

**U.N. Sede Medellín**

*Una universidad con criterio nacional y presencia regional*



[minas.medellin.unal.edu.co](http://minas.medellin.unal.edu.co)

Facultad de Minas  
Sede Medellín



UNIVERSIDAD  
**NACIONAL**  
DE COLOMBIA

# **A Board Game to Simulate the Software Development Process Based on the SEMAT Essence Standard**

Authors:

Grissa Vianney Maturana-González, Ph.D. (c)

Carlos Mario Zapata-Jaramillo, Ph.D.

Johnathan Mauricio Calle-Gallego, Ph.D. (c)

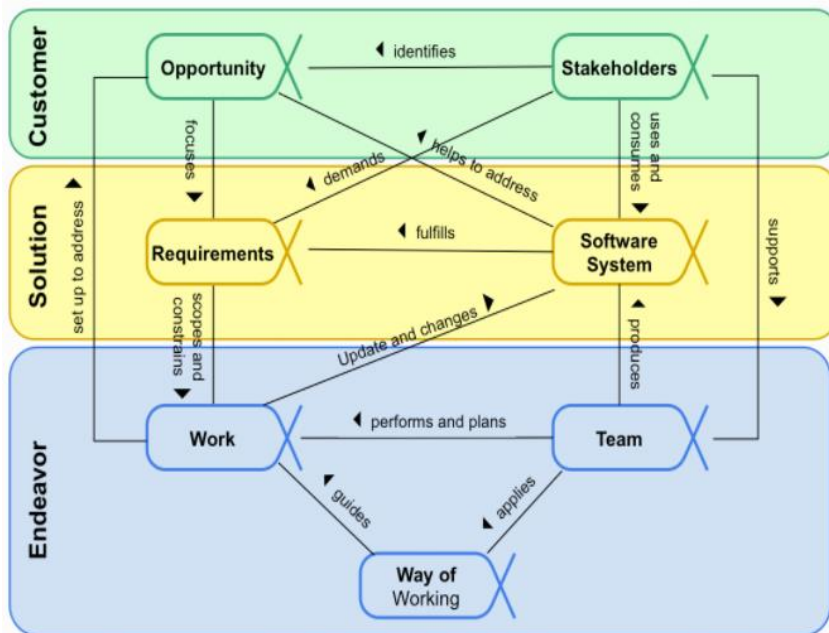
**First International Workshop on Essence in Education & Training  
WEE&T**

**November, 2020**

## Agenda

1. Introduction
2. Related work
3. The SEMAT Essence game
4. Results
5. Conclusions

## SEMAT Essence

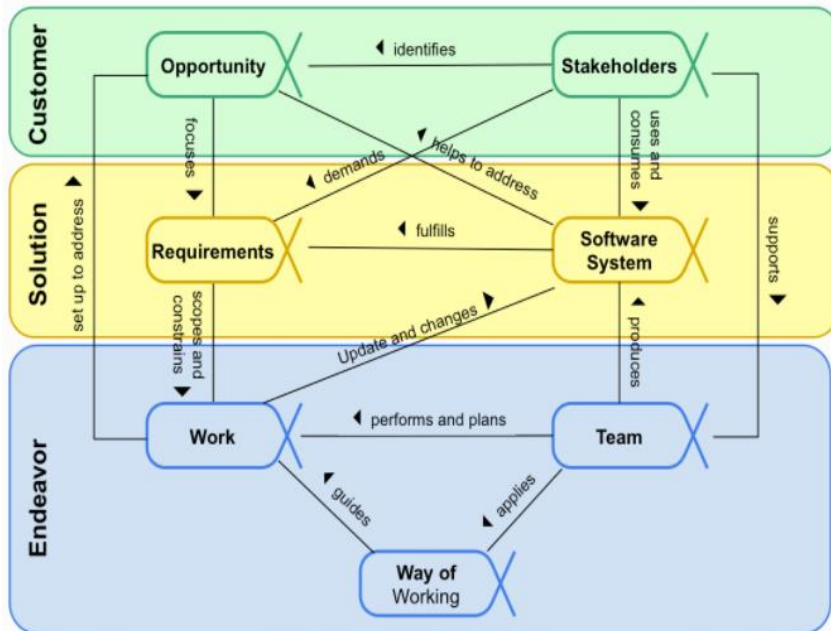


Introduced to newcomers by using:

- Courses and Workshops
- Several kind of games

(Jacobson et al., 2013)

# SEMAT Essence



(Jacobson et al., 2013)

Introduced to newcomers by using:

- Courses and Workshops
- Several kind of games

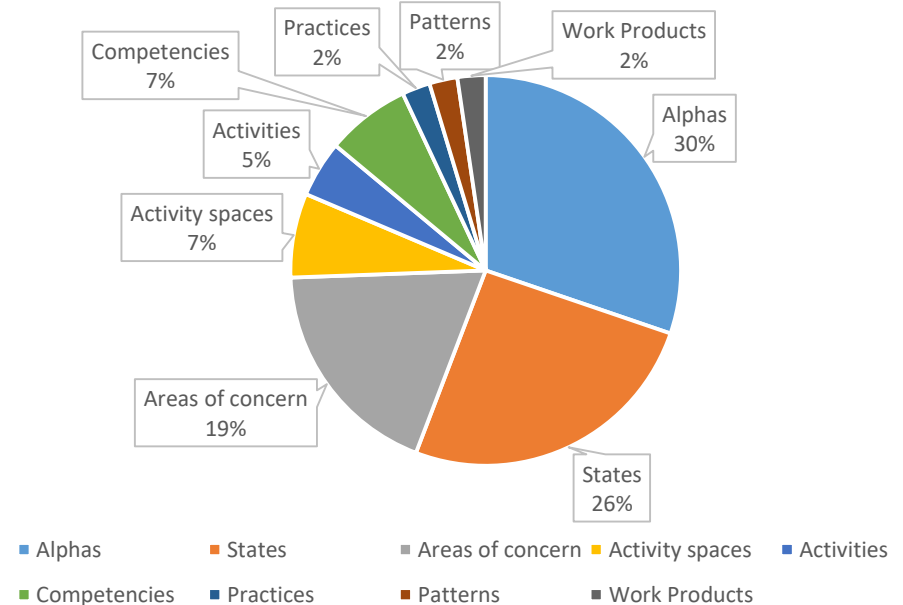


<p><b>Requirements</b></p> <p><b>Conceived</b></p> <p><b>Bounded</b></p> <p><b>Coherent</b></p> <p><b>Acceptable</b></p> <p><b>Addressed</b></p> <p><b>Fulfilled</b></p> <p>What the software system must do to address the opportunity and satisfy the stakeholders.</p> <p>The requirements:</p> <ul style="list-style-type: none"> <li>Establish a shared understanding of what the software system must do</li> <li>Communicate the intent of the software system to be produced</li> <li>Define the capabilities, services and qualities that the stakeholders desire from the system</li> <li>Are organized to allow the scope of the software system to be managed</li> <li>Drive the development and testing of the system</li> </ul>	<p><b>Requirements</b></p> <p><b>Conceived</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Stakeholders agree system is to be produced</li> <li><input type="checkbox"/> Users identified</li> <li><input type="checkbox"/> Funding stakeholders identified</li> <li><input type="checkbox"/> Opportunity clear</li> </ul> <p>SEMAT 1 / 6</p>	<p><b>Requirements</b></p> <p><b>Bounded</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Development stakeholders identified</li> <li><input type="checkbox"/> System purpose agreed</li> <li><input type="checkbox"/> System success clear</li> <li><input type="checkbox"/> Shared solution understanding exists</li> <li><input type="checkbox"/> Requirement's format agreed</li> <li><input type="checkbox"/> Requirements management in place</li> <li><input type="checkbox"/> Prioritization scheme clear</li> <li><input type="checkbox"/> Constraints identified &amp; considered</li> <li><input type="checkbox"/> Assumptions clear</li> </ul> <p>SEMAT 2 / 6</p>	<p><b>Requirements</b></p> <p><b>Coherent</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Requirements shared</li> <li><input type="checkbox"/> Requirements' origin clear</li> <li><input type="checkbox"/> Rationale clear</li> <li><input type="checkbox"/> Conflicts addressed</li> <li><input type="checkbox"/> Essential characteristics clear</li> <li><input type="checkbox"/> Key usage scenarios explained</li> <li><input type="checkbox"/> Priorities clear</li> <li><input type="checkbox"/> Impact understood</li> <li><input type="checkbox"/> Team knows &amp; agrees on what to deliver</li> </ul> <p>SEMAT 3 / 6</p>
---	---	---	--

# SEMAT Essence kernel way of teaching

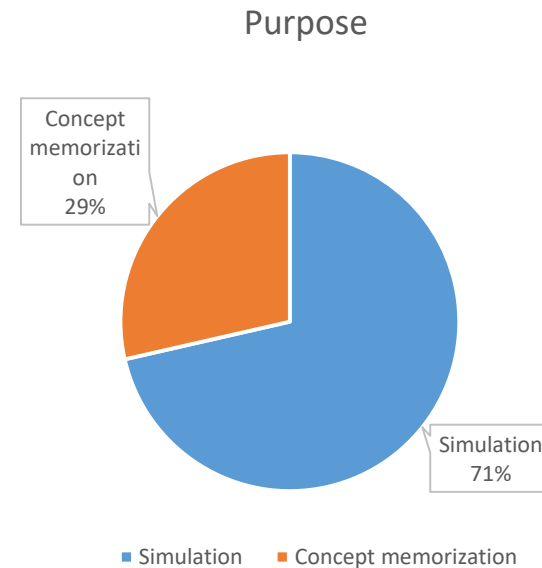
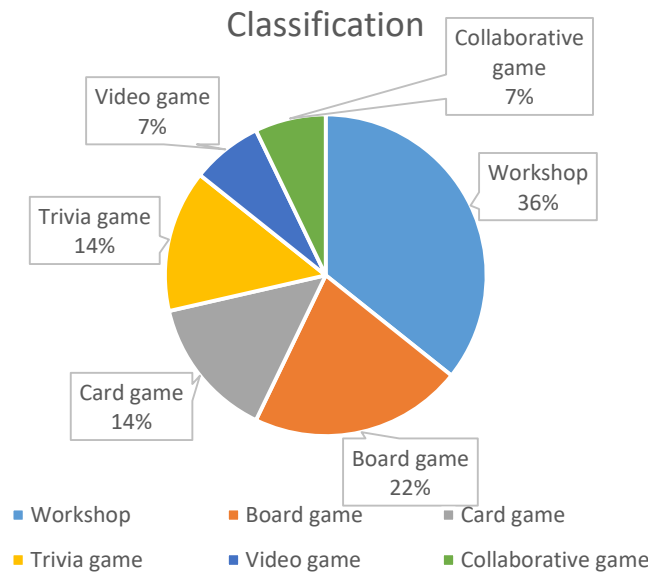
Approach (Authors)	SEMAT Essence kernel elements included	Classification	Purpose
Poker (Jacobson <i>et al.</i> , 2013; Jacobson <i>et al.</i> , 2019)	Alphas, states, areas of concern	Workshop	Simulation
Walkthrough/Chase the state (Jacobson <i>et al.</i> , 2013; Jacobson <i>et al.</i> , 2019)	Alphas, states, areas of concern	Workshop	Simulation
Workshops (Zapata and Jacobson, 2014)	Alphas, states, areas of concern	Workshop	Simulation
Puzzler and Kahoot! (Pieper, 2015; Jacobson <i>et al.</i> , 2019)	Alphas, activity, spaces, competencies, areas of concern	Trivia Game	Concept memorization
Board game (Kemmel <i>et al.</i> , 2018)	Alphas, states	Collaborative Game	Simulation
Checkpoint construction (Jacobson <i>et al.</i> , 2019)	Alphas, states, areas of concern	Workshop	Simulation

SEMAT Essence kernel elements included



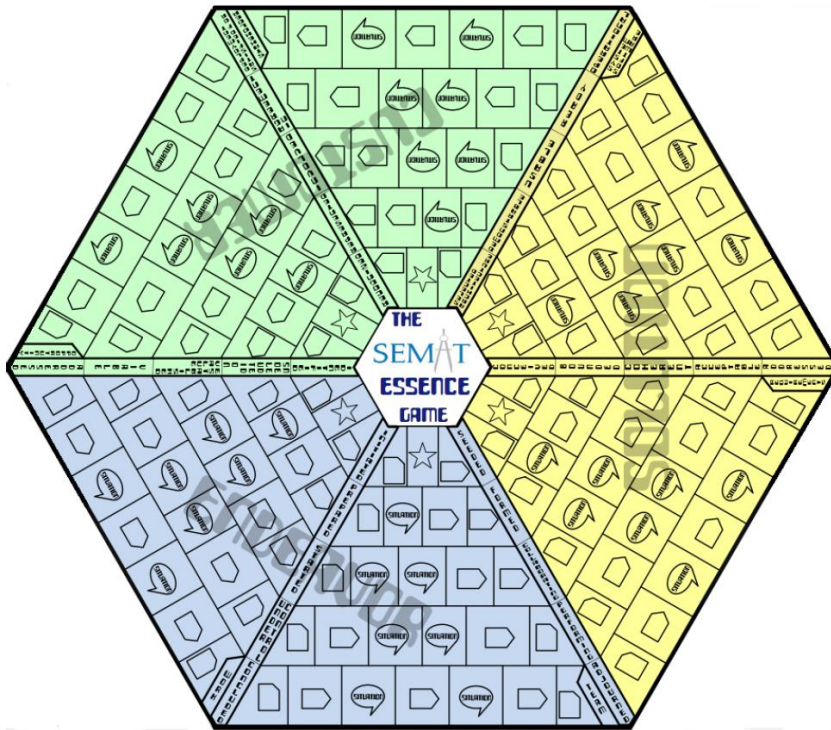
(The authors)

# SEMAT Essence kernel way of teaching



(The authors)

## The SEMAT Essence game



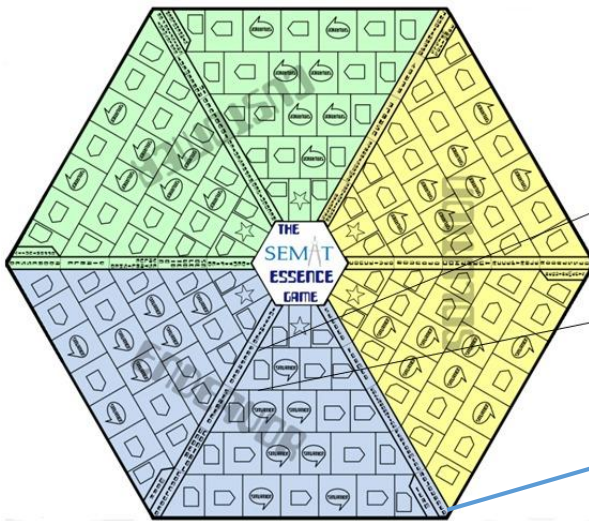
(The authors)

- Simulation-oriented game
- Based on the game Life<sup>®</sup>, (Rome and Hussey, 2013)
- Simulated elements:
  - Alphas
  - States
  - Areas of concern
  - Activities
  - Work products
  - Competencies
  - Practices
  - Patterns

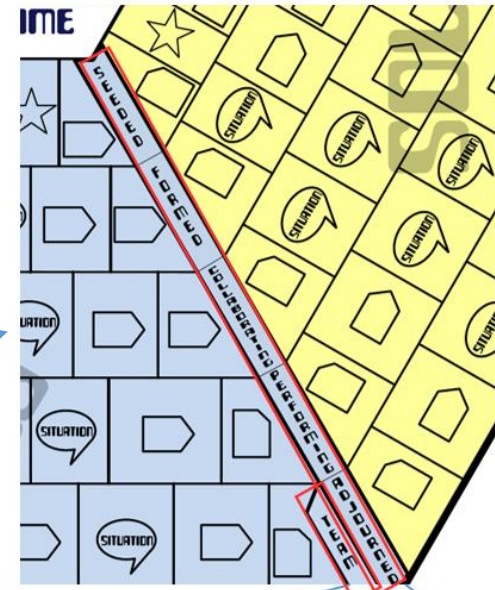
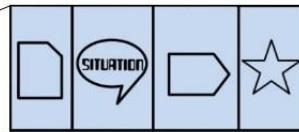


1. Introduction	2. Related work	3. The SEMAT Essence game
4. Results		5. Conclusions

# The SEMAT Essence game



Board Spots



Alphas

States

(The authors)

# The SEMAT Essence game



Pattern <role>

**★ Stakeholder Representation** Kernel

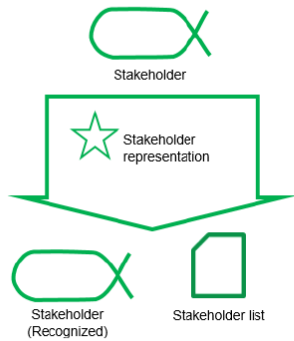
<b>Innovates</b> ★5	<p>Encapsulates the ability to gather, communicate and balance the needs of other stakeholders, and accurately represent their views.</p> <p>People with this competency help the team to:</p> <ul style="list-style-type: none"> <li>• Understand the business opportunity</li> <li>• Understand the complexity and needs of the customers, users and other stakeholders</li> <li>• Negotiate and prioritize the requirements</li> <li>• Interact with the stakeholders and developers about the solution to be developed</li> <li>• Understand how well the system produced addresses the stakeholders' needs</li> </ul> <p>Involved in:</p> <ul style="list-style-type: none"> <li>• &lt;&lt; Activities &gt;&gt;</li> </ul> <p>Patterns:</p> <ul style="list-style-type: none"> <li>• &lt;&lt; Patterns &gt;&gt;</li> </ul> <p>Resources:</p> <ul style="list-style-type: none"> <li>• &lt;&lt; Patterns &gt;&gt;</li> </ul>
<b>Adapts</b> ★4	
<b>Masters</b> ★3	
<b>Applies</b> ★2	
<b>Assists</b> ★1	

Competency card

(The authors)

# The SEMAT Essence game

## Identify stakeholders Market share increasing



<< Brief description >>

---

This activity produces

- << Work Product @ level of detail >>

---

Approaches:

- << Approach >>

---

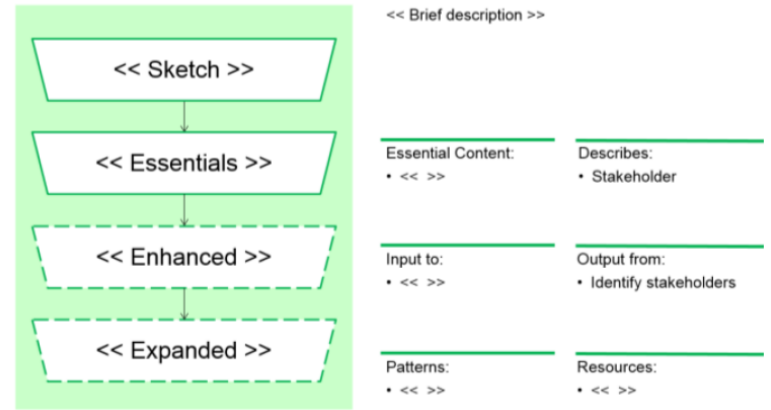
Parent:	Sub-activities:
• << Activity Space or Activity >>	• << Activity >>

---

Patterns:	Resources:
• << Pattern >>	• << Resource >>

Activity card

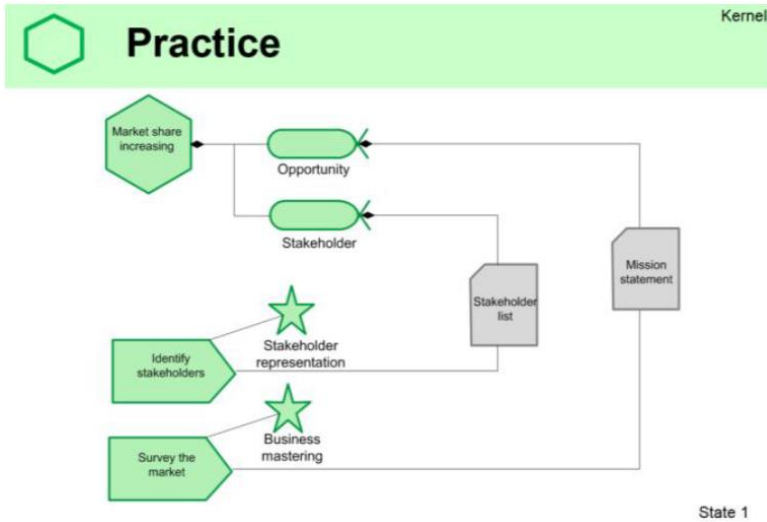
## Stakeholder list Market share increasing



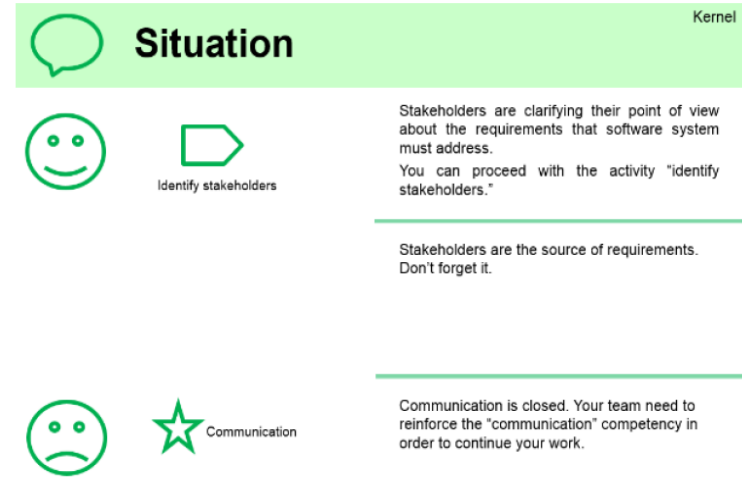
Work product card

(The authors)

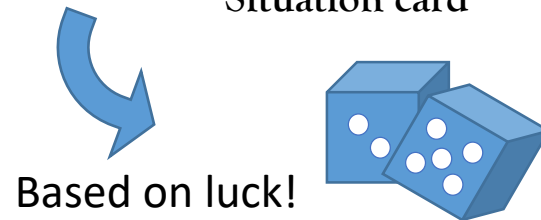
# The SEMAT Essence game



Practice card



Situation card



(The authors)

## Testers

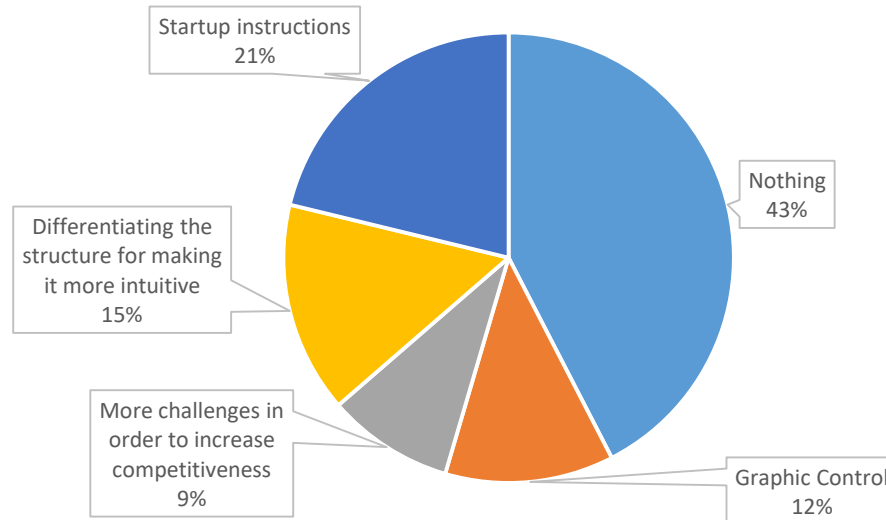
33 university students

4 universities



- “It is an effective way to learn about the elements, symbols, and relationships related to the SEMAT Essence”
- “The SEMAT Essence game may turn into a very competitive but still funny game”

What features would you improve in the game?



## Conclusions

- The SEMAT Essence game: a board game as a mechanism to simulate the main elements of the SEMAT Essence standard
- Based on a state-of-the-art review about the way to teach the standard
- We created a new element called “Situation” in order to provide realism to the game
- “The SEMAT game is a little complex, but it is funny and close to reality”

## Future work

- New control mechanisms
- Creating a virtual version
- Collecting larger samples of game plays



## References

- I. Jacobson, P.-W. Ng, P. McMahon, I. Spence, and S. Lidman. *The Essence of Software Engineering. Applying the SEMAT Kernel*. Addison-Wesley Professional: Crawfordsville, 2013.
- C. M. Zapata and I. Jacobson, “A first course in software engineering methods and theory,” *Dyna*, vol. 81, no.183, 2014, pp. 231–241.
- C. M. Zapata, G. Maturana, and L. Castro, “Tutorial sobre la iniciativa SEMAT y el juego MetricC,” 8th Congreso Colombiano de Computación, Armenia, 2013.
- P.-W. Ng, “Software process improvement and gaming using Essence: an industrial experience,” *Journal of Industrial and Intelligent Information*, vol. 2, no. 1, 2014, pp. 45–50.
- J. Pieper, “Discovering the essence of software engineering: an integrated game-based approach based on the SEMAT Essence specification,” *IEEE Global Engineering Education Conference (EDUCON)*, Tallinn, 2015, pp. 939–947.
- C. M. Zapata, M. D. Rojas, R. Arango, and L. Jiménez, “SEMAT game: applying a project management practice,” *Developments in Business Simulation and Experiential Learning*, no. 42, 2015, pp. 133–143.
- E. Jiménez-Hernández, H. Oktaba, F. Díaz-Barriga, M. Piattini, A. Revillagigedo-Tulais, and S. Flores-Zarco, “Methodology to construct educational video games in software engineering,” 4th International Conference in Software Engineering Research and Innovation (CONISOFT), Puebla, 2016, pp. 110–114.

## References

- J. Pieper, O. Lueth, M. Goedicke, and P. Forbrig, “A case study of software engineering methods education supported by digital game-based learning: applying the SEMAT Essence kernel in games and course projects,” IEEE Global Engineering Education Conference (EDUCON), Athens, 2017, pp. 1689–1699.
- K. Kemmel, J. Risku, A. Evensen, P. Abrahamsson, A. Dahl, L. Grytten, A. Jedryszek, P. Rostrup, P., and A. Nguyen-Duc, “Gamifying the escape from the engineering method prison,” IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), Stuttgart, 2018.
- I. Jacobson, H. Lawson, P.-W. Ng, P. McMahon, and M. Goedicke, “The essentials of modern software engineering: free the practices from the method prisons!,” ACM Books: Milton Keynes, 2019.
- B. Rome and Ch. Hussey, “Games’ most wanted™: the top 10 book of players, pawns, and power-ups,” Potomac Books: Quicksilver Drive, 2013.
- G. Lakoff and M. Johnson, “Conceptual metaphor in everyday language,” Journal of Philosophy, vol. 77, no. 8, 1980, pp. 453–486.
- Object Management Group, “Essence—Kernel and Language for Software Engineering Methods, version 1.2,” 2018, Retrieved from <https://www.omg.org/spec/Essence/About-Essence/>.
- Project Management Institute, “A guide to the Project Management Body of Knowledge (PMBOK Guide)—Fifth Edition,” Project Management Institute, Inc: Newtown Square, 2013.

# Thank You!!!

## A Board Game to Simulate the Software Development Process Based on the SEMAT Essence Standard

Grissa Vianney Maturana-González, Ph.D. (c)

Carlos Mario Zapata-Jaramillo, Ph.D.

Johnathan Mauricio Calle-Gallego, Ph.D. (c)

[gymatura@unal.edu.co](mailto:gymatura@unal.edu.co), [cmzapata@unal.edu.co](mailto:cmzapata@unal.edu.co), [cjonathanm@unal.edu.co](mailto:cjonathanm@unal.edu.co)

First International Workshop on  
Essence in Education & Training

### WEE&T

November, 2020

