

# Human- Robot\_Collaboration\_HRC

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**Table of contents:**

- Summary research paper's
- Critical Analysis:
- Connections
- Conflicts between the findings
- Synthesis Matrix for Literature Review:
- References

## Summary research paper's:

**Paper1:** No-code robotic programming for agile production: A new marker-less approach for multimodal natural interaction in a human-robot collaboration context

This study aims to create Human-Robot Collaboration (HRC) using robotics and human working together in the field of manufacturing without the need of programming expertise which will lead to the robotics can be upgraded at any time needed to do new jobs without any software development only by teaching the robot using the hardware sensors like the camera and microphone which are representing the image recognition and voice recognition by giving instructions to the robot using voice recognition and image gestures the instruction will be stored in the database so when next time there is any instructions given to the robot it will retrieve the instruction from the database and it will trigger the robot to do the request job.

**Paper2:** Employee's perception of robots and robot-induced unemployment in hospitality industry under COVID-19 pandemic

This study investigates perceptions of the service employees in hospitality industry regarding the robot services. Data was collected from more than 405 employees in Amazon's Mechanical Turk (MTurk) about their opinions about the advantages and disadvantages of the robot services in their field some of the employees see it as helping to provide the best performance as a helper but the others afraid that the robotics will take their place in the work field so they will become unemployed.

**Paper3:** Developing human/AI interactions for chat-based customer services: lessons learned from the Norwegian government

This paper discusses the interaction between chat-bots and humans in the field of Human-Robot Collaboration (HRC), the study has been applied in Norwegian. The study aims to increase the performance human service agents by integrating it with chat-bots services. Also, it aims to improve the interactions between the citizens and the human service agents by fast response and also by doing more than one task at the same time so the human services agents will have additional time process additional services they must do.

**Paper4:** Hey Max, Can You Help Me? An Intuitive Virtual Assistant (VR) for Industrial Robots

This study aims to increase the performance of them employees in the industrial are using virtual assistant with low requirement for physical and mental efforts using web dashboard and natural language speaking this study has been tested with 29 users in the industrial area the system has been evaluated using system usability scale (SUS). The qualitative and quantitative results of the study showed that the users found the VR easy to use without any efforts.

**Paper5:** <sup>8</sup> Technical Methods for Social Robots in Museum Settings: An Overview of the Literature

This <sup>8</sup> article aims to study the possibility of applying the robotics in the museums to explain to the visitors of the museum about the arts there with gestures, speech recognition and interacting with them moving between them without interrupting them using sensors like cameras microphones speakers...

**Paper6:** <sup>9</sup> Increasing customer service efficiency through artificial intelligence chatbot

<sup>10</sup> This study focuses on the Analytical Intelligence Unit (AIU) of a major Brazilian bank, which has significantly enhanced its customer service through the implementation of AI chatbots.

### **Critical Analysis:**

Strengths and shortcomings are included in the research on Human-Robot Collaboration (HRC). The papers take a complete approach to study the human robot collaboration on multiple sections, to improve the performance, dedicated algorithms, and used multiple scenarios like HRC with hardware and HRC without Hardware. The research showing promising results that encourage too deep study on it. There is little discussion of incorrect information and no comparison analysis with current methods. Both the good and the negatives can be improved. From a methodological standpoint, using simulation to assess performance makes sense; nevertheless, reproducibility might benefit from additional information about certain datasets or parameters. Although the research contributes significantly to research on Human-Robot Collaboration (HRC), there is room to grow, overcome obstacles, and offer more thorough comparisons with current methods.

### **Connections:**

1- Focus on (HRC): The HRC robotics (Human-Robot Collaboration)

frequently used in everywhere how every it has high progress in single language English but other languages have limitations.

2- Types of HRC: Several articles have discussed many different approaches of Human-Robot Collaboration with different aspects,

which demonstrating that it is a promising path.

3- Performance evaluation: The majority of research contains experimental analysis or performance evaluation

in one form or another to validate suggested solutions.

5- Lightweight solutions: Considering the high cost of the hardware equipment's, several studies

highlight the necessity for lightweight solutions

### **Conflicts between the findings:**

- 1- The HRC robotics (Human-Robot Collaboration):** it covers many fields of our life cycle and it covers many sides in our life side or work but all the solutions provided usually covers one side but it can be adapted to cover more aspects.
- 2- Robotics with Embedded Software vs. No-Code Robotics:** While robotics with loaded codes performs the requested tasks, some jobs remain unfulfilled because they require learning from humans based on field needs. In contrast, no-code robotics appear more promising as they can adapt to various requirements in different aspects.
- 3- Virtual assistant:** in the past 10 years if we asked someone or we made a survey on is it possible you will have an assistant to help you doing your work or to make sure the work is done in the correct way the answer will be **no** but the clock running so fast until we are now have the VR in our cars, mobile phones... but it still limited without giving full access to it to improve it.
- 4- Robotics with Embedded Software vs. No-Code Robotics:** While robotics with loaded codes performs the requested tasks, some jobs remain unfulfilled because they require learning from humans based on field needs. In contrast, no-code robotics appear more promising as they can adapt to various requirements in different aspects.

## Synthesis Matrix for Literature Review:

| Study                                                                                                                                                       | Authors                                                                              | Year | Research Design  | Key Findings/Results                                                                                                                                                                                                                               | Methodology                                                                                                                                                                                                                                 | Limitations                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br>No-code robotic programming for agile production: A new marker-less approach for multimodal natural interaction in a human-robot collaboration context | Jayanto Halim, Paul Eichler, Sebastian Krusche, Mohamad Bdiwi and Steffen Ihlenfeldt | 2022 | Correlational    | This study was conducted within Industrial area to fulfill their requirement to create robot machine to help the employees in the work field that robot will have the ability to learn by the employee without any needs to programming expertise. | The methodology used in the study is based on the relation between the employees and the robot in which human will teach the robot using the image recognition and voice recognition to develop the robot to enhance it to do required job. | For this study they used low-cost sensors for both voice and gesture recognition which could impact the accuracy and the reliability of the study |
| 3<br>Employee' perception of robots and robot-induced unemployment in hospitality industry under COVID-19 pandemic                                          | Omar Parvez, Ali Oztüren, Cihan Cobanoglu, Huseyin Arasli, Kayode K. Eluwole         | 2022 | Quantitative     | The study showed mixed feelings from the employees between the benefit of robotics and the afraid from the robotics will take their place in the work field.                                                                                       | The research used a survey tool with a 5-point Likert scale to study employee opinions. A pretest was conducted to ensure the validity of the survey.                                                                                       | The study focused on the English speaker's employees only and also the survey was applied in narrow area (Mturk) due to the pandemic of covid-19  |
| Developing human/AI interactions for chat-based customer services:                                                                                          | Polyxeni Vassilakopoulou, Arve Haugb, Leif Martin Salvesen and Ilias                 | 2023 | Clinical Inquiry | This study was conducted within the framework of cooperation between universities, researchers, and the business sector to                                                                                                                         | The methodology used in the study is based on a clinical research approach, as outlined by                                                                                                                                                  | chat-bots uses keywords to respond so when there are complex issues it will be hard to find the                                                   |

|                                                                                     |                                                                                                      |      |               |                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                        |
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| lessons learned from the Norwegian government                                       |                                                                                                      |      |               | identify the required outputs to improve the service. Workshops were held with employees to inform them about chatbots and how these tools can enhance their jobs. As a result, satisfactory outcomes were achieved from the chatbots, including improved response speed. | Schein (1987, 2008). This approach emphasizes collaboration between researchers and practitioners to improve organizational practices.                                                                                                                                                                                                     | suitable answers.                                                                                                                                                                                                      |
| 2<br>Hey Max, Can You Help Me? An Intuitive Virtual Assistant for Industrial Robots | Chen Li, Dimitrios Chrysostomou, Daniela Pinto, Andreas Kornmaaler Hansen, Simon Bøgh and Ole Madsen | 2023 | Mixed-methods | This study aimed to increase the performance of them employees using the virtual assistant in field of industry area                                                                                                                                                      | The methodology used in this study for evaluating the virtual assistant includes user study design by involving 29 users who used the virtual assistant also usability of the system was evaluated using system usability scale which provided users stratification and ease of use. The study collected both quantitative and qualitative | The study was applied in industrial area only with limitation of human resources 29 users when it was possible to implement it to wide area cause virtual assistants needed everywhere with or without robot hardware. |

|                                                                                                       |                                                                        |      |                   |                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                       |                                                                        |      |                   |                                                                                                                                                                                                  | data to analysis user experiences.                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                  |
| <sup>5</sup><br>Technical Methods for Social Robots in Museum Settings: An Overview of the Literature | Mehdi Hellou, Jong Yoon Lim, Norina Gasteiger, Minsu Jang, Ho Seok Ahn | 2022 | Exploratory       | This study about ability to use the robotics in the public areas like museum for example using five features of robotics social navigation, perception, speech, gestures and behavior generation | The study of museum robots <sup>6</sup> conducted a general and non-systematic review of literature from <sup>6</sup> databases like IEEE Xplore, Springer Link, ScienceDirect, ACM Digital Library, and MIT Press Direct. The study was analyzed for prepare the requirement will be used to build museum robots like the tasks and communication skills | The limitation on this study author limited this research in the context of museums only when it is able to be applied in various environments which will limit the results and issues findings also another limitation is language when the research in single language only English when museum's visitors from various countries and had different languages. |
| <sup>7</sup><br>Increasing customer service efficiency through artificial intelligence chatbot        | Andrade Ivan Martins De, Tumelero Cleonir                              | 2022 | literature Review | This study aims to enhance bank customer services using analytical intelligence unit (AIU) chat-bots                                                                                             | Described with some exploratory aspects. This study <sup>7</sup> focused in analytical intelligence unit (AIU) of a Brazilian commercial bank.                                                                                                                                                                                                            | The limitation in perception has been involved in the study and the chosen unit in analyses                                                                                                                                                                                                                                                                      |

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