



Resilient design in a complex environment: a potential tool for transdisciplinary dialogue

Diseño resiliente en un entorno complejo: una herramienta potencial para la interlocución transdisciplinar

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Received: January 23, 2025

Aprobado: May 16, 2025

Published: September 24, 2025

Abstract

Resilient design emerges as a crucial approach to developing large-scale systemic processes capable of adapting and thriving in the face of uncertainty and adversity. This proposal focuses on making visible the importance of resilient design in complex environments, addressing the intersection between the complexity of space and context, user needs, and the ability of systems to withstand and recover from disturbances. By looking at the creative process from complexity, one can recognize its non-deterministic nature, understand that the design outcome is not completely predefined and exists in multiple states at the same time, replicating the behavior of subatomic particles. In a metaphorical sense, quantum physics is directly related to the general concept of creativity in design, because, as in the quantum world, during the creative process multiple ideas and possibilities are explored in a non-linear way from different methodologies, and this can be affected by subjective and contextual factors. This interaction with the environment is what builds the resilient designer. Designing from resilience implies understanding how elements are formed and transformed, as well as their impact on the environment, recognizing the diversity of perspectives and the complexity of human interactions.

Keywords: Resilience, resilient design, complexity, creativity, creativity, teaching, transdisciplinary, transdisciplinary, transdisciplinary

Resumen

El diseño resiliente emerge como un enfoque crucial para desarrollar procesos sistémicos a gran escala, capaces de adaptarse y prosperar frente a la incertidumbre y la adversidad. Esta propuesta se centra en visibilizar la importancia del diseño resiliente en entornos complejos, abordando la intersección entre la complejidad del espacio y el contexto, las necesidades del usuario y la capacidad de los sistemas para resistir y recuperarse de perturbaciones. Al observar el proceso creativo desde la complejidad, se puede reconocer su naturaleza no determinista, entender que el resultado del diseño no está completamente predefinido y que existe en múltiples estados al mismo tiempo, replicando el comportamiento de las partículas subatómicas. En un sentido metafórico, la física cuántica se relaciona directamente con el concepto general de la creatividad en el diseño, pues, al igual que en el mundo cuántico, durante el proceso creativo se exploran múltiples ideas y posibilidades de manera no lineal a partir de diferentes metodologías, y éste puede ser afectado por factores subjetivos y de contexto. Esa interacción con el medio es la que construye al diseñador resiliente. Diseñar desde la resiliencia implica comprender cómo se forman y se transforman los elementos, al igual que su impacto en el entorno, reconocer la diversidad de perspectivas y la complejidad de las interacciones humanas.

Palabras clave: Resiliencia, diseño resiliente, complejidad, creatividad, enseñanza, transdisciplinaria

Introduction

Teaching within Design involves not only transmitting existing knowledge but also fostering the ability to question and re-evaluate previously learned concepts, to open space for innovation and experimentation.

Resilient Design from complexity is strengthened as a direct response to the growing entropy in systems. When designing from resilience, the result obtained will always be directed towards resisting, adapting, constructing, proposing, co-creating, sensitizing and maintaining its structure and function in favor of a natural tendency towards disruptive forces within the creative process.

Resilient Design involves exploring the possibilities in constant questioning and development of complex thinking, which allows experimenting with new perspectives of training in Design, proposing it as a basic competence within the professional profile in response to current needs and context.

A resilient designer is shaped from the stimulation of self-knowledge and from the hand of teachers with the appropriate awareness to generate, within the classroom, relational spaces and constant reflection, open to dialogue and dialogue from an approach from which the most relevant is the process and all the actions that precede the result of each of the topics discussed or addressed during the time of work in the classroom, thus creating a collaborative environment built from empathy and trust.

Resilience is not a new concept and the richness with which it has been approached from different fields and perspectives tells us of the great strength it possesses; it is a process that necessarily develops through interaction with others. The individual's sense of life emerges when it is recognized and accepted, regardless of their way of being (Benítez Corona and Martínez Rodríguez, 2017), it is a constant and changing journey, it is not a destination or a trophy to be achieved; the development of this particular competence speaks of a latent, continuous, uninterrupted work of both parties involved and of the richness of the environment that is created with the systemic interaction. And here lies the general objective: resilience seeks to develop systems capable of resisting and recovering from any type of disturbance, maintaining cohesion and rebuilding their systemic fabric and the networks that make them up.

Different studies relate the term resilience to specialized mental health issues; however, each of these definitions lead to discussions about the general, personal and contextual nature of the concept.

This paper aims to present a conceptual approach to Resilient Design from complexity and systemic models in order to make the importance of developing this fundamental competence, in the teaching of Design from an interactional perspective, visible ; to explore resilience and its relationship with the construction and appropriation of imaginaries and referents within a reflective collective system, tinged with subjective stories and interpretations, with abstract dyes that allow the construction and creation of possible solutions from Design as a tool for social change, systemic and integral change, as well as to propose methodologies for teaching Resilient Design.

The main contribution of this article to the field of Design is based on an innovative proposal of conceptualization of resilient design from complexity and systemic models. This approach allows showing resilience not only as a characteristic or particularity of design products, but as an essential competence in a resilient, transformative, ecosystemic and sustainable educational context.

Let us imagine that we are a small sphere, a particle in constant movement within changing and challenging spaces. Suddenly, within the environment, the constant is broken, there are more particles surrounding the initial sphere and, in the face of silence and indifference, it observes itself, observes the other and identifies it as an individual, identifies itself as an element, interacts within the system appropriating key referents in order to build and create its own interpretations within the relational space, communicates its interpretation, stops and observes. But this particle not only observes, it is also observed and forced to interact; and with this interaction it tries at all costs to connect and, in this situation, responds to disturbances, maintaining cohesion and rebuilding its systemic fabric, as well as the networks that compose it.

This particle knows that it cannot be the other, it cannot take its place, so it decentralizes itself to represent the other from what it perceives, feels, observes and lives; it discovers itself from the other.

Effective communication requires considering multiple points of view, adapting to different communication styles and adequately managing social and cultural contexts, which is why Resilient Design can promote experiences of connection, meaning and transcendence in users, generating assertive communication and enhancing its quality as a transdisciplinary interlocution tool. Each particle belonging to the identified system is semantized through forms of locution or communication, whether verbal or nonverbal, and resilience can represent the way in which the message is interpreted and the response obtained from each interaction between these elements.

Design has intrinsic qualities that can define it as an agent of environmental transformation. This quality is not only limited to the creation of graphic proposals, objects or spaces, but also encompasses the possibility of generating significant changes in the interaction of each element or particle within the environment to which they belong and among themselves. To achieve it, it is essential for resilient designers to develop a series of specific skills and competencies; such as analytical skills, essential for the assertive identification of the specific needs of each user, process or context. This includes research skills, information gathering and critical and detailed analysis for the identification of problems and opportunities for resolution, based on design as a potential tool for generating change.

Technical skills are of equal importance for the resilient designer, as they allow ideas to materialize in an effective and assertive manner; while theoretical skills provide the adequate foundation for the resilient designer to understand the principles and theories underlying the practice and, hand in hand with critical thinking, to be able to question, evaluate alternative solutions and make informed, clear and objective decisions, a crucial skill for their innovation and design from resilience.

Thus, a Resilient Design is about designing, contemplating the process and the constant change of each element, the dynamics in balance with the environment, deeply understanding each particle, in order to achieve a resilient connection.

From the field of Design and teaching for Design we can influence the construction of a common space by recovering the necessary elements to create sustainable environments mixed with concepts of innovation and presenting resilient solutions.

Collaborative work between students and teachers is fundamental for the creation of systems that recognize the strengths and weaknesses of each of its parts and reconfigure themselves to respond to each situation, assuming the different roles of the designer: interpreter, manager, creator, interlocutor, active agent within the creative process and construction and deconstruction beyond the natural function of communicating, transgressing the limits and creating transformative and meaningful experiences from resilience.

Empathy and resilience in the reconfiguration of adaptive systems

Empathy is the quality of being and connecting emotionally with others. It allows us to recognize, understand and connect with each of the particles that are part of the system to which we belong; it can be defined as that immediate and unconscious reaction that - based on active listening and identification of the other's problems and needs - allows us to develop effective communication skills.

It is the ability to decentralize, to represent the other based on what he/she perceives, feels, observes and lives; it is a system in constant re-configuration, creating safe and suitable environments for the discovery of oneself based on the other.

Strengthening this fundamental capability within the area of Design allows us to understand different points of view and enriches the way in which the environment is understood; it also gives the opportunity to create effective links, configuring each system for the benefit of conflict resolution and the interlocution between each particle that composes it.

Resilience, on the other hand, can be defined as a diachronic process, in constant evolution and movement. Therefore, it is that space located in the interaction between the individual and the environment, in which the individual plays an active role, weaving the collective imaginary from the social and cultural, reinterpreted from their own experiences in response to the adaptability of the systems.

Emotions are complex experiences, experiences that arise from a variety of sources, including neurochemical, physiological and cognitive processes. At the neurochemical level, emotions are influenced by neurotransmitters and hormones that regulate our mood and emotional responses. For example, serotonin and dopamine play crucial roles in regulating pleasure and happiness, while cortisol is associated with the stress response.

At the physiological level, emotions are manifested through bodily changes, such as heart rate, breathing, sweating and muscle tension. These changes are part of the body's automatic response to external stimuli and can prepare the organism for action, as in the case of the fight or flight response to threatening or risky situations; for naturally social beings, they play a crucial role in our adaptation to our environment. From a cognitive perspective, emotions are closely linked to our thoughts, perceptions, evaluations and judgments of the entire series of events we experience throughout our lives; the interpretations of these situations influence how we feel and how we shape our thought process and personality.

Emotions constitute this initial response and play an extremely important role in the adaptation to the environment and to the system of which each element is a part. They have an adaptive function in the regulation and social interaction and effective communication, modulating non-verbal expression, body language, tone of voice or facial expressions. This emotional communication is essential for establishing and maintaining effective interpersonal relationships, strengthening cooperation, mutual support, social cohesion and, of course, empathy.

Resilient Design is configured from such processes and can be represented as a complex system in constant reconfiguration, where each element and each decision interact in a nonlinear way with the environment and with other elements of the system.

This interdependence means that design cannot be understood in isolation, but must be considered within a broader context that encompasses both human and ecosystemic needs.

Design theories and concepts are not static but evolve and interconnect in complex ways. This implies approaching the study of graphic design in an interdisciplinary manner and considering multiple perspectives.

For Maturana and Varela (1984), we are beings that live in the act of conversing; our relational space consists of networks of conversations that constitute the culture in which we develop; and resilience and empathy emerge as a result of the interaction between the components that are part of the particle system. Resilient Design opens up the way to complexity, to rediscover elements of our systemic nature, among them: empathy and resilience.

Within the interconnected and constantly changing space in which we interact and to which we belong, resilient design recognizes that it would be reductionist to address each issue in isolation. Therefore, we must understand and work with the inherent complexity of each system and from this approach allow us to rediscover and take advantage of the fundamental qualities of the systemic nature, such as empathy and resilience, essential values for the proposal and implementation of sustainable solutions.

By strengthening the systemic interaction between particles there will be a deep and genuine understanding of each element. Resilient Design frames the importance of approaching problem solving from holistic and systems theories. By integrating these qualities, designers can propose solutions that contribute to holistic wellbeing, reconfiguring balanced, harmonious systems in which the particles that compose them are able to thrive and resist in the face of uncertainty and chaos brought about by complexity and constant movement. By integrating these elements into the design process, we can create solutions that are sustainable, adaptive and *being-centered*.

The Dimensions of Being and Grotberg's Resilient Model

The mental map that is created individually from a collective exploration in the creative process is loaded with multiple meanings and symbols for each of the elements represented. As inherently communicative beings, we construct these imaginaries through the interaction of meaningful code systems, adapting our communication both interpersonally and intrapersonally. The United Nations Educational, Scientific and Cultural Organization (Unesco, 1997) identifies three main dimensions of the self: cognitive, affective and psychomotor, which refer to different aspects of human development and are relevantly related to resilient expressions within the model proposed by Grotberg (1999).

The *cognitive dimension* refers to the development of intellectual skills, critical thinking, knowledge acquisition and creativity. Competence is the expression that is specifically and closely related to this dimension of being and strengthens it, since it refers to the ability to face challenges, solve problems and adapt.

The *affective dimension* of the self refers to emotional aspects, such as empathy, self-esteem, social skills and emotional management; this is why both trust and connections can be related to this particle dimension. The ability to establish meaningful bonds and connections promotes the development of a sense of belonging, interpersonal well-being and emotional security.

Finally, we find the *psychomotor dimension*, which can be indirectly related through the concept of *integral development*, which, from a holistic approach, promotes the development of skills that contribute to the physical, emotional and social well-being of each individual or particle that is part of the reconfigured system.

The four pillars of education for the 21st century

Jacques Delors (1996) points out in *Learning: The Treasure Within*, a document presented in the UNESCO report of the International Commission on Education for the 21ST Century, that considers it necessary to guide human beings in the construction of knowledge, skills, discernment, action and evaluation capabilities in an integral manner for the sustainable formation of each individual, and proposes four basic pillars, that is, four objectives that education must fulfill: *learning to know, to do, to be and to live together*. These principles are not only current and considered fundamental for integral education and human development but are also directly related to Grotberg's resilient model.

Resilience has four basic dimensions: physical, emotional, mental and spiritual, which can be directly related to the pillars proposed by Delors (1996). To be resilient, it is of most importance to make the interconnection between each of these dimensions visible and observe how one affects others from their interdependence and the dialogic discourse they represent.

The four pillars are focused on the acquisition of knowledge, stimulating curiosity. The pillar focused on *learning to know* refers to the development of cognitive skills, critical thinking and the acquisition of knowledge, relating directly to Grotberg's competence component and promoting, from resilience, the capacity for adaptability, a critical stance regarding knowledge and the construction of thought. In Resilient Design, learning to know implies understanding fundamental principles of design and acquiring knowledge about the relevant way to address problems, identifying and exploring innovative solutions, focusing on a deep understanding of the context, users and their needs to generate a response to it.

Learning to do refers to the development of practical skills, the application of knowledge in real contexts and the development of work competencies, which are directly related to the integral development within Grotberg's model, including technical, emotional and social skills to promote a holistic reconfiguration and growth, strengthening different emotional and social skills to contribute to practical learning and the ability to do from the ethical with the commitment to propose worthy improvements for the human beings that are part of its system. From resilient design, this dimension of being refers to the application of acquired knowledge, to the effective execution of solutions that not only respond to aesthetics, but also to functionality, adaptability and sustainable design in contexts and conditions in constant systemic reconfiguration.

When we talk about the quality of being, we refer to personal development, self-knowledge and self-awareness, self-esteem and the shaping of individuality and self-identity. Resilience contributes, through trust, to confidence in oneself and in others, as well as in one's ability to establish meaningful and supportive connections.

Integral shaping allows the transmission of values and perspectives to form committed generations endowed with a sense of belonging, transcendence and the search for truth. From the perspective of resilient design, this dimension refers to developing adaptive skills by cultivating self-confidence and openness to change, experimentation and continuous improvement, without neglecting the ethical and social responsibility of the designer and the impact that his or her proposals may have on the environment and the system to which they belong.

On the other hand, *living together* refers to the development of social skills, empathy, effective communication and healthy coexistence; it is directly related to the component of connections within Grotberg's model and allows us to establish meaningful and supportive relationships, as well as to weave networks of healthy coexistence to strengthen social skills, empathy and conflict resolution in a collaborative and systemic way. By focusing on the needs of the user, the community, the particle and its system, resilient design proposes active coexistence in collaboration with others by understanding, empathizing and respecting each position, perspective and culture, promoting inclusion and equity.

Model of resilient expressions

Grotberg (1995) states that resilience is about the capability of human beings to face life's adversities, overcome them and even be transformed by them; she proposes a model of resilient expressions that focuses on promoting resilience in individuals through three main components: competence, confidence and connections.

We can directly relate some characteristics and adaptive skills of Design with these points within the model of resilient expressions; empathy, for example, contributes in promoting the understanding of the user and the design connects with their emotions and experiences to strengthen the connection between both parties; while assertive communication is directly related to the trust component within the model and the construction of resilient and adequate spaces for the integral development of each particle that is part of the reconfigured system.

From this model, Grotberg (1999) extends the subject of resilience to each particle that makes up a system in constant construction and configuration, to each person, group and community, becoming aware of the importance of approaching this concept from a transdisciplinary perspective, strengthening the interlocution within the social sphere to which one belongs. This is why designing from resilience implies understanding the shaping and transformation of each element, its impact on the environment, recognizing the diversity of perspectives and relational complexity from the systemic, from empathy and otherness.

The model of resilient expressions proposed by Grotberg promotes resilience through competence, trust and connections, which contributes to integral development by knowing, doing, being and living together effectively in society, creating meaningful relationships. This is why, taking up this model, we could affirm that design from resilience strengthens the capability to establish meaningful links and connections, as well as the development of a sense of belonging, interpersonal wellbeing and emotional security.

Quantum perception of resilient design

But what does this have to do with our work in the classroom, with the rescue of emotional education and design from resilience? From the concept of entropy, according to Morin (2001), we can interpret resilience as a response to the growing entropy of systems, and by designing from resilience we can propose solutions capable of maintaining their structure and adapting to constant systemic reconfigurations through adaptive management.

Entropy is that disruptive force that, managed in equilibrium, encourages creativity within complex systems and, by integrating adaptive management within these principles of complexity, we can propose solutions from design, capable of maintaining their integrity and adaptability as other factors intervene or interfere in the environment. As a measure of disorder and complexity, we can propose solutions capable of remaining or maintaining their value and utility over multiple life cycles, minimizing environmental impact and the need for new materials.

Morin (2001) suggests that the increase in entropy within a system in constant reconfiguration prompts the change of paradigms within the same system, in which both object and subject are open and interrelated systems, and the dialogic principle favors the approach to this complex interrelationship between order and disorder, cause and effect, autonomy and dependence, accepting chance as a constant reminder that this complexity is changing and unpredictable.

We talk about how these spheres exist by observing and being observed, just as human consciousness emerges and manifests as it is observed in each act of perception that, from elements in common, reconfigures or collapses.

Ideas and concepts in graphic design can exist in a state of superposition, where multiple possibilities coexist until a specific solution is observed or materializes. Complexity means admitting that, within a context, an action, reaction and interaction, it is randomness that gives meaning and direction; it forces us to rethink each step from the human consciousness and the multiplicity of possibilities that design offers us as a factor of change.

The fundamental paradigm shift on design from resilience can be identified as a practical function that allows the constant evolution and reconfiguration of each element within the ecosystem corresponding to the construction of explanatory theories that offer an alternative vision to reality as we know it, paving the way towards the representation of increasingly complex levels.

Heisenberg's uncertainty principle refers us to the act of observing to create or evoke the existence of reality at the quantum level and to intervene in the behavior of the observed particles. From the uncertainty principle we can relate to resilient design in the sense that, like the position and momentum of a particle within a complex, changing and constantly reconfiguring environment, it is impossible to know with certainty the disturbances that may affect such systems; however, the resilient quality of the system allows it to adapt and recover in the face of this uncertainty and to remain active within the process of systemic interlocution in a quantum entanglement, a phenomenon from which these intrinsically linked particles are defined by their capability and disposition towards adaptability, innovation and the unexplored inherent to complexity.

All systemic change begins with a particular change, a step that leads to the expansion of consciousness, to the spirit, to belonging to a whole, to a larger sphere which, in turn, is a particle within an even more complex system, and resilience, hand in hand with active listening, places us as agents of change within the relational space. But how should I behave in the work I do in the classroom to contribute as an agent of change and a reference for each student?

To achieve this key interaction and systemic reconfiguration it is important to be committed to and aligned with the principles of resilient design and active listening. The different components within a resilient system connect with each other despite the distance or different contexts in which each particle is located, and the resilience of such a system depends on this interconnection and cooperation between each of its component elements: without the resilience to the uncertainty of the complex and unpredictable, creativity fades. By establishing a relationship of trust with a genuine interest in the free expression of ideas and emotions, an inclusive environment is created in which each particle develops a sense of belonging within the particular system, promoting diversity and respect. Thus, making others visible and validating their emotions, recognizing experiences and feelings, will strengthen the integral systemic reconfiguration of each element that is part of the whole and will create assertive and resilient relational spaces, incorporating the reflexive collective strengthening to develop a greater self-awareness and understanding of each particle individually and from the other.

Heisenberg's uncertainty principle, by establishing the impossibility of simultaneously knowing with exactitude certain properties of a particular system, allows us to create a metaphor regarding the work of the teacher in the classroom, based on resilient design or resilience. Just as in quantum science, observation influences the state of each system. Within the educational environment, our interaction with each element or particle that makes up our system and the environment or relational space has a clear impact on the development and learning of students, providing a supportive environment, a safe space within a system in constant reconfiguration and movement, in which uncertainty is not a barrier or impediment, but a clear opportunity for transformation.

Conclusions

The concepts of chaos, uncertainty and ecosystemic thinking allow us to conceive human beings as particles and creative systems in essence and in constant reconfiguration with the environment and the contextual factors that define them.

The development of the capability of understanding, based on the discernment and unveiling of all kinds of projections made by human beings as observers of realities, will open up ways to face the freedom of creation and assume the consequent responsibility (Klimenko, 2008).

A resilient system can maintain multiple potential states, which allows it to adapt flexibly to different conditions or circumstances. Like a particle in quantum superposition, a resilient system in constant structural reconfiguration is prepared to respond effectively and adaptively.

Resilient design is created as a personal construct dependent on internal processes and human potential to transform and transform itself, to re-configure itself as both a particle and a system.

From this perspective, resilient design - approached and understood as a quantum action of thought - allows us to theorize about its potential as a tool for generating social and cultural change. It is a latent commitment of those of us who enter the vast field of design and seek systemic reconfiguration that triggers each decision within the creative process to strengthen the design process from resilience. The before mentioned is searching for an assertive coevolution and order of thought in the act of cohesion between disciplines that seem disconnected to distinguish such interrelationships and their relevance within the process of building discourses, signifiers and interpretations of resilient design as a tool for transdisciplinary dialogue.

It is not only about evoking resilient design and the relevance of developing such competence in the classroom (although it is essential), but about surviving Design from resilience; listening, interacting, creating spaces open to dialogue, to questions, to experiences, to coexistence; turning the classroom into an emotional and relational space.

Maturana and Varela (1984) mentioned it some years ago: culture is changed by understanding and it is the coexistence within that space that transforms us; education is not information, education is transformation.

Resilient design is created as a personal construct dependent on internal processes and human potential to transform and transform itself, to re-configure itself as both a particle and a system. 📌

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