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International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

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A Study on Role of AI in Institutional Kitchen

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ABSTRACT: This study explores AI involvement and potential usage in the institutional kitchen. We analyze the implementation of AI technologies such as robotics, machine learning algorithms, and computer vision systems to increase efficiency, safety, and quality control in commercial food service settings. The study finds, among other things:

Robotic systems powered by AI are increasingly automating certain jobs in large-scale institutional kitchens, such as food preparation, inventory management, and food waste reduction.

Machine learning algorithms are used to select menus, streamline supply chain logistics, and predict food spoilage rates.

Computer vision technology enables visual quality and safety control of food products.
While there are major operational improvements possible with AI technology, challenges still remain concerning how to integrate new technology into existing workflows, and how to consider the issue of displaced workers.

Future research ought to examine the long-term impact of AI on kitchen staff's functions, training needs, and performance metrics within their organizations.

KEYWORDS: AI technology, machine learning, Computer vision technology, AI on kitchen staff's functions,

I. INTRODUCTION

Artificial intelligence (AI) is influencing a multitude of industries, with institutional kitchens being no exception. Institutional kitchens are food-serving entities catering to large groups of people and usually taking place in schools, hospitals, and corporate cafeterias. These kitchens have to contend with all the unique challenges determining food preparation, inventory, and control of quality. The response to these challenges and their effective management is where AI technologies can play a significant role.

- They can also automatically do everything from optimizing recipes, planning menus, managing inventory, and predictive maintenance of kitchen equipment.
- Benefits include enhanced food safety, reduced waste, happier customers, and increased operational efficiencies.
- The barriers to the integration of AI systems with any existing infrastructure as well as concerns over loss of jobs.
- Within the commercial kitchen environment, research indicates an increasing adoption of AI technologies spurred by pressure to improve efficiency and better manage cost increases.

This paper will discuss the state of the art concerning the application of AI to institutional kitchens, examine the pros and cons, and survey forthcoming trends. Perhaps, use of AI to optimize institutional kitchen processes speaks thus to the larger discourse over how technology can enhance the delivery of food service in large-scale settings.

II. REVIEW OF LITERATURE

- **Sudip Chakraborty, Sreeramana Aitha, (2024) AI Kitchen** "A few smart devices make the kitchen smart. The bright image of an ancient kitchen has seen a reform. The kitchen nowadays is glorified by modern technology.

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Kitchen chimney, microwave oven, etc., are making the job of the modern kitchen easier. AI has now come into the picture, and nearly all devices have been shortened either by the AI or are becoming AI-integrated. In such a scenario, we are demonstrating the project in the AI-enabled kitchen. There are good reasons for developing an AI-enabled kitchen in comparison to a smart kitchen. While repetitively, tedious work will be handled by AI, it will also safeguard us from any kind of mishap before it presents itself-a general occurrence caused due to forgetfulness or carelessness. Design/Methodology/Approach: We installed a CPU inside the home. In the kitchen, we set up an action controller to connect all kitchen gadgets."

- Matti Minkkinen, Matti Mäntymäki, (2024) The institutional logics underpinning organizational AI governance practices "New developments in artificial intelligence (AI) promise significant benefits, while they also invoke new risks and harms to individuals, organizations, and societies. The rise of AI compels us to put into action strategies for reliable AI governance. However, operationalizing AI ethics principles into governance activities still remains a challenge. Our paper recasts the "AI ethics translation problem" from a unidirectional translation into a bidirectional interaction between multiple institutional logics and organizational AI governance practices. We conduct the study of theory adaptation, using the AI governance translation problem as a domain theory and institutional logics and institutional pluralism as method theories."

III. OBJECTIVES OF THE RESEARCH

- Improved food quality and safety
- Increased efficiency and productivity
- Reduced labor costs through automation
- Better nutrition and meal planning options
- Enhanced sustainability through reduced waste and energy usage

IV. SCOPE OF THE STUDY

1. Periodic Consideration of the Role of AI in the Food Service Industry:
- Uses of AI in commercial kitchens
- Existing AI solutions for kitchen management
2. AI Technologies Implemented in Institutional Kitchens:
- Machine learning for menu planning and stock management
- Vision technology for inspection and quality control
- Natural language processing for kitchen automation and advising staff
3. Effect on Efficiency:
- Time savings through automated processes
- Better resource allocation and scheduling
- Improved productivity in food preparation and serving
4. Safety and Quality Control:
- An AI-powered system for detecting food-related pathogens
- Predictive maintenance of kitchen equipment
- Automated detection and warning systems for allergen detection
5. Trends and Challenges on the Horizon:
- Emerging AI technology in kitchen automation
- Ethical considerations involving the deployment of AI
- Training and adoption challenges for kitchen staff

V. RESEARCH METHODOLOGY

RESEARCH DESIGN

In this study, the researcher will apply a mixed approach by questioning both quantitative and qualitative methods for data collection and analysis:

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QUANTITATIVE SURVEY:

An online survey will be developed and distributed to institutional manager chefs and staff in North America.
The current use of AI, perceived benefits and challenges, and future adoption intents will be collected.

QUALITATIVE INTERVIEWS:

In-depth interviews with institutional managers making AI-related implementations.
These interviews will give voice to experiences, successes, challenges, and recommendations for other kitchens intending to implement AI.

Discovery study:
Upon the commencement of this research study, various kitchen sites will be analyzed for an in-depth observation of an implementation of the ICT interfacing the AI.

In situ observations include collecting information about performance, user interactions, and working flow impacts of the said systems.

DATA ANALYSIS

The quantitative survey data will be analyzed using descriptive statistics and inferential statistical tests to identify existing patterns and relationships. Thematic analysis will identify core themes and insights from qualitative interview data. Descriptive data from these observation studies will be coded and interpreted to show patterns in usages of the AI systems or their impact.

TYPES OF DATA COLLECTION

Primary Data: primary data are those which were collected a fresh & for the first time and thus happen to be original in character.

- Questionnaire

Secondary Data: Secondary data is collected from previous research and literature to fill in the respective project. The secondary data was collected through:

- Articles
- Websites
- Books

Sample Size: (35 customers)

Analysis Technique: Random Sampling and Questionnaire technique selected by researcher to collect the data from the respondent.

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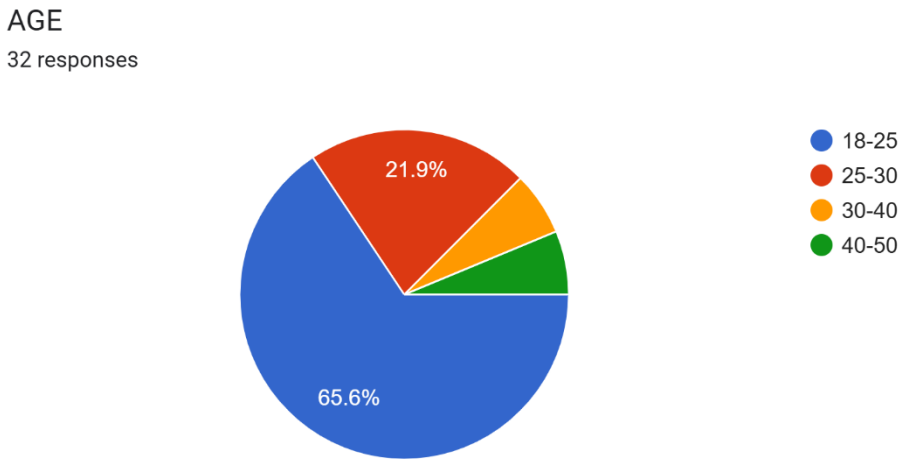
□ **Age**

DATA ANALYSIS & INTERPRETATION



Response	Frequency	Percentage
18-25	21	65.6
25-30	7	21.9
30-40	2	6.3
40-50	2	6.3
Total	32	100

DATA ANALYSIS:
From the above graph and table, it is observed that out of 32 responses, 21 respondent is from 18-25 age group with 65.6%, 7 respondents are from 25-40 age group with 21.9%, 2 respondents are from 30-40 age group with 6.3%, 2 respondent is from 40-50 age group with 6.3%,

INTERPRETATION:
It is observed the most of the respondents are in the age group of **18-25 YEAR** and the last numberof respondents belong to the age group of **30-50 YEARS.**

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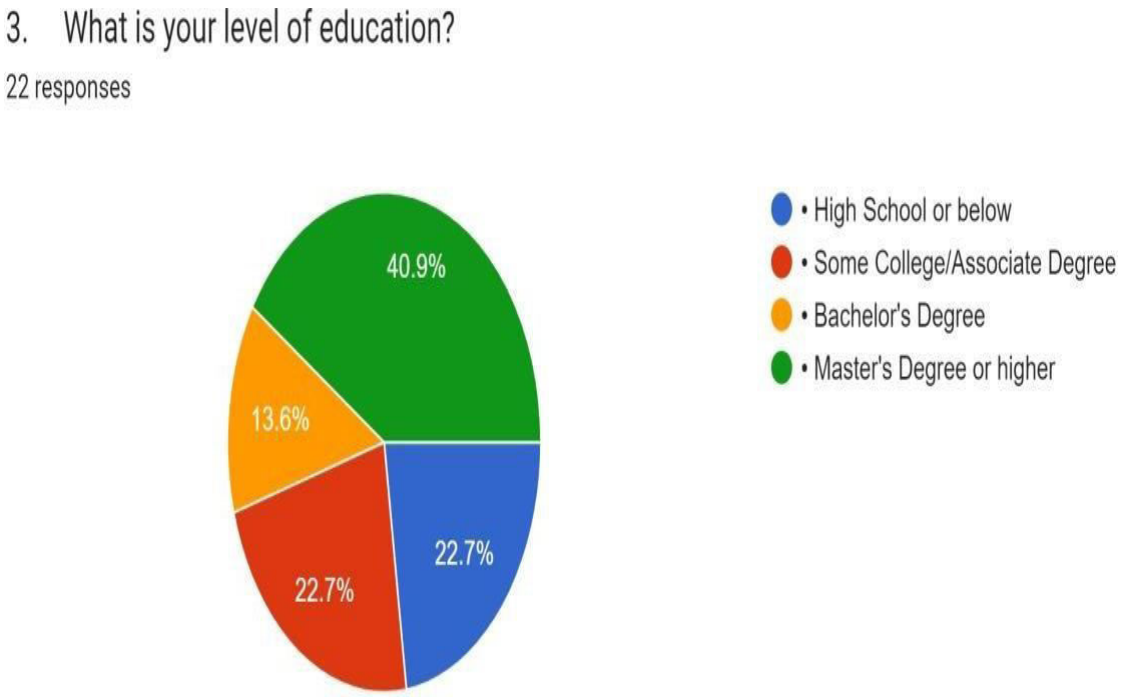
□ Education level



Response	Frequency	Percentage
High school	5	22.7
Some college	5	22.7
Graduation	3	13.6
Post graduation	9	40.9
Total	22	100

Data analysis:
From the above graph and table, it is overserved that out of 22 responses,9 respondents are post- graduation with 40.9%, 3 respondents are graduation with 13.6%, and I respondents has an associatedegree.

Interpretation:
It is observed that most of the respondents are post graduated and the least number of respondents are those who has associate degree.

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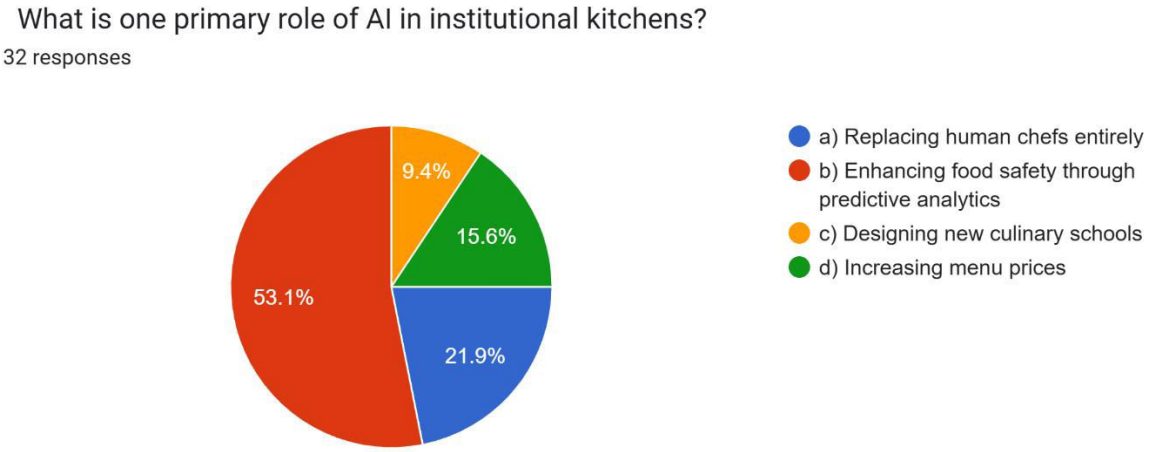
□ what is one primary role of ai in institutional kitchens?



Response	Frequency	Percentage
Replacing human chefs entirely	7	21.9
Enhancing food safety through predictive analytics	17	53.1
Designing new culinary school	3	9.4
Increasing menu prices	5	15.6
Total	32	100

Data analysis:
From the above graph and table, it is overserved that out of 32 responses, 7 respondents by replacing human chefs entirely with 21.9%, 17 respondents are Enhancing food safety through predictive with 53.1%, 3 respondents are Designing new culinary school with 9.4%, 5 respondents are increasing menu prices wh15.6%,

Interpretation:
It is observed that most of the respondents are Enhancing food safety through predictive and the least number spondare those who has Designing new culinary school.

□ Ai driven technology is commonly used for food preparation in institutional kitchens

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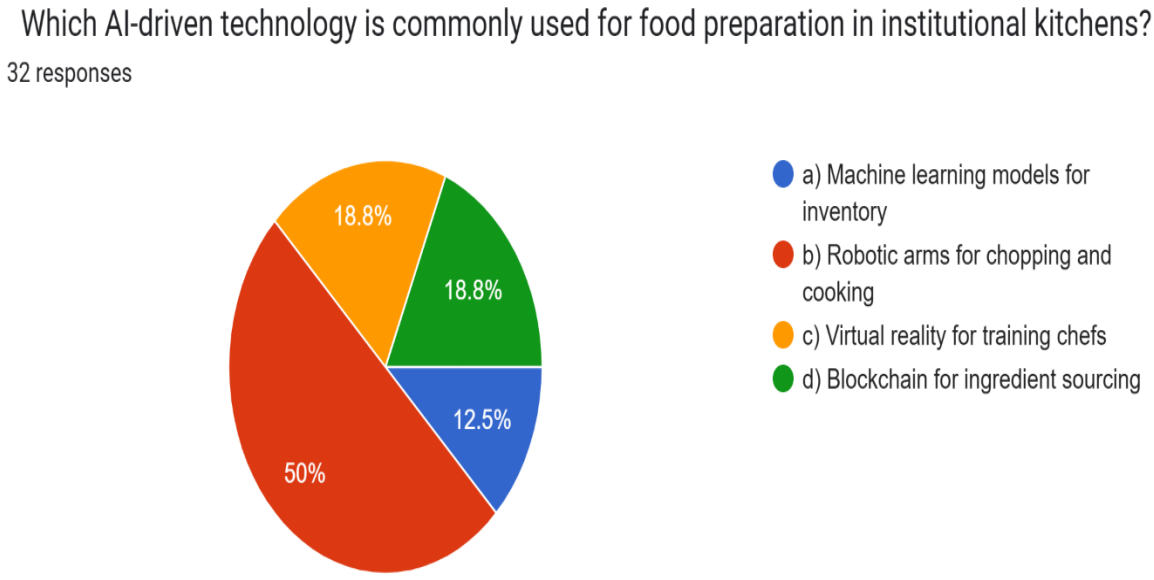

Response	Frequency	Percentage
Machine learning models for inventory	4	12.5
Robotics arms for chopping and cooking	16	50
Virtual reality for training chefs	6	18.8
Blockchain for ingredient sourcing	6	18.8
Total	32	100

Data analysis:
From the above graph and table, it is overserved that out of 32 responses, 4 respondents are Machine learning models for inventory with 12.5%, 16 respondents are Robotics arms for chopping and cooking with 50%, 6 respondents are Virtual reality for training chefs with 18.8%, 6 respondents are Blockchain for ingredient sourcing with 18.8%,

Interpretation:
It is observed that most of the respondents are Robotics arms for chopping and cooking and the least number respondents are those who has Blockchain for ingredient sourcing.

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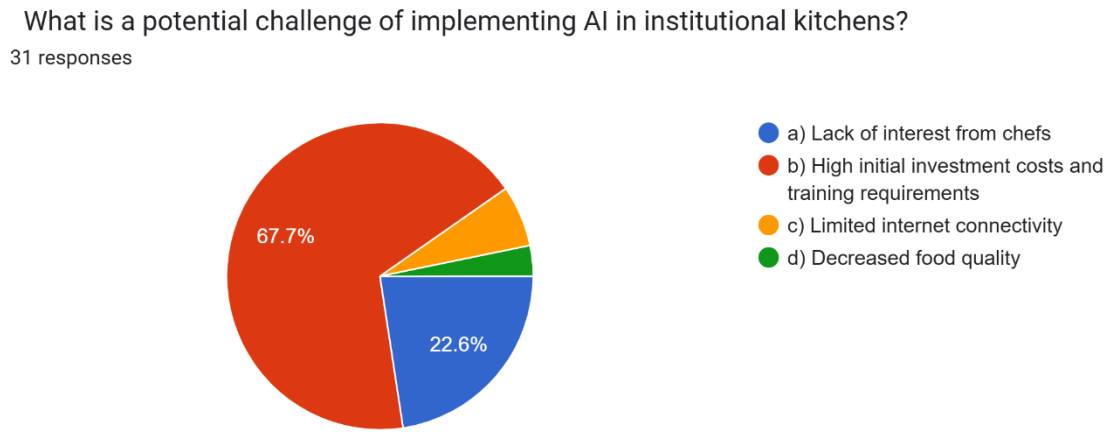
□ What is a potential challenge of implementing AI in institutional kitchens?



Response	Frequency	Percentage
Lack of interest from chefs	7	22.6
High initials investment costs and training requirements	21	67.7
Limited internet connectivity	2	6.5
Decreased food quality	1	3.5
Total	31	100

Data analysis:
From the above graph and table, it is overserved that out of 31 responses, 7 respondents are Lack of interest from chefs with 22.6%, 21 respondents are High initials investment costs and training requirements with 67.7%, 2 respondents are Limited internet connectivity with 6.5%, 1 respondent are Decreased food quality with 3.5%,

Interpretation:
It is observed that most of the respondents are High initials investment costs and training requirements and the least number respondentsare those who has decreased food quality

VI. LIMITATION OF RESEARCH

The study was carried out within the stated parameters. The research was limited.

- The focus only he surveys sample may not be representative of all institutional kitchens globally
- Observational data collection may be limited by access to participating kitchens
- The rapidly evolving nature of AI technologies may make it challenging to capture up-to-date information
- This study is based on the information provided by the respondents.

VII. CONCLUSION

The current study is aimed at providing insights into the current and expected future stand of AI in the institutional kitchen. The findings generated will therefore provide institutions willing to embrace AI with valid information for

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taking proper decisions for making such considerations and build an understanding on its implications for the different operations of food service. Some directions for future research will also be discussed based on the findings from this study.

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