

Conference Paper

Commercial Kitchen Management: From 4.0 to 5.0

Faisal Akbar Zaenal^{1*} and Syamsu Rijal²¹Universitas Hasanuddin, South Sulawesi, Indonesia²Culinary Art Study Program, Department of Hospitality, Politeknik Pariwisata, Makassar, South Sulawesi, Indonesia**ORCID**Faisal Akbar Zaenal: <https://orcid.org/0000-0002-8666-9957>Syamsu Rijal: <https://orcid.org/0000-0003-3258-0233>**Abstract.**

Equipment utilization is one facet of commercial kitchen management. Technology era Industry 4.0 significantly impacted food production, and technology era Society 5.0 has improved the process's effectiveness and efficiency. This study examines how human agents, such as chefs and kitchen crew, collaborate with artificial agents, represented by smart machines, to attain precision and consistency in the culinary arts. The study underlines the value of chefs' essential skills, creativity, and leadership in delivering one-of-a-kind culinary experiences. While technology and clever tools have become integral parts of commercial kitchens, chefs' human touch and personal interaction remain critical. The research also looks at the difficulties and limitations of artificial agents in perfectly recreating human experience and cultural characteristics. It emphasizes the importance of human-machine collaboration to optimize production processes, increase efficiency, and solve the issue of abstraction in the culinary arts. However, it highlights that technology can only replace human intelligence and experience to a limited extent. The study indicates that reciprocal care and collaboration between human and artificial agents are critical for commercial kitchen management's long-term performance and sustainability in the Society 5.0 era.

Keywords: human agents, artificial agents, commercial kitchen

1. Introduction

Industrial evolution influences society's evolution, and technological evolution influences industrial evolution [1,2]. This focuses on studying Society 5.0 or other evolutionary levels in applying technology in the industry. However, in the context of Society 5.0, it also emphasizes the application of technology in the domestic and public sectors and its implications for the sustainability of existence. Three fundamental ideas in this evolution—chefs and their staff working in commercial kitchens, the area known as a commercial kitchen, and consumers who show up through various requests—are derivatives. However, a small portion also contains equipment used in the domestic sector, with the consumer in mind.

Corresponding Author: Faisal Akbar Zaena; email: faisalakbar85@poltekiparmakassar.ac.id

Published 3 January 2024

Publishing services provided by Knowledge E

© Zaenal, Rijal. This article is distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use and redistribution provided that the original author and source are credited.

Selection and Peer-review under the responsibility of the ICHELSS Conference Committee.



Commercial kitchen management refers to four aspects: physical assets, as an aspect of space and the contents of a commercial kitchen; information, as an aspect relating to human resources; the ability to operate various equipment or technology; and time. These four aspects demonstrate that commercial kitchen management is about the culinary industry and technology, or it can be understood differently, and the consumer does not appear in these four aspects because he or she is the objective of management. Thermomix is one of the 5.0 technologies in the context of cuisine. This equipment is multifunctional in that it is capable of milling or grinding, cooking, emulsifying, whipping, steaming, mixing, stirring, blending, chopping, kneading, precise heating, and weighing, making it applicable to domestic kitchens as well as supporting the activities of celebrity chefs and professional chefs. Thermomix is marketed via the official website, www.thermomixindonesia.co.id, in Indonesia at Rp. 28,500,000.00. This price is justified, as consumers remain prioritized through connectivity on the cookie-International website, making Thermomix a sensible technology. However, there is no element of culinary art in the Thermomix, as this device's functions do not include food presentation. The culinary arts connect the culinary industry and technology with consumers.

This is a skill that only chefs and a portion of the commercial kitchen staff possess, which is why it is also a component of commercial kitchen management [3]. This bridge is the core of the application or use of technology in the culinary industry, as it is the only way to form products from commercial kitchens to meet consumers, in addition to being the only way concerning the continuity of the culinary business, namely that in a digital society, demand is becoming increasingly diverse due to the expansion of information about various types of cuisine. In a super-smart society, culinary art is at stake with technology due to the thinning of the culinary labor force.

2. Method

This study is based on fieldwork in Makassar City at The Rinra Hotel, Four Points by Sheraton Makassar, Novotel Makassar Grand Shala, Gammara Hotel Makassar, Nucifera Café Pastry, and Long Mian. Although the research was conducted in hotels and restaurants, the data collection procedure was limited to restaurants because commercial culinary management activities occurred there [4]. The informants were selected based on the organizational structure of the commercial kitchen, in which the chef is the highest-ranking leader, and the work team consists of the positions of sous chef, chef de partie, servers, and steward [4–6]. As this structure is not standardized

[3,7], chefs, sous-chefs, and chefs de partie from each restaurant participated in the data collection procedure. Observation of work activities and conversation with an emphasis on in-depth interview techniques were used to collect data on commercial kitchen management [8–11], where the first technique aims to identify social situations through observation of places, actors, and activities [10] in the commercial kitchen management process, and the second technique aims to understand the perspectives of actors [9]. In commercial kitchen management, data analysis was conducted by combining the results of applying the two data collection techniques and abstracting them to identify recurring cultural themes in several domains, understood as relationships between various subsystems of meaning [11].

3. Result and Discussion

3.1. Human agents and artificial agents in kitchen commercial

One definition of posthumanization is a process in which humans collaborate continuously and meaningfully with computerized systems to create intimacy, in which the collaboration is formed because of the integration of humans and technology, such as machines, equipment, or devices, which is why it is also commonly known as the cyborgization process [12]. This social phenomenon is one of the fundamental causes of the concept of Society 5.0 [12–14] and is a consequence of Industry 4.0. This social phenomenon has occurred in commercial kitchens due to the collaboration of certain equipment with chefs and culinary staff. Collaboration in this context is working together in which the first party assumes a role that has become the second party's obligation and/or responsibility, and the second party is obligated to provide what the first party requires, which occurs not in a context of balance but equality.

Technology, particularly in the 4.0 era, is one of the fundamental reasons for the concept of society 5.0. It can be defined as knowledge, activities, processes, and values that seek to improve human capabilities or enable humans to organize their work [15]. To accomplish both goals, artificial agents—namely, electronic systems in machinery, devices, or hardware—under the control of intelligent agents or software must carry out various tasks [12], including those that fall under the purview of chefs and kitchen staff. Understanding the previous definition of posthumanization and, therefore, what collaboration entails, collaboration occurs not only between machines and humans or vice versa but also between artificial agents and chefs and commercial kitchen crews as human agents, as smart equipment and/or devices are included in society's conception

of collaboration. The number 5.0 is a consequence of personification. In other words, life in a commercial kitchen is about management, which is not only caused by being in a business context but also by the short working time in the process of making food as a dish, in which there are also problems associated with the efficiency and effectiveness of the use of commercial kitchen technology. The two agents engage in managerial activities [3,16].

3.1.1. Precision and consistency

Collaboration between artificial and human agents has become commonplace, particularly in management contexts. However, artificial agents have limitations that restrict their functionality. Inapplicable for use in the textile industry, for instance, are devices designed for use in a commercial kitchen; “brain capacity” refers to the capacity of a hard drive or solid-state disk to store information. Even though the Internet cloud has progressed, aspects of human culture still cannot be communicated with intelligent machines [16].

In the context of a commercial kitchen, the term “variety” refers to two crucial facets of the culinary arts: culinary precision and culinary consistency. Culinary precision is the ability to position color, flavor, aroma, and texture in food with precision and accuracy [3,17]. Consistency in the kitchen refers to the capacity to attain a high level of uniformity in each portion of food served. Both are essential components of the concept of the culinary arts.

This concept has a technical aspect, but it captures the essence of the craft of chefs and certain members of commercial culinary crews, such as sous chefs and chefs de partie. They are crucial in creating flawless dishes in appearance, flavor, aroma, and texture. Although interpretations and meanings of commercial kitchen products can vary [18], this essence refers to a problem in the chef profession [19,20].

On the other hand, there are some food types that intelligent machinery can process with the same accuracy and consistency as chefs. Intelligent machines can be programmed to generate meals that meet predetermined criteria. However, the essence of a chef’s skill and individuality is irreplaceable in creating dishes with intelligence, originality, and a personal touch that is difficult for technology to replicate.

1. *The existence of an irreplaceable chef*

Chefs can create dishes with an interesting combination of flavors, textures, and presentation because they thoroughly comprehend cooking techniques, have

tasted various dishes, and know the latest culinary trends. Their skill in manually preparing ingredients and intuitively modifying flavors and textures is irreplaceable.

In addition, the chef possesses acute intuition and a wealth of experience overcoming obstacles in commercial kitchens. They can select the right ingredients, combine them harmoniously, and tailor the flavor to the diner's preferences. The ability to make prompt and accurate decisions in frequently evolving situations is only partially replaceable by technology. This skill is developed in tandem with their years of experience in the culinary world.

In addition, a chef's leadership function in a commercial kitchen cannot be replicated. They interact with the guests, clarify the concept of the dishes, and make recommendations accordingly, in addition to preparing the food. The demeanor of the chef can distinguish a culinary experience. They serve dishes with a personal touch and create an inviting atmosphere for visitors to enjoy culinary delights.

Even though technological advancements, such as sophisticated apparatus and process automation, have been introduced to commercial kitchens, chefs still need to be more present. The combination of knowledge, skill, creativity, intuition, and personal interaction that a chef possesses renders them irreplaceable in creating unique, gratifying, and warm culinary experiences.

2. *Collaboration between human agents and artificial agents*

According to Aleksandra Berkowicz [15], the purpose of technology in the context of a commercial kitchen is to provide equipment and/or devices that not only realize what is planned according to the creative expectations and experience of a chef but also assist chefs and commercial kitchen crews in running commercial kitchen production efficiently and effectively. This objective includes overcoming the problem of abstraction in the culinary arts, among other things.

Technology in commercial kitchens enables caterers to meet these challenges more effectively. They can rely on cutting-edge equipment, such as a combination oven with automatic temperature monitoring technology, which enables them to achieve consistent culinary results. In addition, technology has enabled chefs to optimize production processes, reducing the time needed for food preparation and cooking, thereby enhancing the efficacy of commercial kitchens.

In addition, technology offers innovative solutions to the issue of abstraction in the culinary arts. For instance, a 3D food printer allows caterers to print food with intricate and appealing designs. With this technology, commercial kitchens can better accomplish

their goals: to assist chefs and kitchen staff in achieving the desired results efficiently, effectively, and consistently, despite the challenges posed by abstraction in the culinary arts.

3.2. The humanist function of artificial agents

Humans, referred to in the context of this article as human agents, have culture, which is a guide for identifying, determining, and deciding about all the various aspects of life [21]. Artificial agents are “the culture of machines,” which functions identically to the culture that exists within every human [12,16]; for this reason, machines are considered “persons” in organizational and/or management structures. The existence of a “culture of machines” led to the creation of the term “smart machine” because, like human cognition, the “culture of machines” also retains a variety of data, or “big data” [22,23], but for different reasons.

As a “person,” a cognitive machine that contains large amounts of data about the responsibilities of chefs and commercial kitchen crews can perform tasks in commercial kitchens. In the era before “smart machines,” chefs and commercial kitchen personnel worked quickly to meet consumer demands. Even though physical assets have become a component of managerial ability [3], the condition of machines needs to be addressed.

During the era in question, damage to machines caused by human error, such as continuous use, or other factors, such as a sudden decrease in electrical power, prompted chefs and commercial kitchen crews to be aware of the condition of the machines and take the time to inspect them periodically. “Before machines got smart,” machine failure caused some of us to panic, or we tried to explain the cause of the breakdown. However, we did not offer a solution, and even though there was someone among us with the courage to deal with the damage, machine failure generally causes long to very long waiting periods until the arrival of replacement parts and an expert, especially in the world of chefs and commercial kitchen crews. In the era of intelligent machines, artificial agents have collaborated with human agents by assuming several roles that, while related to machines, are closely related to human agents. On the other hand, there are now intelligent machines equipped with contact centers where warnings of the impact of errors are provided until machine errors are reported and then reported to the user or human agent. **Figure 1** provides an overview of the differences between these two eras.

By perceiving intelligent machines as individuals with a culture referred to as artificial agents, it is possible to give intelligent machines a humanist function implemented

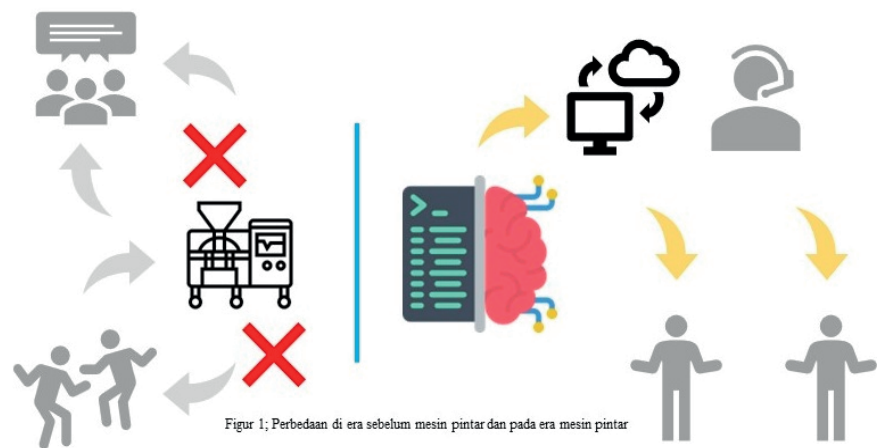


Figure 1: Provides an Overview of The Differences Between These Two Eras.

through collaboration with human agents. However, as previously discussed, there are still practical limitations to the capabilities of intelligent machines. Managing the maintenance of intelligent machinery requires a certain amount of capital, which can be problematic for small and medium-sized economies, particularly in the culinary industry. In addition, the necessary capital should be allocated to human agents or human resources in business because their naivety will likely result in a return to the era before intelligent machines collaborated with them.

4. Conclusion

Our study shows that smart machines in the culinary business are collaborative between chefs and commercial kitchen crews as human agents and artificial agents contained in smart machines. The collaboration in question is equality, namely that each of these agents needs the other, which therefore forms an attitude of mutual care between one another, which, in the context of artificial agents, will maintain product output from commercial kitchens through the conception of precision and consistency, and maintain itself (the machine) with the aim of business continuity going on without worrying about damage to equipment and/or devices. However, the existence of smart machines does not make human intelligence which is formed through knowledge and experience - be - replaced because culinary art, which is the essence of the profession of chefs and commercial kitchen crews, is a humanistic thing because there are senses that smart machines do not have. On the other hand, even though a smart machine with a collaborative interaction model exists, it certainly requires more capital to acquire and operate it.

Acknowledgements

We thank the management and kitchen crew at the research site and the alums and civitas of the Culinary Arts Study Program at Politeknik Pariwisata Makassar. The support provided was of great value and played a pivotal role in achieving our objectives.

5. Funding

The research was conducted with funding from impartial sources.

References

- [1] Fukuyama M. Society 5.0; Aiming for a new human-centered society. In: Japan Spotlight. Japan Economic Foundation; 2018.
- [2] Narvaez Rojas C, Alomia Peñafiel GA, Loaiza Buitrago DF, Tavera Romero CA. Society 5.0: A Japanese concept for a superintelligent society. *Sustainability (Basel)*. 2021;13(12):6567.
- [3] Culinary Institute of America. *The professional chef*. John Wiley & Sons, Inc; 2011.
- [4] Giousmpasoglou C, Marinakou E, Zopiatis A, Copper J. *Managing people in commercial kitchens: A contemporary approach*. Routledge; 2022.
- [5] Labensky SR, Alan MH, Martel PA. *On cooking: A textbook of culinary fundamental*. 6th Ed. Performance Research. 2018;23:431–436.
- [6] Gisslen W. *Professional cooking*. Volume 8. New Jersey: John Wiley & Sons; 2015.
- [7] Escoffier MR. The chef in society: Origins and development. *Hosp Review*. 1987;5(1):6.
- [8] Bernard HR. *Research methods in anthropology; qualitative and quantitative approaches*. AltaMira Press; 2011.
- [9] Lune H, Berg BL. *Qualitative research methods for the social sciences*. Pearson Education Limited; 2017.
- [10] Spradley JP. *The ethnographic interview*. Waveland Press; 2016.
- [11] Spradley JP. *Participant observation*. Waveland Press; 2016.
- [12] Gladden ME. *Sapient circuits and digitalized flesh: The organization as locus of technological posthumanization*. 2nd ed. United States of America: Defragmenter Media; 2018.
- [13] Gorecky D, Schmitt M, Loskyll M, Zuhlke D. Human-machine-interaction in the industry 4.0 era. 2014 12th IEEE International Conference on Industrial Informatics (INDIN). Proto Alegre, Brazil: IEEE; 2014. p. 289–294.

- [14] Ferreira CM, Serpa S. Society 5.0 and Social Development: Contributions to a Discussion. *Management and Organizational Studies*. 2018;5(4):26.
- [15] Berkowicz A. Economization, (post)humanization, and technologization: Perspectives of school organization management. *International Journal of Contemporary Management*. 2019;18(3):27–51.
- [16] Gladden ME. *Posthuman management: Creating effective organizations in an age of social robotics, ubiquitous AI, human augmentation, and virtual worlds*. Volume 2. Defragmenter Media; 2016.
- [17] Dornenburg A, Page K. *Culinary artistry*. John Wiley and Sons Inc.; 1996.
- [18] Adapon J. *Culinary Art and Anthropology* [Internet]2008. 160 pp., Available from <https://books.google.com/books?id=aWutAwAAQBAJ&pgis=1>
- [19] Chelminski R. *The perfectionist; Life and death in haute cuisine*. Gotham Books; 2005.
- [20] Batat W. How Michelin-starred chefs are being transformed into social bricoleurs? An online qualitative study of luxury foodservice during the pandemic crisis. *Journal of Service Management*. 2020;32(1):87–99.
- [21] Goodenough WH. Comment on cultural evolution. *Dalam Deadalus*, 90, 3. The MIT Press; 1961. 521–528 p.
- [22] Minelli M, Chambers M, Dhiraj A. *Big data, big analytics; Emerging business intelligence and analytic trends for today's business*. Wiley; 2013. <https://doi.org/10.1002/9781118562260>.
- [23] Kale V. *Big data computing; A guide for business and technology managers*. CRC Press; 2016.