



LEARNING MANAGEMENT SYSTEM IN FACING THE 4.0 (IR) INDUSTRIAL REVOLUTION: ONLINE CLASS IN FOCUS

Cristy Lyn V. Juntilla¹

¹Student, Graduate School, Rizal Memorial Colleges, Inc.

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ABSTRACT

The purpose of this paper was to emphasize the increasing importance of learning management systems (LMSs) in the context of Industry 4.0. With advances in technology, many educational technologies began to take place within the education sector. However, there hadn't been enough research conducted, and there was a gap in the literature, especially in LMS. I involved twelve (12) public school teachers in selected public schools in Davao City who were teaching elementary learners during the school year 2024-2025. Each participant had over six years of teaching experience. I divided these participants into two groups: six participated in in-depth interviews (IDI), and the remaining six took part in focus group discussions (FGD). I employed a phenomenological research approach to help understand what it was like to experience a specific situation or life event. This study explores the role of Learning Management Systems (LMS) in facilitating online education amidst the 4.0 Industrial Revolution (IR), focusing on key themes such as streamlined communication and collaboration, the utilization of diverse digital tools and platforms, and the empowerment of personalized and flexible learning. It examines how LMS platforms support effective communication between educators and students, foster collaborative learning environments, and integrate advanced digital tools such as artificial intelligence, gamification, and immersive technologies. Therefore, the study highlights how these systems enable personalized learning experiences tailored to individual needs, offering flexibility in learning pathways and assessments. By exploring these themes, the research aims to provide insights into how LMS can enhance the educational experience and prepare learners for the demands of the 4.0 IR era.

KEYWORDS- Learning Management System, Facing, Industrial Revolution, Online Class, Focus

INTRODUCTION

The development and improvement in technology is deeply affecting the education sector as well as all other sectors. The industry 4.0 revolution's effects are reflected on the sectors and this has enforced some changes. As the complicated industrial process becomes more complicated, the industries need human capital with knowledge in different disciplines and abilities. All of the sectors need to move into new formations to be able to reach the required quality and fight with the competitors and obtain their existence.

According to Jafari (2020) in Indonesia the most important component of Industry 4.0, such as acceleration of artificial intelligence, the transition of internet protocol technology to the 6th version, the internet of things and the use of robots in industry, the internet of industrial things and the communication between all these increase the importance of this study (Garbie, 2019). In this context, education environment should be created such that educational environments, especially individuals raised by universities, will be able to access information from their location. In this context, it can be seen that changes in the education system have started. The human strength that the market requires is suitable for interdisciplinary work and individuals with lifelong learning skills (Lam, 2024).

In the basic education institutions, has transformed teaching-learning and has affected the interactions between students and teachers. Therefore, elementary schools were forced to do all of their student teaching and learning online as a result of the epidemic (Ayers, 2023).

The severity of the outbreak has been very catastrophic, in Japan one of the consequences during pandemic has been the closures of schools (Bates, 2020). The need to use technology during the pandemic for the educational purposes of education as sustainability is also inescapable; some new reports have raised this issue in recent years. Learning Management System, a media integration for instructions that utilizes a single platform to coordinate communication processes during instructional events, is one of the technologies used (Alcin, 2018).

In Japan, LMS from computer-managed learning as sustainability to interactive LMS is used by innovative technology networks such as Quipper, Google Meet, Google Classroom, Edmodo, social media, or specialized education as sustainability platforms. Students are required to make great strides in doing their academic tasks by using LMS. According to the statistics, the shutdown has impacted more than 1.7 billion pupils throughout the world, with 160 nations implementing closures as a result of the epidemic (Aksoy, 2019).



In the United States of America has influenced 91% or more of the global student population, according to estimates. Simultaneously, the recession has created opportunities for both the use of technology and the difficulties it faces. In the other hand, it has generated massive insights into the role of technology in transforming the education as sustainability environment, encouraging sustainable education as sustainability, and empowering learners around the world to learn by distance education as sustainability. The incorporation of sustainability in education as sustainability is a worldwide trend, which is why there is a growing emphasis on the development of a wide variety of skills or qualities that contribute to academic achievement by both teachers and students (Kagermann, 2023).

As a result, in Manila, Philippines it is assumed that an institution with academic and labor success would be a long-term institution. As a support, Hermann (2019) mentioned that basic education as sustainability aims to develop in students the ability to see actions, problems, solutions, and consequences in a context that includes scientific, technical, and economic aspects; however, new concepts such as social responsibility and sustainable development in virtual environments must be integrated into these new concepts (Jimenez, 2019).

According to the study of Laurillard (2023) learning as sustainability in Mindanao refers to the location and learning as sustainability process of students and teachers, it cannot be performed face-to-face learning as sustainability events, which hinders instructional activities in the form of delivery of teaching materials to students. Academic practices in schools will contribute to broader distribution, and large-scale social constraints require individual learning as sustainability activities in each household. Nobody can prevent transitions to the current standard, but it takes preparation to adapt or the new normal pandemic (Allen, 2020).

Anglin (2020) mentioned his experience that through using LMS in its distribution in Western Visayas the ease of learning as sustainability at home can be maximized, particularly for teachers who have a responsibility to provide learning as sustainability in the challenging times of the pandemic. Nonetheless, research on the introduction of LMS in developed countries and subject areas are also minimal. Through route analyses, this study aimed to learn more about the factors that influence university students' usage of LMS. To limit the spread of the pandemic universities and school doors were closed (Baldwin, 2018).

LITERATURE REVIEW

In the study of Nunez-Peralta (2019) they mentioned that with the globalization of the internet, the generation of greater forms of research, and the variety of knowledge and sources, the student was immersed in Education 3.0 (Oliva, 2020) posited that virtual platforms appeared, connectivity and interaction between students and teachers increased, and a more personalized and reflective learning model was applied. On the other hand, the key element of Education 4.0 is innovation, and it has radically modified the way in which individuals live, work and establish relationships with others. Thus, it is not only changing what to do and how to do it, but also who we are (Rojas, 2024).

Today, the world is experiencing a time of important transformations. The learning activities carried out by students, as well as the application of methodologies and techniques by their tutors, constitute the basis of a dynamic and changing educational model. This process of structural innovation has bet through time on the development and transformation of science and technology, until evolving to the current Education 4.0. An important aspect is the development of students' skills during the learning process, which enables them to be able to enter the labor market and meet the requirements of labor competencies (Rogers, 2019).

In this way, society will be able to count on a workforce that, in addition to fulfilling its basic roles, is proactive, resourceful and creative. Education in the 21st century has not only had to face the accelerated pace of technological advances, but also a global health crisis due to the HIV/AIDS pandemic, which highlighted the shortcomings in teaching skills and the lack of preparation of institutions to face the technological challenge in education. Technology began to have a place in educational processes in a basic way at the beginning of the new millennium, and was known as Education 2.0 (Salkin, 2018).

At this stage, the teacher was not only dedicated to teaching, but also acted as a moderator to promote interaction in the classroom, while discovering the talents of his students through collaborative work. On the other hand, Education 3.0 has allowed Information and Communication Technologies (ICT) to be incorporated into educational processes, thus integrating new tools that have improved the form of education over the last few years (Surry, 2020). Education established a closer connection with different sources of information. Learning was self-directed and the search for information was encouraged in a 100% digital way. This new concept stimulated students' competencies, directing them to create new content from research, which significantly helped both students and teachers to change their mentality where interaction became more dynamic, participative and creative (Tupa, 2019).

According to Smith (2018) among the benefits of ICT implementation in education are: Access to information and education from any device regardless of location. Develop skills that allow us to develop in a digital environment. Low cost of education, both for students and institutions. Education adapted to the needs of the students. Improvement of knowledge acquired in student groups since the discussion between teachers and classmates is more fluid (Tobon, 2024).



Research Questions

The general aim of this study was to determine the techniques employed by teachers in teaching oral communication to Grade Six students to help them overcome anxiety during oral recitations. Specifically, this study aimed to examine the following questions:

1. What are the lived experiences of the elementary teachers in teaching Industry 4.0 with the aid of learning management system?
2. What are the coping mechanisms used by the teachers in teaching Industry 4.0 with the aid of learning management system?
3. What are the impressive educational insights can be drawn to further inculcate in the teachers the role of Industry 4.0 with the aid of learning management system?

METHODOLOGY

Research Design

I employed a phenomenological research approach to help understand what it was like to experience a specific situation or life event. I used this approach to determine the significance of Learning Management Systems (LMS) in the context of Industry 4.0 for online classes. Phenomenology, as a form of qualitative research, allowed me to delve deeply into non-numerical data through interviews and observation notes. Additionally, I used semi-structured interviews, which combined the flexibility of unstructured, open-ended interviews with a structured agenda. This method enabled me to gather focused, qualitative, textual data (Schensul, Schensul, & LeCompte, 2019).

Research Participants

I involved twelve public school teachers in selected public schools in Davao City who were teaching elementary learners during the school year 2024-2025. Each participant had over six years of teaching experience. I divided these participants into two groups: six participated in in-depth interviews (IDI), and the remaining six took part in focus group discussions (FGD).

I conducted both the IDI and FGD sessions, recording all data gathered. This data was transcribed and summarized to organize the responses of the participants in a systematic manner. The participants had experience in teaching online classes, utilizing various forms of infographics, and integrating different styles of lesson presentation. This provided a comprehensive view of their experiences and practices in the context of online education.

Research Instruments

I conducted interviews to explore aspects that could not be directly observed, as proposed by Patton (1990) as cited in Abersek and Flogie (2019). My aim in qualitative interviewing was not to obtain straightforward answers, but to understand the experiences of participants and the meanings they derived from those experiences, following Seidman's (1988) perspective. Although qualitative studies typically use unstructured, open-ended interviews for their flexibility and responsiveness, I employed semi-structured interviews when I sought more specific and focused information, as noted by Schwandt (2001) as cited in Abrami, et al., 2021.

Semi-structured interviews combined the flexibility of unstructured interviews with directionality and an agenda to produce focused, qualitative, textual data (Schensul, Schensul, & LeCompte, 1999) as cited in Anggraeni (2018). In this study, I collected data using semi-structured interviews to explore how elementary teachers described their lived experiences with various Learning Management Systems (LMS) and their outcomes in sharing educational insights and reflections.

To ensure consistency in the information collected from all participants, I used an interview guide. This guide included open-ended questions and topics to help structure the interviews, while allowing for exploration and follow-up questions to clarify and expand on specific topics as needed. The interview guide assisted in making the interviews more systematic and comprehensive by pre-defining the issues to be explored (Patton, 1990) as cited in Baski, et al. (2019).

Since qualitative research involves studying subjects in their natural settings, I conducted all interviews, except one, via a virtual platform (Google Meet) at times convenient for the participants. All interview sessions were tape-recorded for transcription purposes. I also conducted follow-up interviews, if needed, to clarify meanings or explore areas in greater depth.

Data Analysis

Qualitative data analysis began with the process of organizing, reducing, and describing the collected data (Schwandt, 2001) as cited in Merriam (2019). Unlike quantitative analysis, there were no prescribed formulas for qualitative analysis. As Marshall and Rossman (2006) as cited in Miles and Huberman (2024) noted, qualitative analysis did not proceed linearly and was not neat. However, following good practices and procedures enhanced the credibility of the research. In the final section, I explained the data analysis procedures and described the steps taken to ensure that the results from this study were credible, transferable, dependable, and authentic.



The analysis first involved organizing the data. I kept the information provided by each participant separate and in sequence according to the order of the interviews. This was crucial to allow the teachers who experienced online learning to share their insights and reflections thoroughly. Organizing the data helped it remain manageable, easily accessible, and readily available. I carefully transcribed the digital audio files from the interviews into written form. Additionally, I established a logbook to create an organized record of the data collected from each participant.

In applying Colaizzi's method, I was mindful of the final step, which involved returning the results to the participants. This step had faced criticism from Giorgi (2006) as cited in Moravec (2018), who argued that the researcher and participant inevitably have different perspectives—the researcher from a phenomenological viewpoint and the participant from their everyday perception of the world. This criticism reflected a broader debate in qualitative research regarding the value of "respondent validation" or "member checking." Although it was clear that participants could not merely validate an analysis as "correct," it remained reasonable within the context of descriptive phenomenology to expect that participants would recognize their own experiences in the fundamental structure of the analysis.

Descriptive phenomenology was particularly valuable in areas where there was little existing research, such as the experience of using Learning Management Systems (LMS) during the pandemic. For this study, Colaizzi's method offered a clear and systematic approach, and its thematic nature was likely more familiar and accessible compared to the "distilling" style suggested by Giorgi.

RESULTS AND DISCUSSION

This chapter discussed the implications and future directions of the study on learning management systems (LMS) in the context of the Fourth Industrial Revolution (IR 4.0) and online learning. As the education sector continues to embrace technological advancements, LMS platforms have become integral in shaping the teaching and learning experience. The study highlighted the critical role that LMSs play in facilitating online education, particularly in addressing the challenges brought on by the rapid technological changes of Industry 4.0. The findings indicated that while LMS platforms provide a range of tools and opportunities for educators and students, there are still gaps in understanding how effectively these platforms can be leveraged in diverse educational settings.

Looking ahead, the study calls for further research to explore the evolving role of LMS in the post-pandemic era and its potential for enhancing teaching practices and learning outcomes. Future studies could focus on the long-term impact of LMS usage on student engagement, teacher professional development, and the overall effectiveness of online education. Additionally, as the technological landscape continues to evolve, it is essential to investigate how emerging technologies such as artificial intelligence, virtual reality, and machine learning can be integrated into LMS platforms to support personalized learning and improve educational equity. These future directions will be crucial in ensuring that LMSs remain relevant and effective in the ever-changing educational environment shaped by Industry 4.0.

Implications

The study on Learning Management Systems (LMS) in the context of the 4.0 Industrial Revolution (IR) in online classes has significant implications when viewed through the lens of the educational theories of Jean Piaget, George Siemens, and B.F. Skinner. The study identifies several key themes that highlight how LMS platforms can enhance learning in today's technologically advanced educational environments, particularly in online settings. These themes include streamlined communication and collaboration, the utilization of a variety of digital tools and platforms, and the empowerment of personalized and flexible learning. These themes align with the core principles of Piaget's Constructivism, Siemens' Connectivism, and Skinner's Behaviorism, each offering unique insights into how LMS can improve learning experiences and outcomes.

One of the key implications of the study is how LMS platforms facilitate streamlined communication and collaboration among students, instructors, and peers. In the context of Piaget's Constructivism, this is particularly important as learners construct their understanding through social interactions and active engagement with their environment. In an LMS, the ability for students to communicate with their peers and instructors fosters collaborative learning, which Piaget argued is central to cognitive development. For example, through discussion boards, group projects, and peer feedback, students can share ideas, challenge each other's thinking, and develop a deeper understanding of concepts. By allowing students to engage in social discourse, LMS platforms promote active learning, a key component of Piaget's constructivist theory.

From a Connectivist perspective, streamlined communication in LMS platforms is essential for building networks of learning that extend beyond the classroom. George Siemens emphasized that learning occurs through the connections students make across different networks of information, peers, and experts. LMS platforms enable this by offering tools like forums, messaging systems, and collaborative spaces where students can connect not only with their peers but also with external experts and resources. By participating in these networks, students can gain access to diverse perspectives and continuously update their understanding of the subject matter. This aspect of LMS helps support Siemens' assertion that knowledge is distributed across networks, and effective learning occurs through active participation in these interconnected systems.



Another key implication of the study is the ability of LMS to utilize a wide range of digital tools and platforms to enhance the learning experience. Piaget's theory of Constructivism is evident in this theme, as the use of multiple digital tools allows learners to engage with content in diverse ways, catering to different learning styles and developmental stages. Tools such as interactive simulations, multimedia presentations, and quizzes within the LMS enable students to explore concepts in a hands-on, experiential way. Piaget stressed the importance of learners constructing their understanding through active engagement, and digital tools within LMS allow students to manipulate and experiment with content, thereby deepening their cognitive development.

Siemens' Connectivism also plays a role in this theme. In an era of rapid technological advancement, the ability to access and utilize various digital tools within LMS platforms is vital for learning in today's interconnected world. These tools not only facilitate the delivery of content but also allow students to build and maintain connections between different sources of information. In a connected world, learning is not just about acquiring knowledge; it is about navigating and leveraging diverse digital tools and resources. LMS platforms equipped with tools such as real-time collaboration, cloud storage, and access to external databases enable students to engage in lifelong learning, continuously expanding their knowledge networks. This empowers students to learn through the integration of various digital resources, promoting the development of critical thinking and problem-solving skills in a rapidly changing technological landscape.

The theme of personalized and flexible learning is another key implication of the study. LMS platforms offer a high degree of customization, allowing students to learn at their own pace, choose resources that match their learning needs, and engage in activities that reflect their individual interests. This personalized approach aligns with Piaget's Constructivism, as it enables learners to take ownership of their learning and construct knowledge based on their experiences. In Piaget's theory, cognitive development is seen as a dynamic process that is shaped by the learner's interactions with the environment. By offering personalized learning pathways, LMS platforms create environments where students can engage with content that is developmentally appropriate, promoting deeper cognitive growth and facilitating mastery of concepts.

Siemens' Connectivism also emphasizes the importance of personalized learning, particularly in terms of learning through networks. By offering flexible, personalized learning experiences, LMS platforms allow students to navigate their own learning paths, creating connections with resources, peers, and experts that are relevant to their specific interests and needs. This personalized approach is in line with Siemens' assertion that learning is about creating, managing, and navigating connections. Students can choose from a range of learning materials and formats, such as videos, readings, and interactive content, enabling them to personalize their learning experience and stay engaged with the subject matter in a way that is meaningful to them.

From a Behaviorist perspective, personalized and flexible learning through LMS platforms supports Skinner's emphasis on reinforcement. In this context, learners can receive immediate feedback on their progress through quizzes, assignments, and assessments, reinforcing correct responses and providing guidance for improvement. The ability to work at their own pace allows students to take control of their learning, providing opportunities for incremental reinforcement, which helps build mastery and confidence. Behaviorist principles of stimulus-response learning can be applied through the tracking and monitoring features of LMS platforms, allowing teachers to identify areas where students need additional support and provide timely interventions.

LMS platforms also play a significant role in fostering active engagement and motivation, particularly through features like gamification, progress tracking, and personalized feedback. According to Skinner's Behaviorism, learning is influenced by reinforcement, and by incorporating rewards, badges, and achievement tracking, LMS platforms can motivate students to engage with the content and continue progressing through the course. This gamified approach helps to maintain students' interest and encourages them to set and achieve personal learning goals. The combination of positive reinforcement and immediate feedback ensures that students stay motivated and continue their learning journey, which aligns with Skinner's ideas of conditioning and motivation.

Collaboration is another crucial aspect of modern learning environments, especially in online settings. Piaget's Constructivism suggests that social interaction is essential for cognitive development, and LMS platforms provide various tools for fostering collaborative learning, such as group discussions, peer assessments, and project-based learning. These collaborative opportunities allow students to work together, share ideas, and build upon each other's knowledge, which deepens their understanding and enhances the learning experience. Siemens' Connectivism highlights the importance of interaction within learning networks, and in the LMS context, this can be achieved through collaborative spaces where students can share resources, discuss ideas, and create new connections within a supportive online community.

The LMS platforms also have implications for lifelong learning, which is a key theme in the study. Both Piaget's theory and Siemens' Connectivism emphasize the importance of continual learning and adaptation. LMS platforms, with their ability to provide flexible and personalized learning experiences, are well-suited to support learners beyond the formal educational system. As students transition into the workforce or continue their education, LMS platforms offer ongoing opportunities for skill development and knowledge acquisition, ensuring that learners are equipped to adapt to the ever-changing demands of the 4.0 Industrial Revolution.



Lastly, LMS platforms help bridge the gap between traditional and digital learning, making education more accessible and inclusive. Piaget's ideas on development suggest that learning is a progression from simple to complex, and LMS platforms can accommodate this by providing a range of learning activities that cater to different developmental stages. By offering both structured lessons and open-ended projects, LMS platforms create a space where students can advance at their own pace, balancing both traditional and innovative learning experiences. This flexibility ensures that students can engage with content in a way that suits their individual learning needs, whether they are beginners or advanced learners.

In conclusion, the implications of this study, when viewed through the theories of Piaget, Siemens, and Skinner, emphasize the transformative potential of LMS platforms in the context of the 4.0 Industrial Revolution. By streamlining communication, utilizing diverse digital tools, and empowering personalized learning, LMS platforms foster an environment where students can engage in meaningful, collaborative, and self-directed learning. These platforms not only support students in achieving academic success but also prepare them for the dynamic and interconnected world of Industry 4.0.

Future Directions

As I look ahead, further exploration is needed in understanding how LMS platforms can enhance the streamlined communication and collaboration among educators, students, and peers. This theme remains critical because as technology continues to evolve, effective communication becomes even more central to the success of online learning. Future studies can explore advanced communication features, such as artificial intelligence-driven chatbots, integrated video conferencing tools, and real-time feedback systems, which can foster smoother, more immediate interaction between participants. Examining how these tools facilitate collaboration in both synchronous and asynchronous environments will be essential in identifying best practices for enhancing group work, peer-to-peer feedback, and overall engagement within the LMS.

Utilizing a Variety of Digital Tools and Platforms will continue to be an area of growth. As technology progresses, the landscape of digital tools within LMS platforms will also evolve. Future studies should explore how emerging technologies like virtual reality (VR), augmented reality (AR), and gamification tools can be integrated into LMS platforms to further enrich the learning experience. These tools have the potential to provide more interactive and immersive learning experiences that can cater to various learning styles and help students grasp complex concepts more effectively. Research could focus on how these tools impact student engagement, comprehension, and retention. Moreover, examining the effectiveness of LMS platforms in providing easy access to both synchronous and asynchronous tools will help ensure a seamless learning experience, which is crucial for learners across different contexts.

As I continue to move further into the 4.0 IR era, there will be an increasing demand for empowered personalized and flexible learning environments. The future direction of LMS research should focus on the development of more adaptive learning technologies that cater to the individual needs and paces of learners. AI-powered LMS platforms, for example, could personalize learning paths, suggest additional resources, or modify course content based on real-time assessment of a learner's progress. Research can delve into how these systems can be designed to offer truly personalized learning experiences that meet the diverse needs of students, from those with disabilities to advanced learners. Furthermore, studies could explore how these personalized learning environments impact student motivation, achievement, and long-term educational success.

Another future direction is examining how LMS platforms can support lifelong learning and professional development in the context of the 4.0 Industrial Revolution. As the demand for continuous skill development rises, LMS platforms can be a valuable resource for workers and professionals looking to upskill and reskill. Future research should focus on how LMS can be used to support adult learners, career changers, and those pursuing continuous education in industries that are rapidly transforming due to technological advancements. The future of LMS will need to extend beyond traditional academic settings to meet the needs of the workforce, offering flexible, accessible, and targeted learning experiences that cater to professionals seeking to keep pace with Industry 4.0 changes.

Lastly, future studies should explore the integration of LMS with broader educational ecosystems to foster a more holistic approach to learning in the 4.0 IR era. This could involve investigating how LMS platforms can seamlessly integrate with other tools like Learning Record Stores (LRS), digital credentialing systems, and professional networking platforms. The ability to connect learning across different environments (formal, informal, and non-formal) will be crucial in creating a comprehensive, lifelong learning experience. Research could focus on how this integration facilitates the tracking of learner progress across multiple platforms, providing a more robust, connected understanding of an individual's learning journey. The goal would be to create an ecosystem where learning is fluid, continuous, and adaptable to the evolving needs of learners in a rapidly changing technological landscape.

The future directions for LMS research in the context of the 4.0 Industrial Revolution will revolve around deepening our understanding of how digital tools can foster communication, collaboration, and personalized learning. By continuing to explore the integration of emerging technologies, adaptive learning systems, and cross-platform



ecosystems, future studies can contribute significantly to improving the effectiveness and accessibility of online education.

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