Developing a Scenario-Based Video Game Generation Framework: Preliminary Results

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Abstract—Emergency training and planning provide structured curricula, rule-based action items, and interdisciplinary collaborative entities to imitate and teach real-life tasks. This rule-based structure enables the curricula to be transferred into other systematic learning platforms such as serious games — games that have additional purposes rather than only entertainment. Serious games aim to educate, cure, and plan several real-life tasks and circumstances in an interactive, efficient, and user-friendly way. Although emergency training includes these highly structured and repetitive action responses, a general framework to map the training scenarios' actions, roles, and collaborative structures to game mechanics and game dialogues, is still not available. To address this issue, in this study, a scenario-based game generator, which maps domain-oriented tasks to game rules and game mechanics, was developed. Also, two serious games (i.e., Hospital game and BioGarden game) addressing the training mechanisms of Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNe) domain, were developed by both the game developers and the scenario-based game generator for comparative analysis. The results show that although the game generator uses higher CPU time, memory usage, and rendering time, it highly outperforms the game development pipeline performance of the developers. Thus, this study is an initial attempt of a game generator which bridges the CBRNe practitioners and game developers to transform real-life training scenarios into video games efficiently and quickly.

Index Terms—Serious Games, Game Scenarios, Video Game Generator, CBRNe, Emergency Training.

I. INTRODUCTION

SERIOUS gaming [1] [2], the umbrella term describing the video and board games having additional goals rather than only entertainment, is widely used in several domains such as health [3], defense [4] [5], and education [6] [7]. CBRNe is an acronym for Chemical, Biological, Radiological, Nuclear, and Explosives, and recent research on this domain focuses on personnel training, emergency planning and organizing of field, tabletop, simulation, and serious gaming exercises for preparedness [8].

One of the use cases of serious gaming in emergency planning is on firefighter training. In a study by Heldal [9], firefighter training was examined by using serious games and tools. To do so, qualitative questionnaires and observations on two use cases (i.e., ship evacuation in Baltic Sea and railway accident with cyanide leakage) were used to analyze the impacts of serious gaming on non-users. Results showed that serious games would be useful in emergency training situations, and in-depth training scenarios and evaluation methods were necessary.

In another study, Lukosch et al. [10] performed the steps of the traditional design process with the contributions of the end-users. The primary purpose of the study was to check if the simulations could be used to train situational awareness skills, and the end-users' participation simulation demonstrated the

positive impact of using simulations. However, the main limitation of the study was not having a game-scenario based approach, and future research would focus on this aspect while creating virtual agents.

The use of virtual reality simulation was also a common topic in the literature. Ingrassia et al. [11] focused on testing and comparing performances of 56 medical students during mass casualty triage in real-world and virtual reality (VR). The results showed that VR and live simulation were both useful in improving the accomplishments of the medical students. Ragazzoni et al. [12] also focused on VR training's medical aspect, where the objective was to increase the staff safety in life-or-death risks. Hybrid simulation for infection control and Ebola treatment were also successfully performed virtually, and the results demonstrated that awareness of the health personnel increased.

Serious gaming in CBRNe has been a recent topic, and there are some misinterpretations on the definitions and core concepts, such as the misuse of the words 'game' or 'simulation'. To overcome these misinterpretations, a pre-development survey was developed [13] to be used before implementing the serious games of the European Network Of CBRN TraIning CEnters (eNOTICE) project [14]. In the pre-development survey, 24 questions were asked to the practitioners and experts of CBRNe under the following subgroups: 1) Participant's video gaming background, 2) Participant's knowledge on serious games, and 3) Participant's expectations on eNOTICE serious games. Results from 14 CBRNe professionals showed that the majority of the participants were highly positive on using serious games in CBRNe and provided open concepts, suggestions, and guidelines to develop serious games for CBRNe domain [15].

In this study, a scenario-based game generator, which maps linear real-life scenarios to serious games with training objectives, was developed. The main focus of this study is the CBRNe domain, where the roles, tasks, and goals of the participants are clearly defined. The main objectives of the games are as follows: 1) Providing a tool for additional training, 2) Synergy building, and 3) Transporting a different domain and a new concept to the CBRNe community. Two of the games that were developed by both the scenario-based game generator and by the game developers were based on the real exercises that were performed during eNOTICE project's joint activities in Nimes (France) and Brussels (Belgium). The comparative analysis regarding CPU usage, rendering, memory usage, and game development pipeline on the generator-based and developer-based games was also performed.

II. MATERIALS AND METHODS

In this section, details of the scenario-based game generator (Figures 1-3), two serious games that were developed by both the game designers and the game generator, and their evaluation are explained in detail.

1) Scenario and Task Definitions: The theme of the scenario, active players, location, and interaction mechanisms were collected in advance from the practitioners. Workflow and state diagrams were used to create a detailed scenario
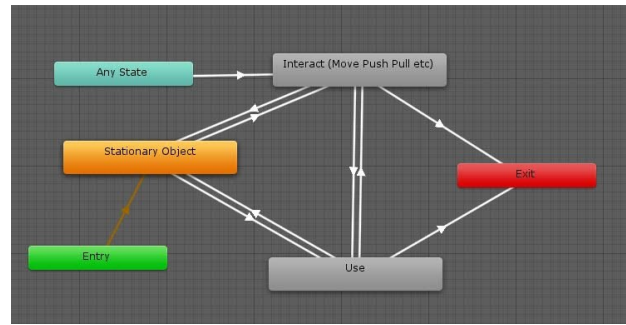

Fig. 1. Initial interaction mechanism including Entry and Exit States, a Stationary Object interacting (i.e., Move, Push, Pull, etc.) and using stationary objects.
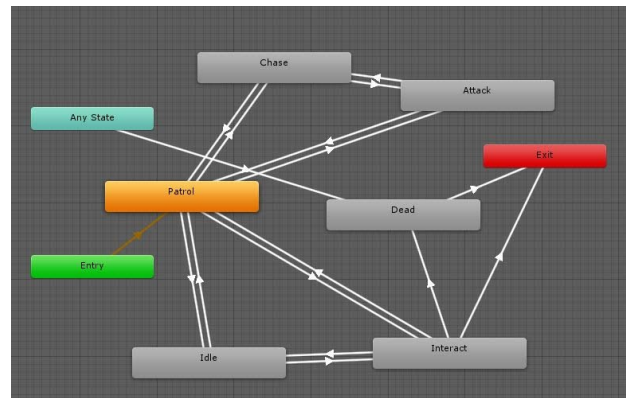

Fig. 2. In an attack scenario, chasing, attacking and interacting use cases are modeled.

where different roles and entities communicate with each other. In the beginning, two different CBRNe scenarios that were based on real practices were mapped to the workflow and state diagram structures. One of the scenarios is based on the subset of the BioGarden exercise (i.e., linear version of the scenario in which the players do not change the flow of the events), which was held in June 2018 in Belgium as part of eNOTICE joint activities. The other scenario is based on the Nimes exercise, which was held in France in January 2018 again as part of eNOTICE joint activities.

Defined scenarios and interaction mechanisms were mapped to game ideas, linear game stories, and interaction mechanisms. Interaction mechanisms were converted into concrete tasks and user roles. A generic system, built on top of the initial scenario definitions, was conceptualized and implemented. Then, the generated system was fine-tuned with goals, feedback measurements, and score adaptations.

The scenarios of the exercises were designed by different institutions such as fire departments, research centers, and hospitals. Thus, breaking the scenarios down into actions and events was a crucial step so that the game mechanics, reward mechanisms, and scoring could be systematized. Also, different roles in the scenarios were assigned to different player types so that the active role of the player and the role of non-player characters (NPCs) were defined.

Before starting to implement the Hospital game, a detailed survey, which was briefly mentioned above, was conducted
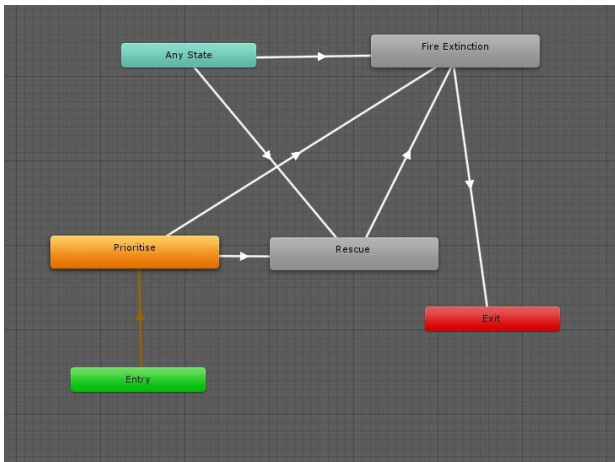
Fig. 3. Fire fighting scenario includes prioritizing the steps, extinguishing the fire and rescuing the affected people.

Fig. 4. Structure of the scenario-based game generator.

on 14 professionals in CBRNe field —7 of them being game players [15]. The scope and the purposes of the study were as follows: 1) Learning the user's gamer profile, 2) Understanding the user's perspective on serious games, 3) Retrieving the expectations of the user, 4) Clarifying the differences between the video/serious games and simulations, and 5) Asking for suggestions. The initial results of the survey were positive and encouraging. The participants' gamer profiles involved playing strategy games and multiplayer games to learn new skills and to relieve stress. After the detailed analysis of the results, a tutorial mode was added to the initial game prototype.

2) Scenario-Based Game Generator: Scenario-based game generator is developed in combination with Unity software's Animator Controller tool and is composed of four different components: 1) Main Code, 2) Control Code, 3) Transition Code, and 4) User Interface. Main Code is where the state definitions and structures —the definitions of the final consequences of the actions— are initialized. Control Code works as a mechanism to form and map action methods and their related states. Transition Code is the link where the game generator works with Unity's Animator Controller. Finally, additional user interface mechanisms such as feedback, scores, and health points are added and grouped under the User Interface component (Figure 4).

While developing the scenario-based game generator tool, the following steps are executed: 1) Creating an environment, 2) Defining state diagrams, 3) Creating animations, 4) Adding basic artificial intelligence (AI) to states, 5) Resolving player and NPC interactions and 6) Adding basic AI for interactions.

In this scenario-based game generator, only linear scenarios, where the decision making of players do not modify the outcomes of the actions, are implemented. The scenario-based game generator is used to generate the duplicates of Hospital and BioGarden games. First, the game scenarios are tested using simple 3D game objects such as cubes, spheres, and capsules (Figures 5 and 6). Then, after checking that the scenario works correctly, initial 3D game objects are automatically replaced with game assets using tag information of the assets.
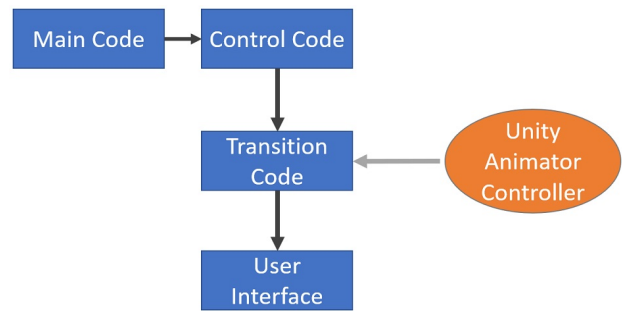
3) Hospital Game: Hospital Game is based on the Nimes scenario, which was performed during the eNOTICE joint activity in January 2018. The main purpose of this scenario is training medical staff for CBRNe circumstances. In this game, the player learns taking security measures such as using gloves, using masks, blocking the entrance of the hospital, and applying decontamination procedures. Players can play different roles, such as a doctor, nurse, and secretary. It is based on a linear scenario, and when the players make wrong choices, they lose game points (Figures 7 and 8).

This game was developed by a second-year Middle East Technical University (METU) Multimedia Informatics program student and the same game scenario was also given to the scenario-based game generator. The initial results of both environments were compared. In both versions of the games, Quadart's Hospital Lowply pack [16], which provides several realistic modular assets, was used.

4) BioGarden Game: BioGarden game is based on the eNOTICE joint activity, which was played in Belgium in June 2018. Although it had a nonlinear scenario, only linear parts of the scenario were implemented so that a comparison with the scenario-based game generator would be possible. In the scenario, there were different laboratories with different structures and responsibilities. The role-playing part was composed of decontamination, role assignment, and evaluation (Figures 9 and 10).

As in the case of the Hospital game, BioGarden game was developed by a second-year METU Multimedia Informatics program student, and the same game scenario was also given to the scenario-based game generator, and the initial results were compared. In both versions of the games, 3LB Games' Low Poly laboratory pack [17], which provides several realistic models, textures, and diffuse maps, was used.

III. RESULTS

In this section, performance outcomes of the scenario-based game generator and the two serious games that were developed by the game developers were compared in terms of CPU usage, rendering time, memory usage, and game development pipeline. All the tests were performed on a laptop having Intel Core i7 9750HQ CPU, 16GB RAM, and NVIDIA GeForce GTX 1660TI graphics.

Table I and Table II present the comparison on CPU usage (i.e. game generator's output vs. developer-based game), Table
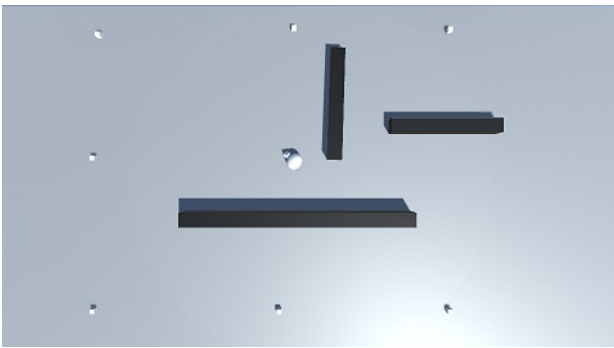
Fig. 5. Initial tests of the scenario-based game generator were performed on simple game objects.
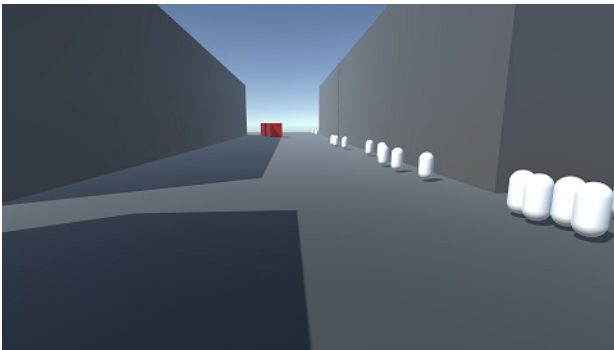

Fig. 6. Initial tests of the scenario-based game generator were performed on simple game objects such as cubes and capsules.

Fig. 7. Screenshots from the Hospital game and a demo of Dialogue menu.

Fig. 8. Screenshots from the Hospital game and a demo of the interaction mechanism.

Fig. 9. The interior design of the Candestine lab from the BioGarden game and menu interactions.

Fig. 10. The interior design of the Clandestine lab from the BioGarden game.

TABLE I
CPU USAGE OF THE HOSPITAL GAME GENERATED BY THE
SCENARIO-BASED VIDEO GAME GENERATOR VS. HOSPITAL GAME

CPU Usage	Hospital (Generator)	Hospital Game
CPU	9 ms	4 ms

TABLE II
CPU USAGE OF THE BIOGARDEN GAME GENERATED BY THE
SCENARIO-BASED VIDEO GAME GENERATOR VS. BIOGARDEN GAME

Memory	BioGarden (Generator)	BioGarden Game
CPU	22.6 ms	8.5 ms

III and Table IV on memory usage, and finally, Table V and Table VI present a comparison using rendering parameters. The rendering profile used the SetPass Calls, Draw Calls, Total Batches, Triangles and Vertices as parameters. SetPass parameter is defined as "the number of rendering passes" [18], a Draw Call as a "call to the graphics API to draw objects" [18] and Batch as a "package with data that will be sent to the GPU" [18] on the Unity's Renderer Profiler page [18].

It took three weeks to develop and implement the scenario-based game generator. The most time-consuming part was the state transitions and handling the outcomes of the actions. After the game generator was built, it took three and a half hours to generate the Hospital game and four hours to generate the BioGarden game using the game generator.

The development of the original BioGarden game took 25

TABLE III
MEMORY USAGE OF THE HOSPITAL GAME GENERATED BY THE
SCENARIO-BASED VIDEO GAME GENERATOR VS. HOSPITAL GAME

Memory	Hospital (Generator)	Hospital Game
Used Total	1.03 GB	0.45 GB
Reserved Total	1.32 GB	0.63 GB
System Memory Usage	1.96 GB	1.38 GB

TABLE IV
MEMORY USAGE OF THE BIOGARDEN GAME GENERATED BY THE
SCENARIO-BASED VIDEO GAME GENERATOR VS. BIOGARDEN GAME

Memory	BioGarden (Generator)	BioGarden Game
Used Total	0.62 GB	0.28 GB
Reserved Total	0.92 GB	0.49 GB
System Memory Usage	1.65 GB	1.27 GB

TABLE V
RENDERING RESULTS OF THE HOSPITAL GAME GENERATED BY THE
SCENARIO-BASED VIDEO GAME GENERATOR VS. HOSPITAL GAME

Rendering	Hospital (Generator)	Hospital Game
SetPass Calls	106	136
Draw Calls	252	298
Total Batches	217	243
Triangles	463.9K	504.9K
Vertices	319.5K	361.1K

TABLE VI
RENDERING RESULTS OF THE BIOGARDEN GAME GENERATED BY THE
SCENARIO-BASED VIDEO GAME GENERATOR VS. BIOGARDEN GAME

Rendering	BioGarden (Generator)	BioGarden Game
SetPass Calls	1826	2200
Draw Calls	2584	3007
Total Batches	2584	3007
Triangles	3.1M	3.2M
Vertices	2.3M	2.4M

days in total: one week for the scenario clarification and role assignment; one week for the text-based decision mechanisms, nine days to finish the user interface and menus and two days to add the assets to the game.

The original Hospital game was first refactored from the initial prototype, which took one week. Then, it took another two weeks adapting the new scenario, merging different game modes, and dialogue generation.

IV. DISCUSSION

In this study, real-life exercise scenarios of two eNOTICE joint activities were developed by game developers as well as a scenario-based game generator —developed during this study. All the frameworks used the same scenario-to-game mechanics mapping. All four versions of the games (i.e., developed by the game developer vs. generated by the game generator) were compared in terms of CPU usage, memory usage, rendering, and game development timeline perspectives. Scenario-based game generator's CPU usage, memory usage, and rendering time were higher when compared with the developer-based

games. The reason for the game generator's higher resource usage was the complex structure of the scenario-based game generator, tag search, and communication with the Unity's Animator Controller.

The rendering performance results of both versions of the games were very similar because the working principle of the game generator was not dependent on the visual contents of the games. Although the game generator used higher memory, CPU, and rendering time, its game development timeline efficiency highly outperformed the game developers (i.e., four hours vs. three weeks). This is a highly promising outcome that will enable further exercise scenarios to be mapped into games in a short period of time. This outcome can benefit the practitioners in two ways: 1) Visualizing the action-state diagrams of the exercise so that they can see the flaws or unassigned roles of their exercises, and 2) Having a rapid game prototype which becomes a fast, interactive testbed and training tool.

The proposed game generator framework will be extended using state machines so that nonlinear scenarios can also be generated quickly. Also, use case scenarios will be adapted to VR environments [19]. The players will interact with their surroundings in the VR environment, achieve their goals, interact with other users and receive feedback regarding the success of their outcomes, which will enable us to build a detailed training environment where training scenarios can easily be modified and played in two different settings: on computers and using VR headsets. All the game versions (i.e., developer-based and game generator-based) will be played by the users, and a comparative analysis will be performed. Finally, the performance, technology acceptance, immersion, and usability outcomes of the proposed system will be tested on participants and practitioners. Besides collecting game-related parameters such as interaction time and score, standard questionnaires on usability [20] and technology acceptance model [21] will also be applied to users. This tool will also be used to develop new prototype games for the future joint activities of the eNOTICE project till 2022.

V. CONCLUSION

In this study, a scenario-based video game generator, which targets the scenarios in CBRNe domain, was developed. This initial version of the game generator used linear scenarios that were based on the joint activities of the eNOTICE project. The effectiveness of the game generator was tested in comparison with two serious games, which were developed by the game developers. Even though the performance of the game generator lacked on the rendering, memory usage, and CPU usage aspects, it highly outperformed the game development pipeline of the game developers. This is a promising result that will enable the practitioners to visualize their scenarios while also generating prototype games rapidly so that the training of CBRNe personnel will be enriched. This current version of the game generator will be improved with usability tests, adaptation to VR and feedback of the CBRNe personnel so that an end-to-end and easy-to-use serious game generator for the CBRNe field will be provided.

REFERENCES

[1] R. Santos, C. Magalhaes, L. F. Capretz, J. C. Neto, F. Q. B. da Silva, A. Saher, *Computer games are serious business and so is their quality: particularities of software testing in game development from the perspective of practitioners*, 2018. arXiv preprint arXiv:1812.05164 https://arxiv.org/abs/1812.05164.

[2] D. R. Michael and S. L. Chen, *Serious games: Games that educate, train, and inform*, Muska & Lipman/Premier-Trade, 2005.

[3] M. Pirovano, E. Surer, R. Mainetti, P. L. Lanzi, N. A. Borghese, *Exergaming and rehabilitation: A methodology for the design of effective and safe therapeutic exergames*, Entertainment Computing, 14, 55-65, 2016.

[4] T. Susi, M. Johannesson, P. Backlund, *Serious games: An overview*, 2007.

[5] D. Crookall, *Serious games, debriefing, and simulation/gaming as a discipline*, Simulation & gaming, 41(6), 898-920, 2010.

[6] R. Tinati, M. Luczak-Roesch, W. Hall, *An investigation of player motivations in Eyewire, a gamified citizen science project*, Computers in Human Behavior, 73, 527-540, 2017.

[7] V. Curtis, *Motivation to participate in an online citizen science game: A study of Foldit*, Science Communication, 37(6), 723-746, 2015.

[8] XVR Simulation — Incident command training tool for safety and security, (September, 2019). Retrieved from https://www.xvrsim.com/en-cn/.

[9] I. Heldal *Simulation and serious games in emergency management: experiences from two case studies*, 22nd International Conference on Virtual System & Multimedia (VSMM), pp. 1-9. IEEE, 2016.

[10] H. Lukosch, T. van Ruijven, and A. Verbraeck, *The participatory design of a simulation training game*, Proceedings of the Winter Simulation Conference, Winter Simulation Conference, 2012.

[11] P.L. Ingrassia, L. Ragazzoni, L. Carenzo, F.L. Barra, D. Colombo, G. Gugliotta, F. Della Corte *Virtual reality and live scenario simulation: options for training medical students in mass casualty incident triage*, Critical Care, 16(1), p.P479, 2012.

[12] L. Ragazzoni, P.L. Ingrassia, L. Echeverri, F. Maccapani, L. Berryman, F.M. Burkle, F. Della Corte *Virtual reality simulation training for Ebola deployment*, Disaster medicine and public health preparedness, 9(5), pp.543-546, 2015.

[13] User Expectations Questionnaire for eNotice Serious Game (2019, November). Retrieved from https://ec.europa.eu/eusurvey/runner/eNoticeSeriousGamePreDevelopment.

[14] European Network Of CBRN TraIning CEnters Official Website (2019, November). Retrieved from https://www.h2020-enotice.eu.

[15] E. Surer, T. B. Atalay, D. Ç. Demirkan, H. Ş. Düzgün, *Serious Gaming in CBRNe Domain: A Survey on User Expectations, Concerns and Suggestions*, 3rd International Conference CBRNE - Research & Innovation, Nantes, France, p.43, 2019.

[16] Unity Asset Store - Hospital LowPoly, (2019, September). Retrieved from https://assetstore.unity.com/packages/3d/environments/hospital-lowpoly-82552.

[17] Unity Asset Store - Low Poly Laboratory Pack, (2019, September). Retrieved from https://assetstore.unity.com/packages/3d/environments/low-poly-laboratory-pack-47677.

[18] Rendering Profiler - Unity Documentation (2019, November). Retrieved from https://docs.unity3d.com/560/Documentation/Manual/ProfilerRendering.html.

[19] E. Surer, *Developing a Scenario-Based Video Game Generation Framework for Virtual Reality and Mixed Reality Environments*, he 15th Summer Workshop on Multimodal Interfaces (eNTERFACE'19) Project Proposal, pp.1-3, 2019. Retrieved from http://web3.bilkent.edu.tr/enterface19/wp-content/uploads/2019/03/p03_description.pdf.

[20] J. Brooke, *SUS-A quick and dirty usability scale*, Usability evaluation in industry, 189(194), 4-7, 1996.

[21] V. Venkatesh and F. Davis, *A theoretical extension of the technology acceptance model: Four longitudinal field studies*, Management science, 46(2), 186-204, 2000.

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