|  |  |  |
| --- | --- | --- |
|  |  | **Implementation of a Manufacturing Execution System for a Learning Factory**  **Mattis Tom Ritter**1**, Cheng Yee Low**2,\*  1Faculty of Mechanics and Electronics,  Heilbronn University of Applied Sciences, Max-Planck-Str. 39, 74081 Heilbronn, Baden-Württemberg, Germany  2Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia,86400 Parit Raja, Johor, Malaysia  \*Corresponding Author Designation  DOI: https://doi.org/10.30880/rpmme.00.00.0000.00.0000  Received 00 Month 2022; Accepted 01 Month 2022; Available online 02 Month 2022  **Abstract:** First abstract sentence introduces the research background information and the problem statement. The second sentence explains the main research objectives and their scopes of study. The third sentence describes the materials, methods, and standard procedures used to conduct the study. The fourth sentence presents key findings and trends that can be observed from the data. The fifth sentence summarizes the discussion regarding those findings and some suggestions for future work.  **Keywords:** Keyword 1, Keyword 2, Other Keywords |

1. **Introduction**

This document is a template for papers to be published in proceedings by Universiti Tun Hussein Onn Malaysia Publisher’s Office. The document itself should be in A4 size, with normal margins of 1 inch all around. The font of the text is Times New Roman with font size 11, except for captions in tables and figures. Unless mentioned otherwise, all lines are spaces 0 points before and 8 points after the line. All paragraphs are justified, with the first line indented.

The introduction should describe general information on the subject matter area of study. It is usually arranged in such a manner to gradually bring to focus the specific motivations of the current study, the research questions, the problem statements, the hypotheses, the objectives, as well as the expected outcome.

1.1 Introduction subheadings optional

The introduction can be split into several subheadings if the author finds the need to organize the information into several subtopics. The subheadings should not go beyond the second level.

1.2 Additional introduction subheadings

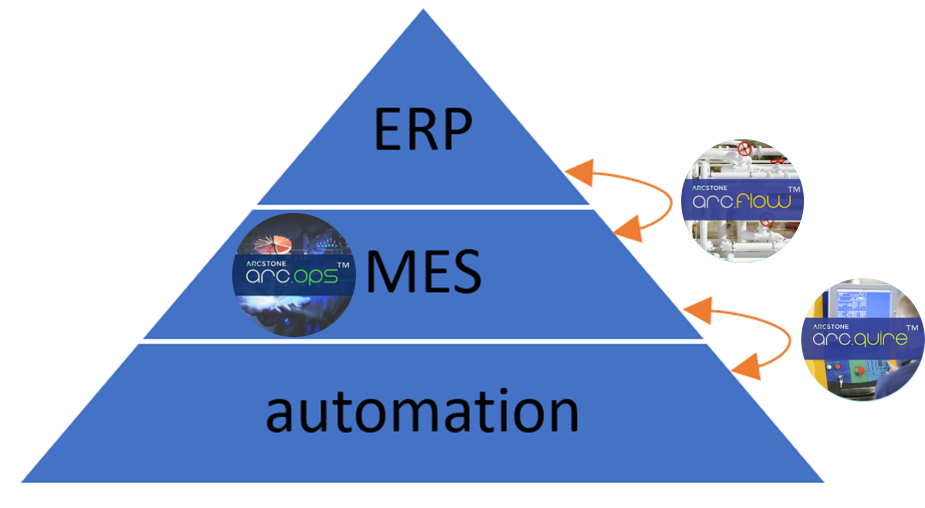
Subheadings in the introduction are usually limited to 2-3 topics. Contents should be brief; more detailed information should be discussed in the methodology section.

1. **Materials and Methods**

The materials and methods section, otherwise known as methodology, describes all the necessary information that is required to obtain the results of the study.

2.1 Arcstones MES

Specifications and properties of materials, equipment, and other resources used in the current study should be described in this section.



2.2 Fischertechnik Learning Factory

Procedures can be described using flowcharts and algorithms. Include the appropriate references to standards. Authors can also explain the scope and limitations of the methods. A close-up of a machine

Description automatically generated

2.3 Equations

Equations and formulae should be typed in equation editors such as Mathtype. Equations should not be presented in the form of an image. Equations should be numbered based on the section number as the following:

Each numbered equation should be in its line and be separated from the surrounding text by the default line spacing. Eq. 1, as are all equations, should be referenced in the text.

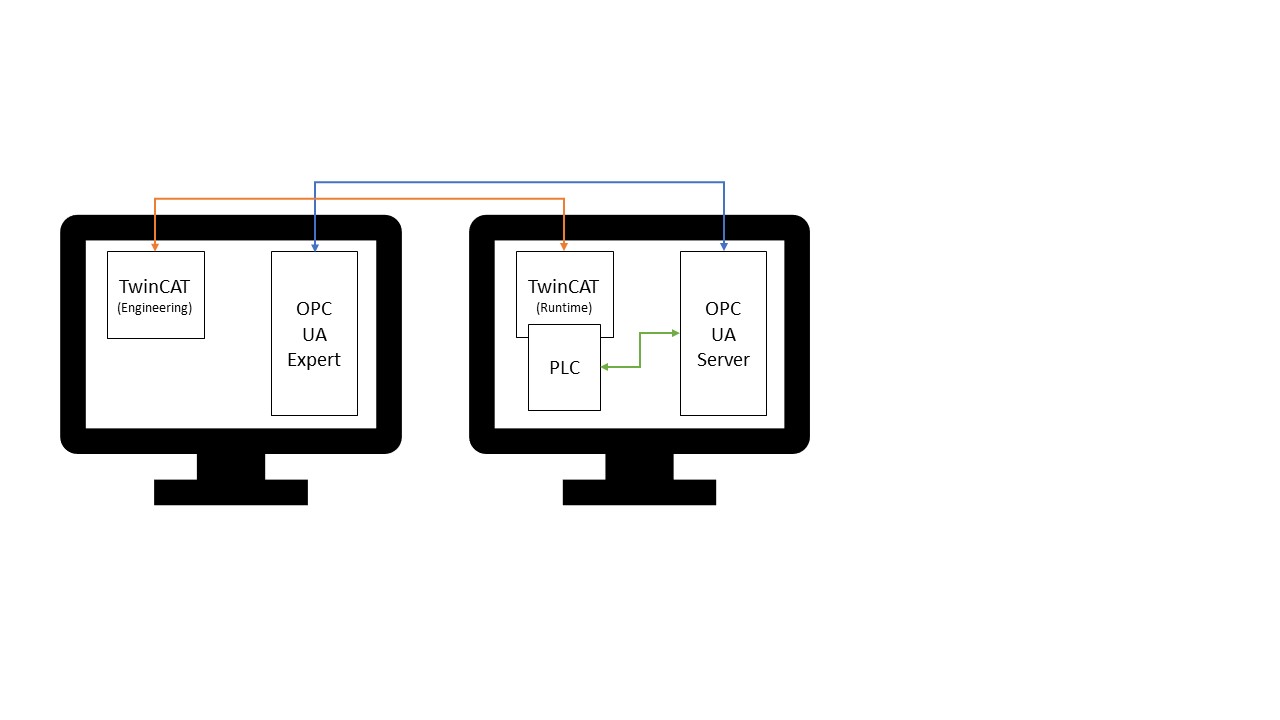
1. **Results and Discussion**

The results and discussion section presents data and analysis of the study. This section can be organized based on the stated objectives, the chronological timeline, different case groupings, different experimental configurations, or any logical order as deemed appropriate.

3.1 Dataflow from Automation Level to MES

Results can be presented in the form of tables, figures, charts, diagrams or other suitable formats. If required, raw data that is too lengthy to be put in this section can be moved to the appendix.



A screenshot of a computer

Description automatically generated

3.2 Discussions

Accompanying discussions that further explain observations of the results are usually placed immediately below the results paragraph.

3.3 Tables

Tables should be numbered based on the section number and formatted based on the style as presented in the following:

**Table 1: Example of presenting data using a table**

|  |  |  |  |
| --- | --- | --- | --- |
| Station | Sensor | State | Sensor value |
| High-bay warehouse | S1\_I1 | Running | false |
| Inactive | true |
| Vacuum gripper robot | S2\_I2 | Running | false |
| Inactive | true |
| Oven | S3\_I6 | Running | true |
| Inactive | false |
| Milling machine | S3\_I1 | Running | false |
| Inactive | true |
| White chute | S4\_I4 | Full | false |
| Empty | true |
| Red chute | S4\_I5 | Full | false |
| Empty | true |
| Blue chute | S4\_I6 | Full | false |
| Empty | true |

Table 1, as are all tables, should be referenced in the text. Items in the table can be aligned to the cell-centre, the right, or the left whenever appropriate. Table caption is aligned left.

3.4 Figures

Figures should be numbered based on the section number and formatted based on the style as presented in the following:

**Figure 1: Example of presenting data using a figure**

Figure 1, as are all figures, should be referenced in the text. Items in the figure should be aligned to the centre whenever applicable. Figure caption is aligned to the centre. All writings, symbols, and data markers in the figure should be legible and discernible, even in black-and-white. Images must be of 300 dpi quality or higher. If a figure is copyrighted by a third party, the authors bear the responsibility to obtain licensing or permission to use the figure in the paper.

1. **Conclusion**

The conclusion should summarize the main findings of the study, and restate the key points inferred from trends observed and discussed regarding the data. Some suggestions should be included to encourage the continuation of the current research.

**Acknowledgement**

This research was made possible by funding from research grant number ABC-XXXX provided by the Ministry of Higher Education, Malaysia. The authors would also like to thank the Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia for its support.

**Appendix A (Optional)**

Any extra data, equations or information that is beneficial to the discussion of the paper should be included here. More appendices can be added as deemed necessary.

**References**

[1] B. Klaus and P. Horn, Robot Vision. Cambridge, MA: MIT Press, 1986. (Example citation for books)

[2] L. Stein, “Random patterns,” in Computers and You, J. S. Brake, Ed. New York: Wiley, 1994, pp. 55-70. (Example for a chapter in a book)

[3] L. Bass, P. Clements, and R. Kazman, Software Architecture in Practice, 2nd ed. Reading, MA: Addison Wesley, 2003. [E-book] Available: Safari e-book. (Example for e-books)

[4] J. U. Duncombe, "Infrared navigation - Part I: An assessment of feasibility," IEEE Trans. Electron. Devices, vol. ED-11, pp. 34-39, Jan. 1959. (Example for a journal article)

[5] H. K. Edwards and V. Sridhar, "Analysis of software requirements engineering exercises in global virtual team setup," Journal of Global Information Management, vol. 13, no. 2, p. 21+, April-June 2005. [Online]. Available: Academic OneFile, http://find.galegroup.com. [Accessed May 31, 2005]. (Example for an e-journal article extracted from a database)

[6] A. Altun, "Understanding hypertext in the context of reading on the web: Language learners' experience," Current Issues in Education, vol. 6, no. 12, July 2003. [Online]. Available: http://cie.ed.asu.edu/volume6/number12/. [Accessed Dec. 2, 2004]. (Example for an e-journal article extracted from the internet)

[7] L. Liu and H. Miao, "A specification-based approach to testing polymorphic attributes," in Formal Methods and Software Engineering: Proceedings of the 6th International Conference on Formal Engineering Methods, ICFEM 2004, Seattle, WA, USA, November 8-12, 2004, J. Davies, W. Schulte, M. Barnett, Eds. Berlin: Springer, 2004. pp. 306-19. (Example for a conference paper)

[8] T. J. van Weert and R. K. Munro, Eds., Informatics and the Digital Society: Social, ethical and cognitive issues: IFIP TC3/WG3.1&3.2 Open Conference on Social, Ethical and Cognitive Issues of Informatics and ICT, July 22-26, 2002, Dortmund, Germany. Boston: Kluwer Academic, 2003. (Example for conference proceedings)

[9] J. Riley, "Call for a new look at skilled migrants," The Australian, p. 35, May 31, 2005. [Online]. Available: Factiva, http://global.factiva.com. [Accessed May 31, 2005]. (Example for newspaper article)

[10] J. H. Davis and J. R. Cogdell, “Calibration program for the 16-foot antenna,” Elect. Eng. Res. Lab., Univ. Texas, Austin, Tech. Memo. NGL-006-69-3, Nov. 15, 1987. (Example for technical report)

[11] J. P. Wilkinson, “Nonlinear resonant circuit devices,” U.S. Patent 3 624 125, July 16, 1990. (Example for a patent)

[12] IEEE Criteria for Class IE Electric Systems, IEEE Standard 308, 1969. (Example for a standard)

[13] J. O. Williams, “Narrow-band analyzer,” PhD dissertation, Dept. Elect. Eng., Harvard Univ., Cambridge, MA, 1993. (Example for a thesis)