

Serious Game for Leadership Skills in the Learning Organization Training

Basuki Wibawa, Pramis B.Wibawa

Abstract: *This paper examines the potential of Serious Games (SG) to support leadership skills improvement training in learning organizations for higher education students. It highlights the main requirements for training and presents a variety of table templates, based on advanced models for leadership training, which have been used to examine the most suitable SG and determine the most appropriate combination to be used in training by considering targeted competencies and skills, uses and effectiveness learning. SG made to cater education and training purposes, by participating in SG, participants able to acquire and retain knowledge more effectively rather than using conventional methods. Consecutively, there is an Immersive Virtual Really (IVR); a technology that can bolster the engaging capabilities of SG. By combining IVR, participants can be completely immersed in virtual environments which offers greater engagement and perception. The combination resulted in participants' encouragement to preserve knowledge longer than any conventional method due to stronger emotional attachment along with physiological arousal. There is an augmenting number investigating the combination of SG and IVR for the purpose of leadership training and behavioral assessment. Hence, a systematic understanding of the development of SG and how it is being implemented for leadership training and research is essential. On this regard, the authors conducted a systematic literature review in five stages, namely; formulation of research problems, identification of relevant prior studies, quality assessment of the studies, summarizing evidence and end with findings interpretation.*

Finally, this paper introduces a systematic literature review regarding SG oriented toward building leadership processes, critically analyzes the situation, and the direction of future research for the development of SG is more effective for leadership training.

Index Terms: *Leadership Skills, Learning Organization, Serious Games, Systematic Review and Training.*

I. INTRODUCTION

Serious Game (SG) have appealed attention on pedagogical research in the recent years. By participating in SG, participants able to achieve and preserve knowledge effectively rather than using conventional learning approach. Consecutively, there is an Immersive Virtual Really (IVR); a technology that can bolster the engaging capabilities of SG. By combining IVR, participants can be completely immersed in virtual environments which offers greater engagement and

perception [8]. The combination resulted in participants' encouragement to preserve knowledge longer than any conventional method due to, stronger emotional attachment along with physiological arousal [3]. Hence, with an augmenting number investigating the aforementioned combination, a systematic understanding of the development of SG and how it is being implemented for leadership training and research is essential. On this regard, the authors conducted a systematic literature review in five stages, namely; formulation of research problems, identification of relevant prior studies, quality assessment of the studies, summarizing evidence and end with findings interpretation. This study introduces a systematic literature review on the potentials of serious game (SG) in building leadership skills in the learning organization training; how is a conceptual framework to guide the development and implementation of such SG is offered for leadership skills in the learning organization training?

II. THEORETICAL REVIEW

A. Leadership Skills

In general, the articles and books of leadership state leadership as influencing the actions of others. Ken Blanchard [1] defined leadership as “in any situation in which someone is trying to influence the behavior of another individual or group, leadership is occurring.” In the recent year, leadership is described as “capacity to influence others by unleashing their power and potential to impact the greater good.” [1] There are five levels of leaders embraced by organizations namely as: Highly Capable Individual (level 1): able to provide productive contributions through managing talent, knowledge and good working habits; Contributing Team Member (level 2): provides individual capabilities to the common goals and works comfortably in a group setting; Competent Manager (level 3): effectively and efficiently coordinates people and resources to pursue desire outcomes; Effective Leader (level 4): promotes dynamic pursuit of version and stimulates higher performance standards; Executive (level 5): develops long-term greatness through an unusual blend of personal modesty and professional great-will. Their resolve is to do whatever is needed to make the organization “great.”

There have been three principal leadership phases since the Industrial Revolution and edging into a fourth. Leadership 1.0 was charisma-led. Charisma is defined as “certain quality of an individual personality by

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Basuki Wibawa, Universitas Negeri Jakarta, Jl. Rawamangun Muka, RT011/ RW014 Jakarta 13220. bwibawa@unj.ac.id

Pramis B.Wibawa, Universitas Brawijaya, Jl. Abdul Muis No. 52 RT002/ RW003 Jakarta 10160, pramiswibawa@student.ub.ac.id, benetiara@hotmail.com

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virtue of which he is set apart from ordinary men and treated as endowed with supernatural, superhuman, or at least specifically exceptional powers or qualities [14].” Leadership 2.0 was the era of scientific management. Daniel McCallum [15] develop the first organizational chart and produced general principles of management that supported top-down command and control leadership. James MacGregor Burns [16] described transformational leaderships as a moral dimension where “the transforming leader looks for potential motives in followers and engages the full person of the follower,” resulted in a relationship of mutual stimulation and advancement that alters followers into leaders and may convert leaders into moral agents. The future leadership is no longer about control, positional power, status and rank

Decisions are made through ideas and innovation which will come through open collaboration and collaborative networks.

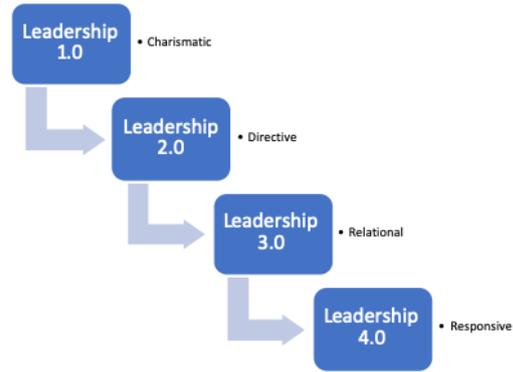


Fig 1. Four Leadership phases

Leadership Theory	Date	Major publications
Swarm Leadership	2017	Swarm Leadership and the Collective Mind by Peter Gloor
Responsive Leadership	2017	2017 World Economic Forum Key theme at Davos
Holacracy	2015	Holacracy: the New Management System for a Rapidly Changing World by Brian Robertson
Connectivism	2005	Connectivism: Learning as Network-Creation by George Siemens
Shared Leadership	2003	Shared Leadership: Reframing the Hows and Whys of leadership by Craig Pearce and Jay Conger
Distributed Leadership	2002	Distributed leadership as a Unit of Analysis by Peter Gronn
Collaborative Leadership	1994	Collaborative Advantage by Rosabeth Moss Kanter
Adaptive Leadership	1994	Leadership Without Easy Answers by Ronald Heifetz
Transformational Leadership	1990	The Leadership Challenge by James Kouzes and Barry Posner
Constructivism	1987	The Tree of Knowledge by Humberto Maturana and Francisco Varela
Constructivism	1987	The construction of knowledge by Ernst von Glasersfeld
Transformational leadership	1985	Leadership and Performance Beyond Expectations by Bernard Bass
Constructivism/cognitivism	1983	Frames of Mind by Howard Gardner
Servant Leadership	1977	Servant Leadership by Robert Greenleaf
Transformational leadership	1978	Leadership by James MacGregor Burns
Instrumental Leadership	1975	Path-Goal Theory of Leadership by Robert House and Terrence Mitchell
Transactional Leadership	1975	A Vertical Dyad Linkage Approach to Leadership Within Formal Organizations by Fred Dansereau et al.
Situational Leadership	1973	Leadership and Decision-Making by Victor Vroom, and Philip Yetton
Situational Leadership	1969	Management of Organizational Behavior by P. Hersey and K Blanchard
Cognitivism	1967	Cognitive Psychology by Ulric Neisser
Contingency theory	1964	A Theory of Leadership Effectiveness by Fred Fiedler
Cognitivism	1963	Social Learning and Personality Development by Albert Bandura and Richard H. Walters
Cognitivism/Constructivism	1956	A Study of Thinking by Jerome Bruner
Behaviourism	1950	Michigan State University Leadership Studies
Cognitivism	1948	Cognitive Maps in Rats and Men by Edward Tolman
Cybernetics	1948	Cybernetics: or Control and Communication in the Animal and the Machine by Norbert Wiener
Behaviourism	1945	Ohio State Leadership Studies
Behaviourism/Cognitivism	1943	A Theory of Human Motivation by A. H. Maslow
Leadership Styles	1939	Patterns of Aggressive Behavior in Experimentally Created "Social Climates" by Lewin, Lippitt and White
Behaviourism	1938	The Behavior of Organisms by BF Skinner
Trait Theory	1937	Personality: a Psychological Interpretation by GW Allport and Ross Stagner
Scientific Management	1920	Economy and Society: An Outline of Interpretive Sociology by Max Weber
Scientific Management	1916	General and Industrial Management by Henri Fayol
Scientific Management	1911	The Principles of Scientific Management by Frederick Taylor
Behaviourism	1898	Animal Intelligence: An Experimental Study of the Associate Processes in Animals by E. L. Thorndike
Behaviourism	1887	The work of the digestive glands by Ivan Pavlov
Scientific Management	1856	Report of the Superintendent of the New York and Erie Railroad to the Stockholders by Daniel McCallum
Great Man Theory	1841	On Heroes, Hero-Worship, and The Heroic in History by Thomas Carlyle

Fig 2 Leadership Timeline (Richard Kelly, 2019)

A. Serious Games

In recent years, Serious Game (SG) have attracted researchers' attention and becoming more popular as it becomes a method of transfer knowledge along with popular training and behavior analysis tool [6]. The term serious game represents a video game whose main purposes are advertising, analyzing, education, exploring, simulation, socializing and training rather than pure entertainment. It

inherits the interface and gameplay characteristics from its counterpart, yet mainly focus on learning or training and the lessons learnt from the game are expected to be used in real-life working environments. Cook et al [5] stated by providing a realistic environment in a serious game, learning process can advance from knowledge acquisition towards skills development to



recognition, analyzation, selection and application of knowledge into different situations. Serious game is answering the need for specialised training in order to enhance the realistic experience faced by the users, its combination of design, gaming technology, and process to the solutions faced by business and other organisations^[2,13]. There are four main principals components of serious game; rules and gameplay, challenges, interaction modes, and objectives. The game objectives could be both explicit and implicit. Explicit as its stated and implicit goals as it includes improving leadership skills, gaining knowledge through the game and acquiring experiences.



Fig 3 Components of Serious Game

Its gaming structure allows tracking participants' decisions and recording their behavior during a game. By collecting and analyzing those behavioral data, it reveals behavioral motivation, validate behavioral models, explore decision-making, recognize behavioral patterns and do assessment of the responses under in varied controlled conditions. Hence, serious game is prospective to offer the understanding of behavioral patterns and behavior changes beyond educational and training aspects.

1) Serious Game Scenario Development

The scenario development of a serious game (SG) is considered complex as it does not have a linear storyline, yet it rather exists with a dynamic metaplot with the participating player in the unfolding sequence of problems and the interactions made within the game influence the outcomes. As technology advances it progressively possible to create a game engine allowing more branches of flexibles rules that enable higher order learning by integrating complex underlying models that allow for an untold number of results. Such flexibility offers an advantage in which each time the participant plays the game, the experience is unique due to the degree of flexibility rule structures offers them to explore the game interface, test hypotheses and reach goals in different and unanticipated manners.

a) Immersive virtual reality (IVR)

LaValle^[9] defined immersive virtual reality as “inducing targeted behavior in an organism by using artificial sensory

stimulation, while the organism has little or no awareness of the interference.” Regarding to this definition, participants will be able to feel the sensation that physically they are inside the controlled virtual environment. The artificially-made and stimulated environment may become realistic increasing the difficulty level for participants to differentiate between the virtual and real world^[9]. Krokos et al^[7] found that IVR offers a better approach to retain knowledge compared to non-IVR environment due to the combination of IVR in SG brings a higher degree of engagement along with participants when compared to non-IVR-SG^[8].

2) Serious Game Engine Development

Dhaliwal and Benbasat (1996) identified that the systems were firstly used in the mid-1960s when AI research focused on defining problems that could be explained using static underlying human expertise. The new systems connect both video game engines with autonomous human expert knowledge bases, resulting to “expert system.” Figure 4 exhibits the framework of the serious game.

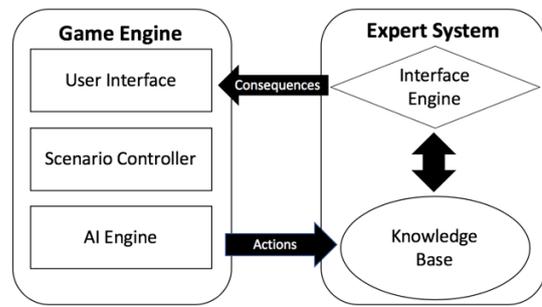


Fig 4 Serious Game Framework

The Expert System

1. The knowledge base (KB) comprises the domain expertise and knowledge, represents in the form of facts and rules that the expert system uses to make determinations,
2. The inference engine reads and activates the rules in the knowledge base whenever the conditions are satisfied, deriving recommendations from the knowledge base and problem-specific data from the dynamic facts base and thus resulting in new facts.

The Game Engine

1. The user interface controls the dialog between the user and the system and allows the student to interact in a virtual 3D environment,
2. The purpose of the scenario controller is to initialize the game session; defining its objectives; and updating the objectives when they have been completed or become irrelevant,.
3. The AI game engine reads the consequences of the rules activated by the expert system. Throughout the scenario, the system considers the time required for an expected response and adjusts it to the evolution of the scenario accordingly.

Since there is a certain level of subjectivity evaluation for problem-solving and the usage of higher-order thinking skills, the final analysis of the participants' reasoning skills will be evaluated outside the serious game environment due to "the performance assessment using scoring rubrics that may describe different level of proficiency is considered unsuitable for computer games [11]."

III. METHODOLOGY

The methodology used in this study is a systematic of literature review. The systematic literature review was conducted in five stages: formulating the research problems, identifying relevant work, assessing the quality of studies, summarizing the evidence, and interpreting the findings.

IV. RESULTS AND DISCUSSIONS

A. Formulating the research problems.

Rüppel and Schatz [13] elaborated three interdependent worlds that need to be balanced during the design process of a serious game: reality (how the game is connected to the physical world), significance (what value needs to be achieved), and performance (how to create playful activities). The authors then observed the three principal aspects. The observation allowed us answering two main research questions in order to get an in-dept understanding along with the formulation of eleven sub-questions.

In summary, there are two type of impacts of training and research IVR-SG; pedagogical impact and behavioral impact [10]. Sub-question 1 and sub-question 2 were formulated to discover the pedagogical impact, while sub-question 3 and sub-question 4 were intended for behavioral impact. Sub-question 5 was formulated to explain the measurement of participations' experience during a session of serious game, followed by sub-question 6 up to sub-question 11 were formulated to explore specific details of various systems, including the teaching methods, navigation solutions, sense stimulation, narrative methods, non-playable characters, and hazard simulation.

MQ2: What are the essential elements for developing IVR SGs in evacuation study?	SQ6: What are the teaching methods? SQ7: What are the navigation solutions? SQ8: What are the senses stimulated? SQ9: What are the narrative methods to encourage the participants to follow the game storyline, and complete it? SQ10: Are there non-playable characters (NPCs) and how do they contribute? SQ11 : What are the hazards simulated?	

Main Research Questions (MQ)	Sub-questions (SQ)	Assessed Aspects
MQ1: What are the outcomes and measures for implementing IVR SGs in evacuation study?	SQ1: What are the learning outcomes? SQ2: What are the learning measures? SQ3: What are the behavior outcomes? SQ4: What are the behavior measures? SQ5: How to evaluate the participation experience?	Meaning: Pedagogical impact Meaning: Behavioral impact Play: Participation experience Play: Hardware and software system Reality: Software system

B. Identifying the relevant work

This particular step includes three main concepts; immersive virtual reality, serious games (SG), and evacuation training and research. Eligible papers included in the systematic literature review were collected from journals and conference proceedings.

C. Assessing the quality of studies

Once the identification of eligible paper was done, it followed by a scoring process in order to evaluate the papers quality. Each paper was scored based on the three assessment questions based on the quality assessment approach [4]; (a) How appropriate is the prototype design in addressing the questions of this review? (b) How appropriate are the methods and analysis for addressing the question of this review? (c) How relevant is the focus of the study for addressing the questions of this review?

Each dimension have a score ranged from 1 to 3, in which 1 have the lowest quality, 2 means medium quality and 3 possess the highest quality. The three dimensions' scores were summed to obtain a total score for each paper.

D. Summarizing the evidence

Then, the qualified prior papers were analyzed and coded using a data extraction spreadsheet which included the aforementioned research factors and research questions resulted in two types of identified outcomes namely pedagogical outcomes and behavioral outcomes.



E. Interpreting the findings

On the regard of analyzed data in the prior step, the authors synthesized numerous aspects and factors which have influences on the development and implementation of an IVR-SG leadership training into a conceptual framework shown in Fig. 5.

IVR-SG resulted diverse outcomes for the behavioral impact namely behavior compliance, behavior recognition and behavior validation. Further, there are important measures for the gaming development process are needed to be added into IVR-SG in order to evaluate and trace behavior and record participants’ data.

Another important concern is the selection of IVR equipment. Head-mounted display (HMD) and projection-based display (PBD) were classified in the study. Each need distinctive navigation solutions, which are the crucial parts of IVR-SG.

On the development process, several elements in the conceptual framework are taken into consideration by developers in order to reach high-quality IVR-SG. For instance, stimulated hazards; static hazards and dynamic hazards. Static hazards influence game narrative particularly on the surrounding-drive approach by creating hazardous

area in which give participants limited moving option. Other than static hazard, there is dynamic hazards which rather flexible varying on training purposes and the background of participants. Participants must feel being physically within a virtual world to reduce unrealistic behavior, hence sense stimulation is principally depending on the equipment availability. Non-playable characters (NPCs) are also considered as a crucial factor of IVR-SG due to their capability in increasing the realism of IVR-SG and aptitude to interact with participants in order to reach research objectives.

Once the development process is completed, the expected research objectives shall be measured during the implementation phase in order to confirm the effectiveness of IVR-SG along with participant’ experience to achieve strong evidence in supporting the results and providing feedback to evaluate the usability of IVR-SG. If the end-results are not desirable, there must be improvements on the IVR-SG in accordance with the measured results until the results meet the expectations. Once the improvement is implemented, a final product of IVR-SG is considered completed which it now able to deliver expected research objects that meet research requirements.

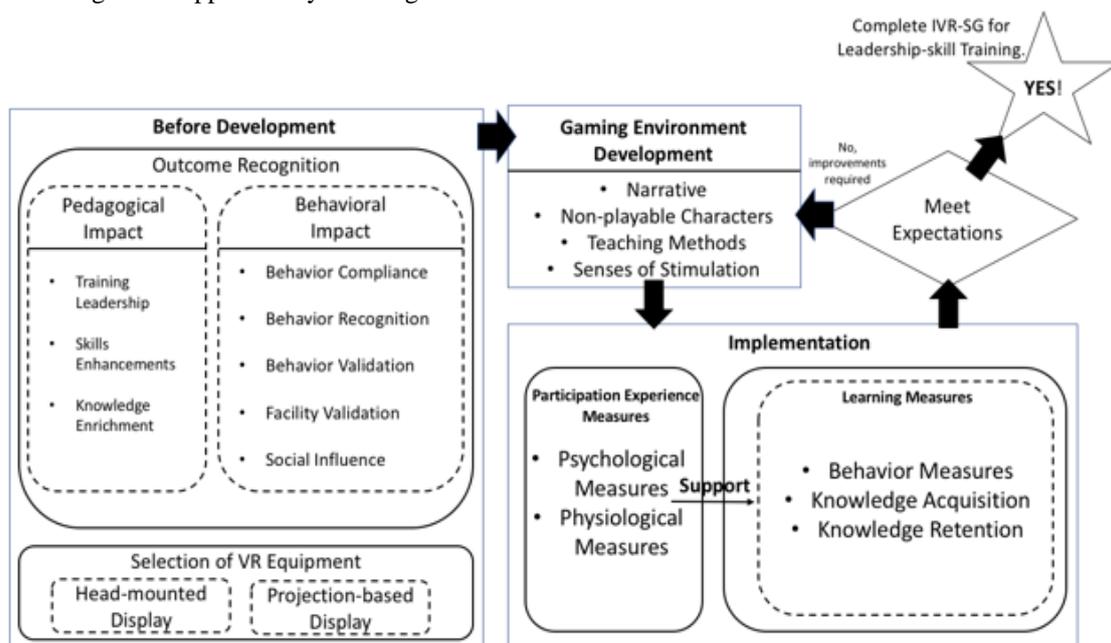


Fig 5 Conceptual Model for Developing and Implementing IVR-SG for Leadership Training

V. CONCLUSION

The study provided a systematic literature review on Immersive Virtual Reality – Serious Game (IVR-SG) for leadership training. Recent advancement of technology permits to predict an innovative teaching method in preparing professional for their progressing roles without putting the participants themselves at risk. The findings show the advantage along with disadvantage of IVR-SG in providing leadership knowledge and participants’ behavior analysis. This study of systematic literature review offers in-depths understanding of the characteristics and configuration of IVR-SG, resulted in a conceptual framework for developing and implementing IVR-SG according to the

examination into existing literatures. The conceptual framework is originated from findings of systematic literature review which aims contribute to future implementations of IVR-SG for leadership training. The authors found potential directions for future researches, particularly on the impact of different answers of navigation to overcome motion sickness. Hence, the future research on the application of an IVR-SG approach would be valuable as serious game (SG) could become a significant tool offering a safe, consistent and efficient learning experience in leadership training.

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AUTHORS PROFILE

Basuki Wibawa is affiliated with National University of Jakarta as a Professor. The research interests include Technology based learning, Blended learning in educational field.

Pramis B.Wibawa is an MS scholar at University of Brawijaya. Has a bachelors degree in Business Administration and International Marketing and Business. The research interests span over business, Marketing and Corporate Strategic planning.