Archetype-Based Organizational Change: A Teaching Experiment with Undergraduate Business Students

Francisco Araujo, ARBA Dynamics Lab, hello@pacoaraujo.com

2026 International System Dynamics Conference

Delft, Netherlands

July 20-24, 2026

Abstract:

This paper describes an exploratory classroom experiment that introduced System Dynamics structures into an undergraduate Organizational Change course to deepen students' analysis of a real company problem. During the first semester of 2026, 28 fourth-semester students worked in teams on a challenge from a zeolite-based company whose operations and inventory had been affected by prolonged rainfall. Rather than building models from scratch, students used a small set of System Dynamics structures and a Forrester-inspired reporting outline to define the problem, select a structure, build a causal explanation, explore policy options, and reflect on implementation. Most teams selected Limits to Growth, one selected People Express, and the quality of outputs varied considerably. Even so, the exercise helped students move away from symptom-based recommendations and toward a more structural understanding of organizational complexity. The main weakness was the limited capacity to design and test policies from the identified structure. The paper argues that System Dynamics structures can serve as reusable pedagogical assets that lower barriers to SD adoption and bridge organizational change, teaching, and later simulation work.

Keywords:

Organizational change, Undergraduate business students, Archetype-based learning, Structural diagnosis, Change management education

Introduction:

A recurring challenge in organizational change education is that students often produce recommendations that are reasonable but shallow. Their proposals may call for better communication, more training, tighter control, or stronger leadership, yet these responses frequently remain focused on visible symptoms rather than on the deeper structures generating recurring organizational problems. This limitation becomes even more evident when students are asked to work with real organizations, where ambiguity, multiple stakeholders, conflicting incentives, resource constraints, and delayed consequences complicate diagnosis and intervention.

System Dynamics offers a powerful response to this challenge by encouraging attention to endogenous structure, feedback, accumulation, and unintended consequences. However, introducing full System Dynamics modeling into an undergraduate business course can be difficult when students have no prior exposure to causal loop diagrams, stock-and-flow thinking, or simulation. In such settings, the technical barrier may prevent students from engaging with the field's deeper value.

This paper describes an exploratory classroom experiment designed to address that barrier by using **System Dynamics structures** as analysis scaffolds. Rather than asking students to build formal models from scratch, the intervention gave them a small set of pre-existing System Dynamics structures and a guided outline that translated selected modeling principles into an applied framework for diagnosing organizational problems and designing change interventions.

The experiment was conducted during the first semester of 2026 with 28 fourth-semester undergraduate students, approximately 20 years old, enrolled in **AD2001B – Detección de Oportunidades Estratégicas, Módulo 1: Cambio Organizacional**. The class was taught in Spanish. Students worked in teams to analyze a real challenge from a company under NDA, referred to here as **ZMX**, and were asked to identify and address one focal organizational problem using one of several System Dynamics structures.

ZMX is a business that sells zeolite-based products for water treatment and agriculture, operating in a business-to-consumer context while also extracting the mineral through open-cast mining. In 2025, the company reportedly experienced approximately four months of heavy rain, which interrupted extraction, damaged inventory, and stressed production. Because the company also sells to both Mexico and Arab markets, the disruption had broader implications for fulfillment and organizational performance. This context provided students with a live, multi-dimensional problem involving operations, inventory, environmental exposure, production, and market pressure.

The purpose of this paper is primarily methodological and pedagogical. It does not attempt to prove the effectiveness of learning through a formal experimental comparison. Instead, it documents the design of the classroom experiment, describes the analytical framework used to guide students, summarizes the outputs that emerged, and reflects on how System Dynamics structures may lower the barriers to adoption for students and practitioners in organizational change contexts.

The contribution to the System Dynamics community is twofold. First, the paper presents a replicable teaching method for introducing structural reasoning into management education without requiring full simulation expertise from the outset. Second, it suggests that the structures already developed by the System Dynamics community can be mobilized as reusable assets for non-modelers, helping more people explore complex situations without first carrying the full technical burden of the field.

Method:

Educational setting and participants

The experiment took place in **AD2001B – Detección de Oportunidades Estratégicas, Módulo 1: Cambio Organizacional** during the first semester of 2026. Participants were 28 fourth-semester undergraduate students, approximately 20 years old. The class was taught in Spanish. Although students had encountered some elements of systems thinking in earlier classes, they had no direct exposure to System Dynamics from an SD perspective and no formal training in causal loop diagramming, stock-and-flow modeling, or simulation.

The intervention was exploratory and embedded in regular course activities. Its purpose was not to train students as modelers, but to test whether System Dynamics structures could help them generate deeper, more structurally grounded recommendations for a real organizational challenge.

Organizational case

Students worked with a real company case under a nondisclosure agreement, referred to here as **ZMX**. ZMX sells products made with zeolite, especially for water treatment and agriculture, while also extracting the mineral through open-ceiling mining operations. In 2025, a prolonged rainy season reportedly interrupted extraction for about 4 months, damaged inventory, and put pressure on production continuity. Because the company serves both Mexican and Arab markets, the operational disruption also affected delivery, reliability, and strategic response.

The class received the same overall challenge and focused on one common problem within that broader context. This meant that all teams worked on the same company and issue, though they could interpret it through different System Dynamics structures.

Team organization

Students worked in teams of four or five, resulting in six final teams. The teams submitted written reports containing their diagnosis, structural interpretation, and recommendations. While the broader course grading emphasized how students applied Lewin's change framework, no formal rubric was used to assess the quality of the System Dynamics component itself. The exercise was exploratory, and the intention was to observe any level of structural understanding rather than require technical proficiency.

System Dynamics structures provided

Students were introduced to the following System Dynamics structures:

- People Express
- Tragedy of the Commons
- Stray Dogs
- SIR
- Limits to Growth
- Bass Diffusion

These were presented via a Genially resource that included descriptions and structure overviews. The objective was not to teach each structure in full technical detail, but to offer reusable dynamic patterns that students could use as analytical starting points for the ZMX challenge.

Reporting framework

Students completed a guided worksheet titled "*Archetype-Based Organizational Change*", inspired by Jay W. Forrester's reflections on System Dynamics and the qualities of strong modeling in *System Dynamics—the next fifty years*. The worksheet guided teams through problem definition, justification of structure selection, causal representation, endogenous reasoning, policy exploration, external stress testing, resistance analysis, and change implementation. An English version of the worksheet is included in **Appendix A.**

Instructional sequence

The experiment unfolded over **three two-hour sessions**.

Session 1: Framing the challenge and introducing the structures
Students were introduced to the ZMX case, to the idea that recurring organizational problems may reflect recurring dynamic structures, and to the set of System Dynamics structures available for interpretation.

Session 2: Selecting a structure and developing a diagnosis
Teams began identifying which structure best fit the ZMX issue and worked through the early parts of the outline, especially problem definition, structure identification, and causal story.

Session 3: Diagramming, policy reasoning, and report completion
Students developed their diagrams and completed their reports. Because most teams converged on **Limits to Growth**, the instructor provided additional support using **Comodel.io** and AI-assisted diagram generation to help them build causal loop diagrams.

Role of instructor support and AI

The experiment was not a test of unaided student transfer. Because students were new to System Dynamics and most teams selected the same structure, the instructor actively intervened to support diagram construction and structural interpretation. In particular, Comodel.io and AI assistance were used to help students externalize their reasoning visually.

The final method, therefore, combined four elements:

- pre-existing System Dynamics structures,
- a Forrester-inspired analytical outline,
- instructor facilitation,
- and AI-supported causal diagramming.

Evidence collected

The main evidence collected for reflection was the set of final team reports. No formal rubric was used for the System Dynamics reasoning itself, and no surveys, interviews, or coded reflection instruments were administered. As a result, the results presented in this paper are narrative and interpretive rather than statistical.

Results:

The experiment produced varied but informative outputs. While the results do not support strong claims of effectiveness, they do reveal meaningful patterns in how novice undergraduate students engaged with System Dynamics structures in an organizational change setting.

Convergence around Limits to Growth

A strong pattern emerged in the teams' choices. Five of the six teams selected **Limits to Growth** as the structure that best fit the ZMX case. Only one team selected **People Express**, adapting that model's stock-and-flow logic to its own interpretation of the company's needs.

This concentration suggests that **Limits to Growth** was the most intuitively accessible structure for students in this context. Given the company's exposure to environmental disruption, damaged inventory, production stress, and market demand, the notion of growth constrained by capacity or external conditions may have seemed especially natural. At the same time, this convergence limited the diversity of structural interpretations produced across the class.

Variation in output quality

The quality of the reports varied substantially. One team stood out as clearly stronger in both process and findings, showing a more coherent connection between problem framing, structural logic, and recommendations. Several other teams produced partial but useful insights. One team produced a much weaker result, suggesting that exposure to a structure and a guided outline does not by itself ensure meaningful structural reasoning.

Even so, the exercise appeared to push students toward greater depth than would typically be expected in a conventional organizational change assignment. Students were required to think more seriously about how the company operated, what interdependent elements shaped the problem, and why simple solutions were unlikely to work.

Recognition of structural complexity

One of the clearest outcomes was that students moved, at least partially, away from silver-bullet thinking. The assignment forced them to recognize that ZMX's problem could not be understood as a single isolated failure. Instead, it involved multiple stakeholders, environmental exposure, operational constraints, production pressures, and market implications. This helped students confront the idea that organizational problems often emerge from interacting structures rather than from one clearly identifiable cause.

This shift may be one of the most important pedagogical outcomes of the experiment. Even when the quality of structural representation was uneven, the exercise encouraged students to see the problem as a dynamic configuration rather than as a static event.

Use of diagrams and AI-supported representation

Since students had no prior training in System Dynamics notation, many needed support to turn their reasoning into diagrams. Once most teams selected Limits to Growth, the instructor helped them use Comodel.io and AI tools to construct causal loop diagrams. This assistance enabled students to visualize dynamic relationships more clearly and strengthened the structural dimension of their reports.

The use of AI support, therefore, became part of the method itself. It lowered the technical barrier to diagram construction and allowed students to focus more on interpretation than on notation alone. However, it also means that the outputs reflected a scaffolded process rather than fully independent modeling ability.

Difficulty with policy design

The most consistent weakness across teams was the move from structural diagnosis to **policy design and testing**. Students were better able to identify or approximate a structure than to specify which interventions would modify that structure and what dynamic consequences those interventions might create. In other words, the diagnosis progressed further than policy reasoning.

This suggests that the experiment needed more time devoted to teaching policy design, policy resistance, and policy testing. Although the outline explicitly asked students to distinguish intuitive but ineffective policies from more structural interventions, many teams needed additional support to do so effectively.

Search for shortcuts

A second recurring difficulty was that some students tried to find shortcuts to thinking. Rather than dwell in the ambiguity of the case and use the structure as a disciplined reasoning tool, some looked for fast answers or formulaic fits. This is pedagogically important because it suggests that structural tools do not automatically eliminate superficial analysis. They must be accompanied by enough facilitation and time to help students reason more carefully.

Overall pattern of appropriation

Taken together, the reports suggest three broad levels of appropriation:

- a stronger level in which the structure meaningfully shaped diagnosis and recommendations,
- a middle level in which students adopted the framework partially and extracted some useful insights,
- and at a lower level, where the structure remained mostly superficial.

Although the outputs were uneven, the experiment suggests that System Dynamics structures can help undergraduate students think more profoundly about organizational problems, especially by forcing attention to constraints, feedback, and stakeholder interaction.

Discussion

This classroom experiment suggests that System Dynamics structures can serve as a practical bridge between organizational change education and more formal System Dynamics practice. For students who are not yet ready for equations, simulation, or stock-and-flow construction from scratch, reusable dynamic structures appear to offer an accessible entry point into structural reasoning.

This is important because one of the major barriers to adopting System Dynamics in management education is the perception that it is too technical, too mathematical, or too specialized for early-stage learners. The experience described here points to another possibility: the System Dynamics community has already built a rich repertoire of structures that can be reused as analytical assets. These structures can help students and practitioners begin exploring complexity without first mastering the field's full technical apparatus.

Seen from this perspective, the value of the experiment is both pedagogical and strategic. Pedagogically, it pushed students to go beyond symptom-based recommendations and to recognize that there are rarely silver bullets in multi-stakeholder organizational situations. Strategically, it suggests a pathway for wider diffusion of System Dynamics: lowering the adoption barrier by giving non-modelers access to reusable structures before asking them to build full models.

At the same time, the experiment also revealed clear limitations. First, beginners may gravitate toward the most intuitively legible structure, in this case **Limits to Growth**, rather than seriously compare alternatives. This points to the need for more deliberate instruction in distinguishing among structures and defending structural fit.

Second, identifying a structure and designing a policy are not the same skill. Students were able to approach the first more readily than the second. This means future versions of the method should devote more time to policy design, structural interventions, dynamic consequences, and policy resistance.

Third, the method depended heavily on facilitation. The better outputs did not emerge from exposure alone. They emerged from the combination of a clear outline, repeated prompting, instructor support, and AI-assisted diagramming. In that sense, this is not yet a plug-and-play tool, but a scaffolded teaching method that still requires active instructional design.

These observations suggest several improvements for future iterations. More time should be dedicated to:

- explaining the structures more deeply,
- helping students compare multiple possible fits,
- explicitly teaching policy design and testing,
- and extending the exercise toward simulation-based experimentation.

This last point is especially relevant. The experiment can be understood as a **bridge to simulation in change management**. Students begin by using existing System Dynamics structures to interpret a case, then represent that structure visually, and later may move toward testing interventions more rigorously through simulation. In that sense, the method may help reduce the gap between systems thinking language and actual dynamic modeling practice.

For the System Dynamics community, the broader implication is that the field's accumulated structures are not only research products. They can also be turned into educational and practical tools for managers, students, and organizational actors who need a more disciplined way to think about complexity. This may be one of the most promising ways to broaden SD adoption without diluting its core insights.

Conclusions

This paper describes an exploratory classroom experiment that introduced System Dynamics structures into an undergraduate Organizational Change course as a scaffold for structural diagnosis and intervention design. Working with a real challenge from a zeolite-based company facing operational disruption, students used a guided outline inspired by Forrester's modeling principles to define the problem, select a dynamic structure, construct a causal story, explore policy ideas, and reflect on implementation.

Although the students had no formal background in System Dynamics, many were able to move beyond surface-level recommendations and engage more deeply with the problem's structural and multi-stakeholder nature. The exercise also revealed important limitations, especially students' tendency to converge on a familiar structure, their difficulty in designing policies from the structure, and their persistent search for shortcuts.

Even with these limitations, the experiment suggests that System Dynamics structures can function as powerful entry points for management education. They lower the initial barrier to adoption, accelerate the move toward useful structural insight, and can prepare students for later work in simulation and dynamic policy design. For the System Dynamics community, this points to an important opportunity: to mobilize existing structures not only as expert modeling assets, but also as reusable tools that empower a wider range of people to think structurally about organizational change.

References:

Braun, W. (2002). *The system archetypes*. System Dynamics in Education Project, MIT Sloan School of Management.

Bass, F. M. (1969). A new product growth model for consumer durables. *Management Science, 15*(5), 215–227. https://doi.org/10.1287/mnsc.15.5.215

Forrester, J. W. (1961). *Industrial dynamics*. MIT Press.

Forrester, J. W. (2007). System dynamics—the next fifty years. System Dynamics Review, 23(2–3), 359–370. https://doi.org/10.1002/sdr.381

Kermack, W. O., & McKendrick, A. G. (1927). A contribution to the mathematical theory of epidemics. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences, 115*(772), 700–721. https://doi.org/10.1098/rspa.1927.0118

Kotter, J. P. (1996). *Leading change*. Harvard Business School Press.

Lewin, K. (1947). Frontiers in group dynamics. *Human Relations, 1*(2), 143–153. https://doi.org/10.1177/001872674700100201

Meadows, D. H. (2008). *Thinking in systems: A primer*. Chelsea Green Publishing.

Richmond, B. (1993). Systems thinking: Critical thinking skills for the 1990s and beyond. *System Dynamics Review, 9*(2), 113–133. https://doi.org/10.1002/sdr.4260090203

Saeed, K. (1992). Slicing a complex problem for system dynamics modeling. *System Dynamics Review, 8*(3), 251–261. https://doi.org/10.1002/sdr.4260080305

Saeed, K. (1998). Defining a problem or constructing a reference mode. *System Dynamics Review, 14*(2–3), 219–229. https://doi.org/10.1002/(SICI)1099-1727(199822/23)14:2/3<219::AID-SDR148>3.0.CO;2-9

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. Doubleday.

Sterman, J. D. (2000). *Business dynamics: Systems thinking and modeling for a complex world*. McGraw-Hill.