2018

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RS D7 2018
Relating Systems Thinking and Design Symposium 2018
www.systemic-design.net
WORKING PAPER

Designing resilient creative communities through biomimetic service design

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Abstract: Creative communities are grassroots, bottom-up initiatives of people who through their diffuse design capacity propose new, desirable service futures that address the problems of everyday life. These creative communities exist within a transition from modernity towards sustainment, their adversarial character embodies alternative values such as conviviality, solidarity, openness and shift the focus from growth to flourishing. The sociotechnical system that is a creative community creating social innovation faces constant threats due to the collapse of traditional support structures and their disruptive, adversarial character and so, identifying strategies to increase its resilience is necessary. We turn to nature for inspiration and mentoring. Biomimisis is a framework that designs solutions inspired by biological systems. We argue that permaculture, provides an interesting direction for the development and research in the context of social innovation.

Keywords: Design for sustainability; Service design; Resilience; Biomimisis; Permaculture

1. Introduction

This paper aims to support the idea that increasing the resilience of creative communities by fostering the emergence of greater diffuse capacity on a local level can act as a successful exit strategy for service design. To achieve this goal, we turn to Biomimisis, the study of biological systems to translate their principles in sociotechnical ones. Applying these through design can provide a way to reconstitute the domains of everyday life (Kossoff, 2015) and transition towards sustainability in some grassroots, distributed way. At the same time these different ways of looking at provide a direction that seems to provide an answer to many emerging issues in the context of service design within a systems thinking framework. The paper is divided in six sections. In the first section we position our work in the context of the discourse in the field of service design and social innovation. In the second section we present the systemic perspective of the field of resilience followed up by a brief overview of the practice of Biomimisis. In the fourth section we focus on the idea of permaculture, a systemic view of agroecological models. In the second to last section the case study of working with the 'apano meria 'social enterprise on the island of Syros in relation to the research question are presented. The focus of this section is about translating the lessons extracted from biological systems to social systems. In the final sections we present our conclusions.

2. Social innovation

In the last couple of decades service design has emerged as a field with promising potential to minimize the material flows and increase the overall sustainability of human activities on the planet. One of the central reasons for this is the adoption of 'service dominant' logic as opposed to the 'goods dominant' logic of traditional economies. Service dominant logic sees value as dynamic and co-created when a service provider and a client interact (Meroni & Sangiorgi; 2011) whereas goods dominant logic asserts that value as static and embodied in material products. The intersection of design for sustainability and service design goes far beyond simply minimizing the ecological footprint of our society. John Ehrenfeld (2008) posits that everything done to minimize unsustainability is not conductive to the emergence of sustainability, the possibility that all life flourishes forever. In this sense the social and the esoteric are aspects of the human experience that have to transition towards the "reconstitution of the domains of everyday life" (Kossoff; 2015) in order to alleviate the catastrophic failings of the instrumental thinking that is so closely associated with modernist ways of thinking.

According to Manzini (2017) social forms are made possible, durable and, where appropriate, relocatable by acting on a social ecosystem to make it more desirable. This can be done through two main courses of action: the creation of dedicated enabling systems that foster the existence of a specific family of social forms; or through the modification of the characteristics of the environment as a whole, so as to make it more desirable for a multiplicity of social forms. Creative communities that use the diffuse design capacity to co-create collaborative services sit in the center of social

innovation and transition studies. This difference between collaborative services and standard services (Cipolla & Manzini; 2009) exemplifies the dichotomy between reducing unsustainability and enabling the emergence of unsustainability. Collaborative services can be understood that the level of the cooperation is higher in building the service itself. There is a form of cooperation to its core that is of complementary nature. Due to that complementary nature ideally, we would be talking about Deriu's conviviality in the context of degrowth: "Conviviality refers to a society in which contemporary tools are used by all in a comprehensive and common way, without being dependent on a body of experts who control them" (Deriu; 2015).

These creative communities exist within a transition from modernity towards sustainment, the next epoch of human development (Fry, 2003). The adversarial character of these systems causes them to embody alternative values such as conviviality, solidarity, openness and shift the focus from growth to flourishing (Ehrenfeld, 2008). Not only are the systems of values adopted by these communities more compatible with sustainability they also challenge a hierarchical order. Such action is collective rather than individual, such a disruption is what Rancière calls a "dissensus" (2010). A dissensus is not merely a disagreement about the justice of particular social arrangements, it is also the revelation of the contingency of the entire perceptual and conceptual order in which such arrangements are embedded, the contingency of what Rancière calls the partition or distribution of the sensible (le partage du sensible) (Rancière, 2010). Increasing the variety of these systems is a necessary perquisite to both overcome control from the hegemonic ideology (law of requisite variety) as well as to increase the resilience of these systems.

Today social innovation and social entrepreneurship have garnered a lot of attention from professional designers and funding agencies (Telalbasic, 2015). Due to the externalities of this approach the social enterprises and creative communities that are structured are not emergent, bottom up but exist due to external reasons. In addition, the designers associated with the project are not embedded in the community and there is rarely special attention given to increasing the diffuse design capacity in the community. In a sense the community becomes dependent on external resources and as such when this stops the community withers because it lacks the capacity to exist without the supporting apparatus. This lack of 'exit strategy' has been identified as an issue that becomes more and more important in-service design discourse. The theoretical model presented and the supporting case study aspire to provide the initial structure of a framework for designing with creative communities in a way that increases the odds of a self-sustaining community creating social innovation. However, this process has several shortcomings in relation with spatial and temporal sustainability. If the expert designers engaged in the projects are removed the diffuse design capacity has not reached a level of maturity that allows the community to continue evolving and flourishing. This field is referred to as designing 'exit strategies' for the design team. This project aims to present the initial thought process of such an exit strategy developed in an action format informed by Participatory Action Research methodologies (Fassi et al 2013)

Within this context we posit that applying resilience thinking and biomimetic design methods, in the context of a systemic perspective these ecosystems of creative communities can be enabled,

strengthened and better achieve their goals. Increasing resilience by fostering the diffuse design capacity can be a viable exit strategy in any service development within a community.

3. Resilience

Resilience is defined as the capacity of a system to retain its organisational closure while absorbing external perturbations (Walker and Salt, 2012). The sociotechnical system which is a creative community creating social innovation faces constant threats due to the collapse of traditional support structures and their disruptive, adversarial character. Identifying strategies to increase the capacity of any system to resist external forces are necessary to ensure their survival in a time of unprecedented environmental and social pressures but in the context of the wider transitions towards sustainment and the necessary reconstitution of the domains of everyday life. “Three aspects can help us to achieve resilience: Persistence to withstand shocks or unexpected events, transformability, to move from crisis to innovation, adaptability, or able to understand change.” (Rockstrom, 2009) Meadows (2008) explains that once we see the relationship between structure and behaviour, we can begin to understand how systems work and how to shift them into better behaviour patterns. Systems thinking, she adds, can help us to manage, adapt and see the wide range of choices we have before us and help us to identify root causes of problems and see new opportunities. So, systems thinking are behavioural patterns, and learning to use them along with design can result in the design of resilient strategies to forecast the effect of a design.

Another tool is the notion of the Panarchy which is developed by Gunderson and Holling. This tool attempts to understand the source and role of changes in systems which transform and take place in adaptive systems (Gunderson and Hollng, 2001). Based on the study of ecosystems, the researchers describe how nature proceeds through recurring cycles that contain four basic phases: 1) Rapid growth (r); 2) conservation (K); 3) release (omega); and 4) reorganization (alpha).

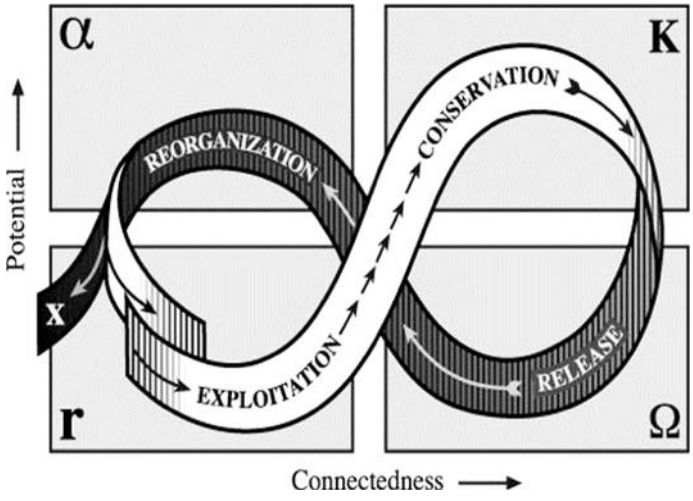

Figure 1 Panarchy. Source:

In panarchy, adaptive cycles take place at different scales (global and local) of time and space (gradual and episodic, rapid and slow unfolding). Panarchy is explained as the antithesis of hierarchy. The original meaning is defined as a set of sacred rules or as a framework of nature's rules. This term is now widely used to visualize systems theory and complexity. The theory of panarchy 'rationalizes the interplay between change and persistence, between the predictable and unpredictable and how panarchies represent structures that sustain experiments, test the results, and allow adaptive evolution' (Resilience Alliance, 2015).

The three-levelled system of a panarchy is used to emphasize the connections that are critical in creating and sustaining adaptive capability. The number of levels in a panarchy varies, is usually rather small, and corresponds to levels of scale present in a system. Visualizing panarchy is both creative and conserving, and the interactions between cycles combine learning with continuity. The cycle is then represented as the engine that periodically generates the variability and novelty upon which experimentation depends. As a consequence of the periodic but transient phases of destruction (omega stage) and reorganization (alpha stage), here a system's structure and processes can be reorganized. This reshuffling allows for the establishment of new system configurations and opportunities for the incorporation of exotic and entirely novel entrants into the system. Finally, the adaptive cycle explicitly introduces mutations and rearrangements as a periodic process Within each hierarchical level in a way that partially isolates the resulting experiments, reducing the risk to the integrity of the whole structure.

The tools above represent a contemporary notion of resilience thinking, looking at the rhythms of creating, conserving, revolting and finally declining within a continuous cycle. Although it requires deeper study, the idea offers a principle that designers can incorporate into their philosophy of making ecological and social systems. (Ruano, 2016) One approach to further incorporate natures teaching in the design process is Biomimisis, a trans-disciplinary approach to problem solving which has emerged through the integration of design with other disciplines, such as biology and engineering and attempts to translate biological mechanisms to components of socio-technical systems.

4. Biomimisis

In order to create the strategies necessary, we turn to nature for inspiration and mentoring. Biomimisis is a framework that designs solutions inspired by biological systems. It opens up possibilities of seeing the way nature works, teaches and informs arts and sciences (Ruano, 2016). It encourages deeper studies in order to arrive at technologies and strategies that may be achieved through interdisciplinary dialogues. Ecosystems display differing degrees of resilience. Understanding the strategies developed by nature to increase the resilience of eco-systems is a first step. Identifying and reframing these solutions can foster the resilience necessary for creative communities to flourish. The emerging fields of biomimetic design of services can support the evolution of service design (Ivanova, 2014). methods in the context of social innovation and shift the underlying assumptions behind the decisions made. Biomimisis has proven a robust methodology for the

development of solutions in the fields of material engineering and product design, applying lessons from nature is a frontier for service design and the creation of resilient organisations.

We can explore the relationship between ecology and social innovation through the lens of a biomimetic idea generation tool for service design as it is proposed by Ivanova. This process takes into consideration the ecology metaphor, the fact that service design and ecology share the same level of organization and lastly, the relation of their definition - both terms study interactions of organisms with their environment, in ecology with the natural inhabitant and in service design with resources, people, organisations, nature and technology. (Ivanova, 2014)

Biomimicry is a tool that can help us find options and can sometimes force the researcher to find answers (Benyus 1997). Using a natural pattern does not guarantee that the biomimetic artifact or system will work; for this reason, a prototype (digital or physical mock-up) is required. As the prototype is developed, it will be acquiring features that can be evaluated and modified, if necessary 'How does nature do...?' is a key question to ask in the process of implementing biomimetic thinking in design. It suggests new ways of inquiry in designing infrastructure, messages or artefacts using keywords related to natural forms, functions, processes and systems found in nature. The difficulty occurs when the learner must structure this information, or validates its accuracy. (Ruano, 2016). This action format is incredibly compatible with the massively co-designed approach used in social innovation. The service itself is in continuous iterative redesign process evolving and growing.

Ivanova proposes "a conceptual proposition of what biomimetic service design might "look like"", a tool inspired by the TRIZ methodology and the Lotus Blossom tool by Namahn and Design Flanders and follows the following steps: definition of the design challenge and definition of eight design requirements; abstraction of design principle which needs to define each design requirement in more general terms; searching for a biological analogue to each abstraction; and extraction of the principles behind each biological example which is intended to prompt a deeper understanding behind "how does nature do this." (Ivanova, 2014)

5. Permaculture

We argue that permaculture, an agroecological systemic design tradition (Cassel, 2015), provides an interesting direction for the development and research in the context of social innovation. In contrast to monoculture where only one type of value is the goal of the system, permaculture provides a systemic view that is focused in fostering virtuous cycles and cooperation between different symbiotic systems. Looking at creative communities as an interconnected ecosystem instead of discrete systems provides a different avenue for increasing their resilience and capability for flourishing by creating positive feedback within a wider ecosystem of bottom up initiatives on both a local and global level.

In order to draw inspiration, the prairie was selected as the basis for designing an ecosystem of creative communities entangled in virtuous circles aiming to increase the resilience of a bottom up organisation while increasing the overall flourishing in an insular environment. The example of prairies shows the significance of multiple and different "crops" in order to succeed resilience. This metaphor leads us to the idea that a social-ecological system requires many and diverse creative communities interacting each other and applying the principles of the community resilience.

Due to the high level of complexity of the systems of polyculture in general and the prairies specifically, are diverse by their nature and they interact transferring knowledge and leaving constant feedback, ensuring the maximization of the community resilience by the constant creation of new variety and the emergence of redundancies.

The Prairie metaphor suggests a polycentric model (Benyus 1995), as well. Classic studies on the sustainable governance of social-ecological systems highlight the importance of so called "nested institutions". These are institutions connected through a set of rules that interact across hierarchies and structures so that problems can be addressed swiftly by the right people at the right time. Nested institutions enable the creation of social engagement rules and collective action that can "fit" the problem they are meant to address. In contrast to more monocentric strategies, polycentric governance is considered to enhance the resilience of ecosystem services in six ways, which coincide elegantly with other principles aiming to increase the resilience of local creative communities and ecosystems: it provides opportunities for learning and experimentation; it enables broader levels of participation; it improves connectivity; it creates modularity; it improves potential for response diversity, and builds redundancy that can minimize and correct errors in governance.
Another reason why polycentric governance is better suited for the governance of social-ecological systems and ecosystem services is because traditional and local knowledge stands a much better chance of being considered. This, in turn, improves sharing of knowledge and learning across cultures and scales. This is particularly evident in local and regional water governance, as in watershed management groups in South Africa or the management of large-scale irrigation systems in the Philippines, where polycentric approaches have facilitated participation by a broad range of actors and incorporation of local, traditional and scientific knowledge. (Simonsen et al, 2014)

6. The 'apano meria' social cooperative as a resilient service polyculture

In order to elaborate the strategies recognised the 'Apano Meria' Social enterprise will be analysed with respect to the relationships between different focus groups and how these can increase the overall resilience of the system. The object of this case study is a collection of different creative communities with various interests but connected by a common theme: enabling the flourishing of the island of Syros. In order to achieve this goal three main themes have been adopted: the environment, culture and people. Each of these themes is made up of different special interest

groups that are interconnected both within the theme and in the wider scope of the community. The breadth of the whole enterprise is visualised in the system map below.

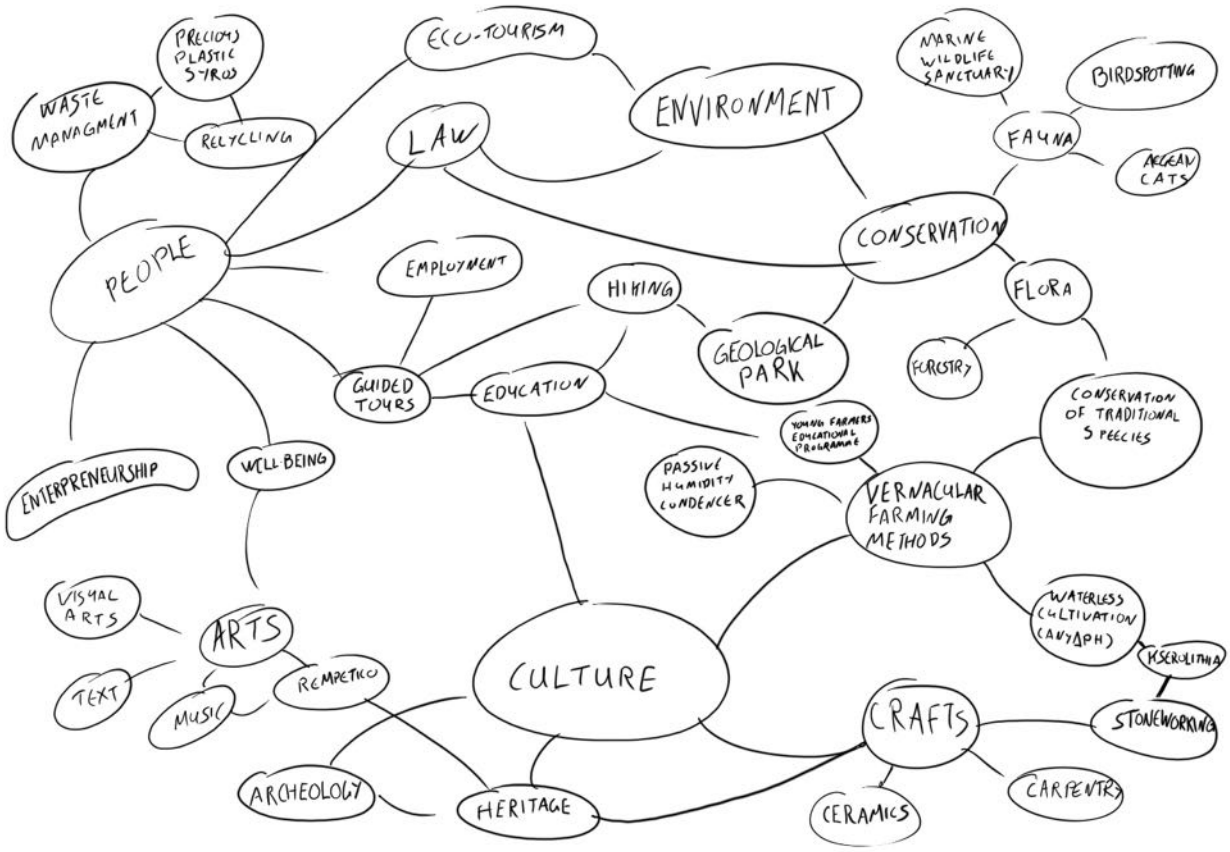

Figure 2 System map of the 'apano meria' social cooperative

The three main thematic areas around which the activities take place are People, Culture and Environment. The high connectivity between the issues and the crosspollination between different focus groups increases the overall variety of the whole venture. Some notable attractors within the system are: The designation of the area of ‘apano meria’ as an Environmental and Geological Park, to protect all natural, architectural, geological and marine features, to maintain and restore human-built structures that form the living history of the area and the Cyclades in general, and finally for the area to become a centre for sustainable activities, such as walking and geological tourism, climbing, diving, fishing, ecotourism and the promotion of archaeological sites. The goal is the establishment of a geological park in the network of UNESCO Global Geoparks which are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development.

A different issue is associated with the conservation of traditional farming methods and varieties. This touches on the environmental aspects (conservation of native species) as well as heritage

management and environmental stewardship. The Cyclades region is a very arid one and as such vernacular methods for cultivation with minimal water use were developed. In order to aid local farmers in transitioning toward such, labour intensive, methods a Passive Humidity Condenser was developed in collaboration with the local university. These types of interconnected relations increase the resilience of the systems and point to the leverage points to further increase the diffuse design capacity.

All of these teams are in an open dialogue amongst them and the goal is to foster the evolution of the diffuse design capacity in a way that creates design redundancies throughout the system. Understanding the flows of information, the juxtaposition of people in different roles as well as increasing the overall diffuse design capacity of the participants in the social enterprise is the first step in creating a resilient organisation. Identifying relevant biological models that create virtuous cycles and translating these to design strategies will increase variety, resilience and the contingency between different people and communities. Functional redundancy, or the presence of multiple components that can perform the same function, can provide insurance within a system by allowing some components to compensate for the loss or failure of others. Redundancy is even more valuable if the components providing it also react differently to change and disturbance. This, response diversity (differences in the size or scale of the components performing a particular function give them different strengths and weaknesses, so that a particular disturbance is unlikely to present the same risk to all components at once).

Within a governance system, a variety of organisational forms such as government departments, NGOs and community groups can overlap in function and provide a diversity of responses, because organisations with different sizes, cultures, funding mechanisms and internal structures are likely to respond differently to economic and political changes. Diverse groups of actors with different roles are critical in the resilience of social-ecological systems, as they provide overlapping functions with different strengths. In a well-connected community, where functions overlap and redundancy is present, creativity and adaptability can flourish. In the next section the five lessons from the biological methods analysed are presented. Permaculture was central in the selection of biological metaphors but not the only one. Social insects and hermit crabs were also used as inspiration for the extraction of design principles for the project.

Figure 3 Bioinspired service design. Adapted from Ivanova 2014

A diversity of users and designers can also safeguard the sustainable use of a resource. The case study of the Mangroves forests. Its mutualism in ant-plant relations underlines the significance of the collaboration between different species in the same ecosystem which benefits all the participants. It presents a mutual social-ecological interaction - the place can be the shelter for the society, where people can live and build homes, harvest crops, etc. but the society can be the shelter for the place at the same time, by offering important “nutrients”, through socialecological interactions. However, in a community of creative entities, the metaphor of mutualism can be related to people’s exchange of knowledge and services which, at the same time, “feed” the whole community with trust, multiple options for responding to change and dealing with uncertainty and helps to increase self–reliance. All these “nutrients” contribute to the resilience of the creative community

Self-reliance requires connectivity. Connectivity refers to the structure and strength with which resources, species or actors disperse, migrate or interact across patches, habitats or social domains in a socialecological system. Consider, for example, the epiphytic plants connected in Bromeliads: Bromeliad is the system, the epiphytes are parts of the system. How they are linked together determines how easy it is for an organism to move from one module to another. In every system, connectivity refers to the nature and strength of the interactions between the various components. From a social network perspective, people are individual actors within a system embedded in a web of connections.

Connectivity can influence the resilience of ecosystem services in a range of ways. It may safeguard ecosystem services against a disturbance either by facilitating recovery or preventing a disturbance from spreading. The effect on recovery is demonstrated in riparian habitat. Closely situated plant communities with no physical barriers enhance recolonisation of species that may have been lost after disturbances such as floods. The basic mechanism is that connection to areas that serve as refuges can accelerate the restoration of disturbed areas, thus ensuring the maintenance of functions needed to sustain the habitat and their associated ecosystem services.

Perhaps the most positive effect of epiphytic connectivity is that it can contribute to the maintenance of biodiversity. This is because among well- connected habitat modules local species extinctions may be compensated by the inflow of species from the surroundings. Local resources form the fourth principle of how nature maintains its high levels of resilience. Looking at the desert ecosystems, a process of 'local facilitation' among plants enables the usage of the local resources enabling the whole ecosystem exists. As Meroni posits “Within the next few years, we will have to learn to live (and to live better, in the case of most of the inhabitants of this planet) consuming fewer environmental resources. And we will have to do so by establishing new social undertakings at all levels.” () The groundwork for great systemic changes, for macro-transformations, is laid by micro-transformations, i.e.

by the radical innovations introduced into local systems. Therefore, we can make complexity and diversity work efficiently through localities which consist of networked people working together with high level of self-reliance.

The fifth and last principle which arose during this idea generation tool, is the necessity of feedback between the actors. In the study of social insects, we understand that the most of the individuals would be trapped and probably die, without the feedback each one leaves through its pheromones. In resilience we refer to fast and slow variables, drivers (external to the system, or from higher scales) cause change in “slow” (controlling) variables; as slow variables approach threshold levels, the fast-moving variables in the system fluctuate more in response to environmental and other shocks; and these shocks or directional change in the drivers can push the system across a threshold into an alternate stability regime. Therefore, feedbacks play an essential role in complex systems

7. Conclusions

The possibility of an exit during the post design process in services is probably the greatest concern of any service designer today. The example of panarchy shows an unending process for creating and maintaining adaptive capability. However, what could happen if this diffuse design capacity of each creative entity could be translated into expert through the biomimetic model for resilience? Unfortunately, the usage of the principles of biomimetic creative communities is a process that has a timeframe that makes it impossible to lead to concrete data. The very design process adopted in the context of the ‘apano meria’ social enterprise is similar to panarchy and as such no beginning or end exists only adaptive cycles between the different phases.

However, combining the early research findings extracted in the last two years, we can assume that the model of biomimetic creative communities creates an optimistic scope for further research. Adressing the community one domain higher provides the opportunity to maximise the diffuses design capacity of the members.

Although not evidently being biomimetic, creative communities exhibit biomimetic elements. During the process of bio-inspired idea generation tool we kept confirming that all the important characteristics of a social-ecological system for resilience thinking into a creative community exist in nature. We explored case studies from nature which prove their resilience is based on these characteristics.

Therefore, the logical outcome is that if by enhancing resilience, we enhance the design capacity of a creative community, this enables the exit of the designer during the post-design process if the system has gained enough adaptive capability to maintain its resilience in high levels. The preliminary research findings suggest that the research thesis is valid and we will continue to report the ongoing, massive co-design process undertaken on the island of Syros.

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