas Chef 15 found AI-generated presentations lacked the desired emotional connection.

AI as a visual brainstorming tool: AI helps visualise potential layouts and refine ideas before physical execution. Chef 8 utilises AI for concept visualisation, finding inspiration to adapt to unique presentations without direct replication.

Innovativeness remains human-centric: Despite technological support, the essence of artistic expression is grounded in the chef’s intuition, cultural influences and personal experience—AI complements rather than replaces this process. Chef 14 integrates AI recommendations with personal style to enhance plating creativity.

Chefs presented compelling arguments illustrating their relationship with AI in presentation and plating. For instance, C8 shares, “I use AI-driven tools to explore various dishes that might inspire how I present food on the plate. Recently, I worked on a red mullet dish and asked ChatGPT for suggestions on presentation. While reviewing its ideas, I found inspiration to create a unique look that reflected my vision. Although AI provided helpful suggestions, I did not replicate them; instead, they sparked new ideas that guided my final presentation.”

5. Discussion and conclusion

Using an exploratory qualitative research design, this study examined the impact of AI-driven technological tools on chefs’ general skills, creativity and innovativeness in Michelin-starred restaurant kitchens. The findings highlight a complex relationship between AI-driven tools and culinary expertise in Michelin-starred kitchens. While AI enhances efficiency, supports knowledge acquisition and fosters innovation, there are valid concerns about skill erosion and over-reliance. The literature indicates that the use of technology in restaurant kitchens has the potential to compromise the craftsmanship of chefs, as it reduces the opportunity for hands-on practice (Seyitoğlu *et al.*, 2025a). Technology can cause chefs to forget traditional cooking techniques and lose mastery in specific cooking styles (Seyitoğlu *et al.*, 2025a). This study has also revealed that technology helps chefs improve their skills by eliminating time-consuming tasks, saving time and supporting them in producing better products. However, in the context of the impact of AI-driven tools on chefs’ skills in Michelin-starred restaurants, our study makes new contributions to the existing literature.

Chefs recognise the potential for AI to expand creative horizons, enabling experimentation with new techniques, flavours and presentations. Nevertheless, many also emphasise the importance of balancing technological use with traditional manual and sensory skills, as over-dependence could diminish essential artisanal competencies. The dual role of AI as both an enabler and a potential limiter underscores the need for strategic integration that leverages AI

to inspire and streamline without compromising the authenticity and cultural storytelling central to haute cuisine. Moving forward, key challenges include maintaining creativity, curiosity and manual dexterity, while embracing AI as a supportive tool for innovation and creativity in Michelin-starred restaurants. The findings of a study on the use of robot chefs in restaurant kitchens (Seyitoğlu *et al.*, 2025a) revealed that robot chefs have only cons, such as preventing creativity in cooking, as they do not introduce anything new during the cooking process and do not address the constantly evolving and innovative requirements of being a chef. By examining the effects of AI involvement in recipe creation and food production on consumers' willingness to order, recent research by Kim *et al.* (2025) indicates that a balanced approach in restaurants, in which AI handles routine, objective tasks while humans focus on creative and intuitive work, can yield positive results. It emphasises the importance of defining clear roles in human-AI collaboration.

To better understand why AI is considered both a creative enabler and a potential limiting factor, it is necessary to refer to human-AI collaboration models and the socio-technical systems approach. Collaborative intelligence models demonstrate that creativity arises from problem-solving processes in which humans and machines work together (Ali *et al.*, 2025; Salma *et al.*, 2025), and this is increasingly evident in Michelin-starred kitchens, where chefs shape their intuitive decisions with AI. These models explain why chefs, while acknowledging AI as a supporter in idea generation, feel the need to retain ultimate creative authority to preserve craftsmanship and authenticity. Moreover, the concept of "socio-technical systems (STS)" highlights the interconnectedness of social elements (people, interactions, organisations) and technical elements (technology, processes) in organisations (Thomas, 2024). STS posits that optimising one requires optimising the other; neglecting either can hinder effectiveness. Consequently, a successful organisation must balance predictable linear processes with unpredictable non-linear processes driven by social interactions and creativity, thereby fostering both human and technical components for adaptability and stability. In this line, while AI can enhance the creativity and efficiency of chefs in Michelin-starred restaurants by providing valuable insights and freeing up time for innovation, it can also constrain their creative expression through standardisation, reduced skill development and a reliance on data-driven approaches, which may inhibit the pursuit of unique culinary experiences. Balancing these elements is essential for maximising the potential of chefs. The integration of these theoretical frameworks demonstrates that the dual role of AI in creativity and innovation arises from a dynamic interaction among human competence, technological capacity and organisational-cultural structures.

This study provides a comprehensive examination of how AI integration can transform the culinary landscape. It contends that AI in haute cuisine exemplifies a contested augmentation of craft rather than a pathway to full automation. By illuminating these dynamics, this research contributes both theoretically and practically to the discourse on the integration of AI into the culinary arts, addressing significant questions regarding identity and authorship in contemporary gastronomic practices. Michelin-starred restaurants can leverage these insights to harness the potential of AI while preserving the rich traditions that define their culinary identity, ultimately reinforcing the delicate balance between innovation and tradition. By understanding and implementing the theoretical, managerial and practical implications of this study, Michelin-starred restaurants can harness the potential of AI while preserving the rich traditions that define haute cuisine.

5.1 Theoretical implications

This study offers significant theoretical implications that highlight the profound impact of AI-driven technological tools on culinary practices in Michelin-starred kitchens.

Redefining culinary creativity and skill development: The findings challenge traditional notions that emphasise manual dexterity, sensory acuity and experiential knowledge as the sole drivers of culinary excellence. Instead, they suggest that AI integration can redefine what

constitutes culinary creativity and skill. This invites a broader conceptualisation where technological fluency becomes a core component of a chef's skill set. The emergent understanding is that competence in the modern kitchen includes not only artisanal techniques but also the ability to effectively leverage AI tools for inspiration, experimentation and precision. Such a perspective extends existing theories of the culinary arts to incorporate digital literacy as a fundamental aspect of advanced cooking. More specifically, the evolving skill set of Michelin-starred chefs is consistent with fundamental theories of creativity, such as Amabile's Component Model, which emphasises the interaction of domain knowledge, creative processes and intrinsic motivation and Csikszentmihalyi's Systems Theory, which positions creativity within the dynamic interaction between the individual, the domain and the environment. These frameworks help contextualise how AI is reshaping contemporary culinary creativity not merely as a technical shift, but as a restructuring of the broader creative system in which chefs operate.

Evolving the concept of artistic practice in culinary arts: From a theoretical standpoint, the dual impact of AI on both enhancing and restricting creativity introduces a nuanced dialogue about the nature of artistic expression in the context of technological augmentation. It raises questions about whether creativity becomes more about the synthesis of human intuition and machine-generated ideas, or risks homogenization through over-reliance on AI-generated solutions. This tension contributes to the development of new frameworks for creativity, originality and artistic authenticity in a digitally mediated culinary environment, providing a fertile ground for further scholarly exploration.

Implications for cultural and heritage preservation: The findings also suggest that AI can be used as a tool for cultural preservation, enabling chefs to access, interpret and incorporate traditional recipes and narratives into modern cuisine. Theoretically, this broadens the understanding of cultural authenticity and innovation as complementary rather than oppositional forces in haute cuisine. It encourages an interdisciplinary approach that integrates the culinary arts, cultural studies and digital technology, facilitating a richer understanding of how tradition can evolve with technological support.

5.2 Managerial implications

Based on the study's findings, managerial implications are presented across three dimensions.

Strategic integration and deliberate negotiation of AI: For restaurant managers, the findings underscore that AI should not be framed as a replacement for human craft. Instead, its adoption requires deliberate negotiation with chefs to ensure that tools are integrated thoughtfully to support, rather than diminish, culinary excellence. Managers should establish clear protocols for AI use, prioritising its application for research, experimentation, or process optimisation where it augments human capability, rather than automating fundamental manual skills. This approach respects chefs' concerns about de-skilling and fosters genuine collaboration.

Dual-focus skill development programs: Managers should implement continuous training programs that holistically develop both traditional culinary skills and AI literacy. This dual-focus approach ensures chefs remain masters of manual techniques while becoming proficient in leveraging AI-driven tools as facilitators. Such programs could include workshops on the ethical and creative application of AI, safeguarding the artisanal integrity of their culinary practice by emphasising augmentation over substitution.

Fostering innovation while respecting tradition: Managing innovation requires a delicate balance, encouraging the experimental use of AI-driven tools to stimulate creativity and efficiency while preserving essential traditional skills and cultural narratives. Empowering chefs to explore AI-inspired ideas thoughtfully, guided by their expertise and cultural understanding, reinforces that AI's role is to augment, not dictate, the culinary vision. Such a working environment may enhance the restaurant's brand authenticity, culinary differentiation and capacity to adapt to evolving culinary trends.

5.3 Practical implications

Significant practical implications are provided for practitioners under four main aspects as follows.

Enhancing consistency and efficiency: In practice, AI-driven tools can assist with quality control and process standardisation, which are critical to maintaining Michelin standards. For example, AI-driven tools can optimise temperature controls, portion sizes and presentation standards, ensuring each dish consistently meets high expectations. This consistency reduces waste, improves operational efficiency and enables chefs to devote more time to refining innovative concepts rather than to routine tasks.

Leveraging AI for focused experimentation and continuous learning: Chefs should be encouraged to experiment with AI-driven tools for developing new recipes, presentation styles and flavour pairings. For instance, using AI for flavour discovery can inspire chefs to incorporate unconventional ingredients or techniques, fostering culinary innovation. Restaurants could establish dedicated R&D kitchens equipped with AI tools, creating a space for safe experimentation and iterative testing.

Leveraging AI for cultural and menu storytelling: AI's ability to access vast datasets about culinary history, regional cuisines and cultural narratives can be used to craft menu stories that resonate with diners. Chefs can utilise AI-driven tools to develop authentic storytelling that enhances the guest experience, linking dishes to cultural heritage, historical insights, or culinary traditions in innovative ways. This storytelling authenticity has the potential to add a unique value proposition that can differentiate Michelin-starred restaurants in a competitive market.

Augmenting, not replacing, culinary heritage: AI-driven tools can serve as dynamic digital archives for traditional recipes, techniques and cultural stories, actively preserving culinary heritage amidst innovation. Chefs can draw on these AI-supported resources to create dishes that honour tradition while judiciously incorporating new techniques or ingredients. This ensures that the essence of cultural authenticity evolves, demonstrating how AI can augment the continuation and interpretation of heritage.

Addressing ethical dimensions in practice: The practical integration of AI should also acknowledge potential ethical implications. For instance, discussions around data ownership of unique recipes developed with AI-driven tools, transparency with guests about AI's role in dish creation and the long-term impact on job roles as AI automates specific tasks are crucial. While this study is exploratory, the data suggest that chefs and management must proactively engage with these ethical aspects as AI becomes more prevalent.

5.4 Limitations and future directions

Although this study makes a significant theoretical and practical contribution to the literature, it also identifies limitations that offer opportunities for future research. First, as this paper is based on a qualitative study with 23 interviews and includes the specific perspective of Turkish chefs working in Michelin-star restaurants, it may limit the generalizability of results in other cultural, geographical and restaurant types contexts, which can be an opportunity for future studies to delve into the topic from different angles and contexts. Future studies could investigate the long-term effects of AI-driven tools on the dynamics, culinary creativity and innovation in Michelin-star kitchens. Additionally, cross-cultural studies represent another avenue for research into how perceptions of AI-driven tool use vary across culinary traditions and cultural contexts. These studies could examine how cultural factors influence the acceptance and utilisation of technology in kitchens, providing insights into best practices for integrating AI in ways that respect and preserve unique culinary identities.

This study lacks a categorisation of AI-driven technological tools in semi-structured interviews with chefs. Although questions addressed various tools, such as robotic systems, smart kitchen equipment and generative AI, the absence of predefined categories may have limited the analysis of how each type of AI-driven tool specifically influences chefs' skills,

creativity and innovation. Future research can develop a structured framework to classify AI-driven tools into distinct categories, such as robotic automation systems, smart equipment and generative AI. This categorisation would allow for a more nuanced understanding of their specific impacts on culinary practices. In addition, this study did not examine the specific characteristics of the AI-driven tools used by chefs, such as whether they are free or paid, proprietary or open-access. As such, the lack of categorisation regarding these aspects may limit the understanding of the contextual factors influencing chefs' engagement with these technologies. Future research could benefit from exploring these dimensions to provide a more comprehensive analysis of the impact of AI tools in culinary practices.

With only two women among the 23 chefs interviewed, the underrepresentation of female chefs in the sample is also a limitation. This reflects broader trends in the culinary industry, in which men are disproportionately represented in professional kitchen roles (Acosta *et al.*, 2022). As a result, the findings may be influenced by male perspectives, potentially limiting the diversity of experiences and insights regarding AI-driven technologies in culinary practices within Michelin-starred restaurants. Future research should aim for more balanced gender representation to capture a broader range of narratives and to enrich the understanding of these dynamics in the restaurant industry.

Future research could also investigate how chefs use AI-driven tools to communicate their culinary heritage to international audiences and how resource constraints shape the availability of such tools across different culinary settings. Exploring these dimensions would yield valuable insights into the interplay among technology, culture and culinary identity, thereby contributing to a more comprehensive understanding of the evolving culinary landscape.

Furthermore, while this study provides a snapshot of current attitudes towards AI-driven tools in culinary arts, it does not capture the long-term implications of AI integration. Such studies could be designed to observe how the sustained use of AI-driven tools affects chefs' skills, creativity and overall innovation in the culinary field over time. They could help identify whether the initial benefits observed are sustained and whether any potential drawbacks, such as skill erosion, become more pronounced over time.

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Data availability statement

There is no data associated with this manuscript.

Declaration of generative AI in scientific writing

During the preparation of this study, the author used Grammarly to check grammar and language. After using this tool, the authors reviewed and edited the content as needed and took full responsibility for the publication's content.

Appendix

Q1. Would the use level of AI-driven tools (e.g. robotic cooking systems, AI-driven robots to assist, smart AI-powered ovens, AI-powered smart fridges with temperature-control sensors) in Michelin-starred restaurants affect chefs' skills?

- Do you believe using AI-driven tools has influenced your culinary skills? How so?

- Q2. Can you explain the relationship between AI-driven kitchen technology and chefs' creativity?
- In this context, what do you think about using AI-based tools in the kitchen (e.g. robotic cooking systems, AI-driven robots to assist, smart AI-powered ovens, AI-powered smart fridges with temperature control sensors)?
- Q3. Can AI tools help foster innovation in the culinary field? How so? Do you have any examples of how AI has contributed to the development of a new, innovative dish or technique?
- Do you benefit from AI-driven technological tools to seek inspiration or generate new ideas for your dishes? If yes, can you provide examples? Have you used, or are you using, any AI-based tools (e.g. generative AI tools such as ChatGPT) in this context?
 - What role does technology play in your process of experimenting with new recipes or techniques? Have you used, or are you using, any AI-based tools in this sense?
 - Has technology influenced your approach to presentation and plating techniques? If yes, how? Have you used, or are you using, any AI-based tools in this sense?

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