Redesigning Social Organization for Accelerated Innovation in the New Digital Economy: A Design Thinking Perspective

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Abstract We now appear to be in the full grip of the media transformation from paper-based media to a digital-based media. This evolution in mobility of information (experiences) has occurred alongside the mobility of matter and labor (goods and services, mass and heat), all of which have come about as a result of evolution in technologies of encryption, computation, communication, representation, sensing, and transportation. All these changes have contributed to a market environment that is more open, connected, complex, and dynamic, and to corporate and civic organizational configurations that are overwhelmed and slow to adapt to these changes. In the Hasso Plattner Design Thinking Research program, we have been observing these changes, and developing solutions to accelerate the rate of innovation in the new digital economy. Our work has led us to focus on the design team, the design coach, and the instrumented design space as the new unit of knowledge work, as opposed to the individual employees and line manager. This new unit is larger than the individual and so can take in more information. It is smaller than the typical organizational group or department, so it is faster to act and more agile. And the data rich and computational nature of the instrumented space, means that the technology can be considered a bona fide member of the design team. The variety of organizational structures now possible as well as the way these structures need to change in very short time frames has made it necessary to develop a biological metaphor of the organization as an organism that can fold, unfold, and refold as it adapts rapidly to a fast-changing environment. This radical shift from the hierarchical, clockwork, command and control organizations of the industrial age, will be explored with a view to showing alternative redesign of social organizations and the means to accomplish the requisite sociological, psychological, and technological transformations effectively.

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C. Meinel, L. Leifer (eds.), *Design Thinking Research*, Understanding Innovation,
https://doi.org/10.1007/978-3-319-97082-0_8

1 Introduction

Organizations are increasingly embracing design thinking methodology as a way of structuring their innovation endeavors. Leading business journals such as Harvard Business Review proclaim design thinking as a key methodology for organizational innovation (Kolko 2015). There have been a number of case studies documenting groups within organizations practicing design thinking with varying levels of success (Köppen et al. 2016). A deeper study of these case studies reveals that design thinking is used in three ways—as a workshop method to introduce employees to new ways of creative thinking, as a product development methodology that is user-centric, or as a methodology to drive change in organizational productivity and responsiveness. These case studies also reveal a number of challenges in implementing design thinking within an organization such as strategic directives from top management clashing with user-centric insights by product teams, organizational silos circumscribing design thinking and converting it into its own silo, and individuals who develop a design mindset feeling restricted by existing organizational routines (Schmiedgen et al. 2016). We too have faced difficulties implementing high performance design teams in industry, not because companies do not seek design team performance, but rather because the broader organizational context in which these teams operate does not fully support high performing design thinking teams. Thus, there is an imperative to understand the role of social organization and its influence on design thinking and ask the question—what kind of an organization is required to realize the full potential of high performance design teams?

In this book chapter, we will begin by outlining the critical relationship between a design team's context and the team's performance. Next, we will describe in greater detail the nature of current social organizations in which design teams are embedded and examine their advantages and disadvantages. Following this, we will propose a new form of social organization centered around instrumented design spaces and consisting of teams that can form and reform to act and respond faster to market needs and technology opportunities. Next, we will discuss the merits of this new form, followed by an example. We will conclude the chapter by examining the range of changes that people need to make to transform existing social organizations into this new form of a social organization.

2 Design Teams Are Context-Dependent

It important to consider the nature of the social organization in which a design team is embedded for four main reasons. First, a design team's performance occurs in the broader field of a market environment. Second, the nature of the social organization determines access to resources that a team needs in order to perform design work. Third, the nature of social organization dictates an assumption of roles which define what behavior is acceptable to the organization irrespective of its effectiveness in the

market. Fourth, the nature of the social organization determines the identity or group to which an individual feels he or she belongs.

A design team's performance occurs in the broader field of market environment. In the digital economy, the market is an ever-changing environment. New companies are coming into this environment and new devices are being invented in this environment. Current customers that are using a product, are constantly adapting it to their purpose so that a team has to observe them through need-finding to identify an opportunity for growth. If a company does not act on such opportunities, its competitors might, and in so doing disrupt the market share of that company. High-performance design team needs to operate in such rapidly changing market conditions, discover opportunities, and create products that address user needs and drive company's business growth. The social organization within a company mediates a team's interactions with the market. This mediation occurs in several ways, which leads to the next point.

The nature of social organization determines access to resources that a team needs to perform design work. In order to be a high-performance design team, the members need access to resources such as capital, information and additional talent. These can be constrained by the nature of social organization in such a way that it hinders high performance design behaviors. For example, access to information can be restricted by middle management through a permission process that seeks to safeguard role legitimacy rather than promote creative teamwork.

The nature of social organization dictates an assumption of roles which define what behavior is acceptable to the organization irrespective of its effectiveness in the market. Once a team is a part of an organization, each team member develops an assumption of the role that he or she is actually playing out (Katz and Kahn 1978). The social organization reinforces this role through mimesis, narratives, and incentives. This role then becomes a key driver of individual and team behavior rather than the market.

Finally, the nature of social organization determines the occupational, professional, or class (owner, manager, employee, contractor) identity that an individual feels he or she belongs to. This identity further influences team interactions and either constrains or facilitates collaborative relationships with others in the market. One of the researchers who first drew attention to this phenomenon was Anna Lee Saxenian in her book, "Regional Advantage," where she compared the Silicon Valley to companies on Route 128 on the East Coast of the US. Her study showed that California's Silicon Valley was able to keep up with the fast pace of technological progress during the 1980s, while the vertically integrated firms of the Route 128 beltway fell behind (Saxenian 1996). She argued that the key was Silicon Valley's decentralized organizational form, non-proprietary standards, and tradition of cooperative exchange (sharing information and outsourcing for component parts), in opposition to hierarchical and independent industrial systems in the East Coast. This led to Silicon Valley engineers identifying with the entire regional ecosystem rather than one company, which in turn accelerated information sharing and worker mobility, while the Route 128 engineers identified themselves with only their company and were limited in their interactions to people within that company.

Thus, in order to foster information and idea sharing type team interactions, we need to consider the nature of social organizations in which such teams are expected to operate, and if necessary, we may need to redesign them.

3 The Hierarchical Organization

Organizations can be considered a form of ordering planned action. Human beings organize themselves so that a particular action occurs to achieve the desired goal more efficiently. The dominant form through which humans organize is that of a hierarchy with predetermined lines of communications. Another name for this form of organizing is command and control (Fig. 1).

The "command and control" structure comes out of military history where we as humans organized ourselves for campaigns. It typically consists of people organized into different strata, with power distributed between these strata. There is a stratum where people hold more power than the layer below it, and that layer holds more power than layer below it, and so on. This way, power distribution comes in the picture when we talk about this form of organization.

The "command and control" hierarchy could also be considered a "thinking and doing" hierarchy, or "planning and execution" hierarchy, where there is a separation between thinking and doing. Take for example, in 1969, Drucker wrote:

> . . . For business, during the last thirty years, has had to face, on a much smaller scale, the problem government now faces: the incompatibility between "governing" and "doing." Business management learned that the two have to be separated, and that the top organ, the decision maker, has to be detached from "doing." Otherwise he does not make decisions, and the "doing" does not get done either. (Drucker 1969)

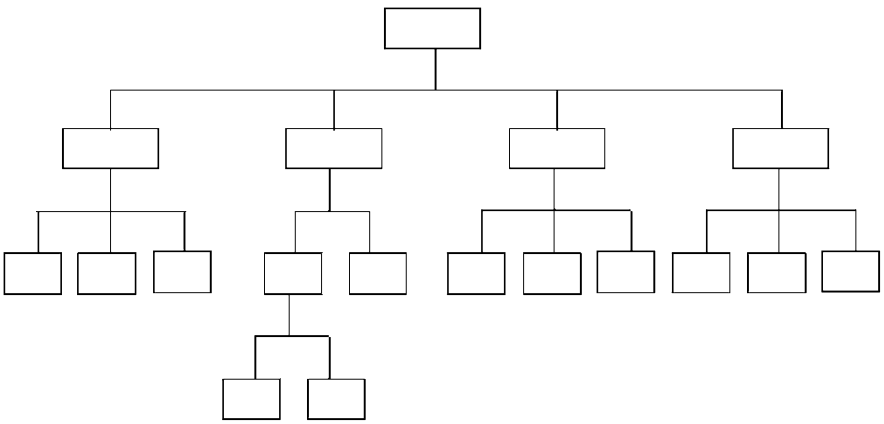

Fig. 1 A typical hierarchical organization structure that emphasizes command and control

This may derive from two basic assumptions of the industrial economy—(1) effective action is planned action, and (2) division of labor is necessary to achieve economies of scale. In time, this separation took on deeper social and psychological connotations whereby those who think, or plan were considered to be higher in status than those who did the actual work.

Before going on to discuss the advantages and disadvantages of the hierarchical organization, it is helpful to remind ourselves that design thinking as a practice emphasized values and actions that encouraged empathy, ideation, and hands-on prototyping and thus blurred the lines between thinking and doing.

3.1 Advantages of a Hierarchical Organization

A hierarchical organization displays the following advantages.

1. Efficiency: With this form of an organization. Once the task or the objective and activities are clearly planned, then the organization can actually perform those activities efficiently. The allocation of resources, which is fixed in nature, can happen faster, and the organization can respond more quickly to its environment, which presumably is also not changing. Now, as long as the environment remains static, and provided the organization is targeting the right outcome, this form of organization can be shown to be more efficient than a non-hierarchical one.
2. Legitimacy: The hierarchical organization is more familiar to most people, and a majority of people seem to prefer it. They have grown up in families where they experienced the hierarchy—father, mother, uncle, grandmother and it feels natural. Hierarchy has an intuitive feel and makes us feel safe. There is less uncertainty as individuals know their place in the organization and they know the ways of advancing within it. The familiar and ordered structure also engenders more respect for the organization. So, legitimacy and respect are tied more to a hierarchical command and control form of organization, because to some extent it has become the way we understand what it means to be organized.
3. Means of control through incentivizing: We have been socialized into hierarchies. For a majority of people who have a natural affinity to hierarchies, a hierarchical organization enables effective distribution of control through an incentive system of titles, compensation and perceived advancement that helps retain them in an organization.

3.2 Disadvantages of a Hierarchical Organization

A hierarchical organization displays the following disadvantages, which become especially acute in the context of design thinking performance.

1. Response time: If power is concentrated centrally, and there are too many levels in the hierarchy, such an organization can become very slow and find it difficult to a respond quickly in a dynamic environment.
2. Information overload: Response to changes in the environment, becomes the primary responsibility of the leaders or the people who hold concentrated power. In today's dynamic market environment, this concentration of responsibility in a small group of people becomes a bottleneck to organizational effectiveness. In a dynamic environment, people need to respond to new developments, threats, and opportunities in a much more fluid way. If everybody is passing information to the person on top and the organization is working 24 hours, it is easy to see how those who hold concentrated responsibility become overloaded with information. This then results in a management crisis whereby the amount of information and the hierarchical structure of persons no longer works as effectively.
3. Complexity: In order to better understand the relationship between complexity and organizational design, it is helpful to understand the Cynefin framework proposed by Kurtz and Snowden (2003). In it they described four domains most organizations have to navigate for strategic environmental survival:—simple, complicated, complex and chaotic. In the simple domain, relationships in the environment between cause and effect are predictable and stable, in the complicated domain, the relationship are dynamic but still stable and could be analyzed and predicted. In the complex domain, relationships are weak, emergent and unpredictable. While in the chaotic domain, relationships could not even be identified. The hierarchical organization is well-suited for domains of simple and complicated. But once one goes to the complex domain where the relationships are weak, and there are no strong signals, there's no single decision that can actually drive action. One needs to conduct hundreds of different experiments to actually figure out the right set of responses. In this domain, and more so in the chaotic domain, the hierarchical command and control organization becomes a hindrance since it constrains or restricts experimentation.
4. Learned Helplessness: Most people have relied on their hierarchy to help them resolve conflicts. For example, if two employees have a conflict and go to their boss to settle their differences then the need to engage each other, and work through such differences is minimized. Thus, a hierarchical organization indirectly reduces self-reliance and self-driven engagement to initiate action. In its extreme form this can become a pervasive quality and result in learned helplessness (Maier and Seligman 1976).

4 The Innovation Organization

4.1 Requirements

In order to arrive at the new form of organization, it is helpful to list the requirements that could enable design teams to achieve high innovation performance. Innovation activity by its nature occurs in the ambiguous and complex domain. It is by nature an

emergent activity that cannot be planned ahead of time and then executed. There is trial and error. There is wayfaring. The market itself is changing. The technology is changing. Customers bring in their own adaptation to products released in the market. Therefore, performance is determined by how a team and organization responds to this dynamic environment. Dealing with a dynamic environment requires a form of organization which has some or all of the following characteristics.

1. Non-permission based: This refers to the ability to access resources quickly, without having to take permissions up and down a hierarchical chain or from a large number of people. The requirement to take permissions is an impediment to innovation. Whether that be a popular vote or whether that be an authorization from a single person. The organizational form we are suggesting should not have the requirement to take permission.
2. Resilient: At the same time, if people don't take permission and make mistakes, the form should have the ability to forgive, learn and reform. This requirement goes hand-in-hand with the ability to be non-permission based.
3. Foresighted and playful: It is also a form of organization that enables individual dreaming, and individual imagination, to become team imagination, to become organizational imagination.
4. Rapid and distributed sensing: This refers to the ability to coordinate with a large number of people outside to gather data rapidly and make sense of the data. It is a form that should enable this rapid sense-making because when in a dynamic environment, the organization's response rate depends, to a large extent, on its perception and sense-making capability.
5. Flexible Acting: The organization should leave room for a wide range of values, cognitive dispositions, and action tendencies. We need the organization to allow forms within it that don't quite fit the dominant culture to have time to grow and demonstrate value. This diversity is necessary for creating an environment where alternative ways of acting are generated, experimented with and, if proven useful, allowed to influence and change the organization.

With these requirements, we began to see that the new form of the organization that we propose is more like a flow field than a physical structure. Borrowing from the principles of fluid mechanics to construct order in such an organization, we understand that flow is directed by two aspects—the cohesive forces between the fluid molecules, and the contours of its container. Accordingly, we define the new structure by two key aspects.

1. The interactions between the participants of this organization.
2. The shape of the environment in which the "flow organization" exists.

4.2 Reframing the Organization

Innovative organizations need to take on more responsibility than traditional organizations. The requirements described previously point to a shift in the framing of organizations. From a mechanical clock metaphor to flow metaphor. The following

factors are particularly salient when reframing organizations from hierarchical to a flow form.

Shaping Environments

In a hierarchical organization, action is influenced through planning and adherence to the plan through hierarchical channels of authority. These channels are central to the effectiveness of the organization. In a flow organization, action is influenced by shaping the environment in which it is situated. Beyond this influence, the teams working in that environment are allowed freedom to wayfare (Ingold 2009). The shaping of the environment becomes central to the effectiveness of a flow organization. This can take the form of designing physical spaces in which teams operate to designing embedded narratives for the shaped environment. Figure 2 below shows the shaped environment of a studio space within Stanford University. This environment was designed carefully to elicit certain behaviors from the teams within. The artifacts in this environment, its layout and its audio/visual characteristics, all give subtle but clear indications to the teams to emphasize certain actions. This mechanism through which an environment influences action is called stigmergy and was first discovered when investigating how ants coordinate indirectly over time and space through environmental markers (Theraulaz and Bonabeau 1999). This mechanism has also been identified in human-human communication (Parunak 2005).

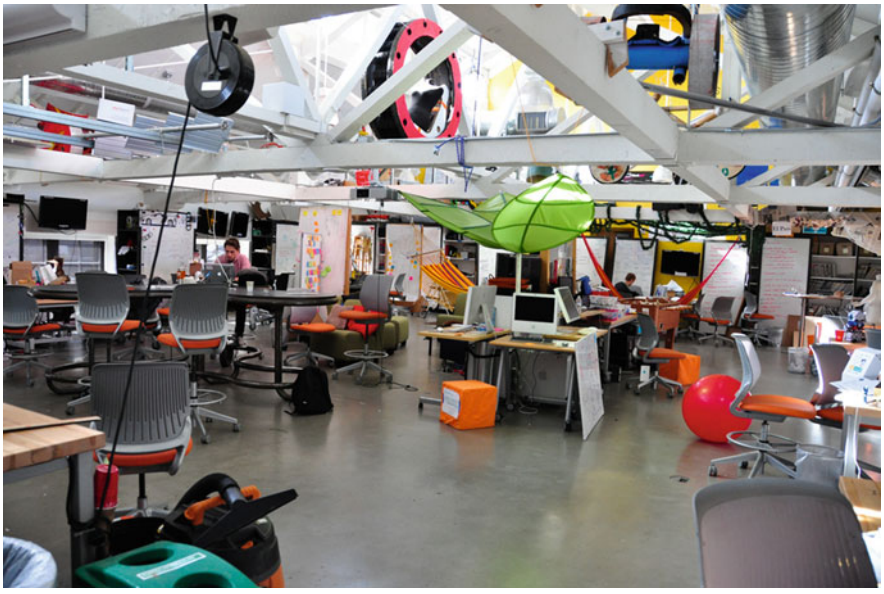

Fig. 2 ME310 loft, an intentionally shaped environment for graduate level design course at Stanford University.

Team as a Fundamental Unit

The other factor that distinguishes a flow organization from a hierarchical organization is that the team is now the fundamental unit of the organization, instead of the individual. This facilitates greater information processing capacity as well as greater potential for generating alternatives for innovation. The team can be considered a super-organism in comparison with the individual acting as a micro-organism.

The term 'team' is currently being co-opted in the hierarchical organization to imply a manager or a team lead working with a small number of his or her subordinates. This is not what we mean by a team for a flow organization. A team in a flow organization is a group of people working interactively and non-hierarchically to develop joint cognition, joint motivation, joint imagination and joint action.

Activating Intrinsic Motivation

A key issue that goes with dismantling levels of hierarchy and changing to a team as the unit of organization is the issue of motivation. In a hierarchical organization, the hierarchical levels of authority imbue motivation in individuals by bestowing promotions, financial incentives and projecting the fear of being fired. In contrast, in a flow organization with its shaped environments and teams, the motivation needs to be activated intrinsically. This is more challenging but also a pre-requisite for creative engagement that could result in successful innovation outcomes (Amabile 1997). This activation of intrinsic motivation requires intentional effort on part of the individuals within the teams.

Regulation

This brings us to the institutional regulatory environment. In the past, hierarchical organizations just consisted of the individual and the institution. Flow organizations have the individual, the team, and the institution. The institutional regulation which includes legal framework, financial and accounting framework, and corporate governance framework needs to be re-oriented to recognize and enable high performance teams.

Team-Tool System

Teams in flow organization would be enabled by instrumentation and tools that form an integral system we can call a Team-Tool system. While we as humans have been using various tools for work since the dawn of civilization, it was only in the mid twentieth century that the concept of system that augments humans with tools was proposed by Vannevar Bush (1945). Douglas Engelbert's implementation of the Memex proposed by Bush led to the development of key computing technologies such as hypertext, graphical user interface, the computer mouse, and video-conferencing (Engelbert 1968). These technologies have exponentially improved our capacity to coordinate and process information.

However, we need to develop new and improved set of tools and instruments that operate at the team level and not just at the individual level, so that we can augment the collaborative capacity that results in teams becoming super-organisms. We have the beginnings of such a Team-Tool system based on the Interaction Dynamics Notation (Sonalkar et al. 2016) that gives feedback on the patterns of interactions

among designers in a team. But it has not yet been fully implemented. The Team-Tool system needs to also include financial tools such as stock options for employees, and these could be implemented as smart contracts using blockchain technology such that it engenders fairness and transparency within the organization (Tapscott and Tapscott 2017).

Leadership
Leadership in a flow organization functions through demonstration by self-action followed by diffusion of influence through mimesis and stigmergy. This is in sharp contrast to leadership in a hierarchical organization that functions through plan-setting or strategy-setting followed by diffusion of influence through external narratives and the channels of command and control. Once, the hierarchical structure is dissolved in a flow organization, the often-mistaken conflation between managers and leaders would be removed. In a flow organization, teams lead, not managers.

4.3 Why Do We Propose This Form?

We believe the new frame proposed above, will satisfy the requirements we derived. Specifically, this new form addresses (1) the change in the dynamics of the environment, which in turn effects (2) the complexity of the organization.

Table 1 shows a graph of the requirements versus the proposed design. It should go without saying that the dynamic environment, is causing us to use the Team-Tool System, which increases the rate of change in the environment, which in turn causes us to increase the performance of the human-tool system.

Table 1 Flow organization characteristics mapped against requirements for an innovation organization

Flow organization design feature / Requirement	Team as fundmental unit	Team-tool system	Leadership	Shaping environments	Activating intrinsic motivation	Regulation
Non-permission based	X		X		X	X
Forgiveness-based (Resilient)	X		X		X	X
Foresighted and playful	X		X	X		X
Rapid & distributed Sensing	X	X			X	X
Flexible Acting	X	X		X	X	X

4.4 Example of Innovation Organization

The flow organization form that we propose above is an ideal form that may not quite exist in today's world, but is an organizational form that we are working towards achieving. There may exist aspects of the flow organization today and they have existed in the past. The example below describes what could be characterized as a partial flow organization that was developed within Stanford University in the mid 1970s. The description of the organization is paraphrased from Bernard Roth's The Achievement Habit (Roth 2015, pp. 166–170).

Roth describes how the structure of the Design Division at Stanford University changed from a hierarchy to a team-based organization that has contributed to its success. The Design Division (now called as the Design Group) was part of three divisions in the department of Mechanical Engineering. Each division had a director that was appointed by the chairman of the Mechanical Engineering department. Roth describes that he noticed flaws in this hierarchical organizational structure which manifest as faculty relegating responsibility to the division director, occasional misuse of power by division directors who sometimes put personal interest ahead of division interests, and unilateral decision-making by chairs when division directors were absent. In the mid-1970s, the Design Division which had eight faculty members decided unanimously to restructure the group to operate as a flat organization without a director. This met with initial resistance from the department chair, but the structure was nevertheless established, and it continues to operate to this day.

Roth further describes the working of this flat organization thus—"*Our new structure hinged around an hour-long weekly meeting, open to all Design Division faculty and staff. The meeting had no chair-person; we simply went around the table, taking turns bringing up any issues that required the division's decision, reporting on past happenings, and announcing future events. We operated by consensus and negotiation, almost never voting on anything. There was almost no acrimony, and people treated each other with respect, collegiality, and a spirit of shared purpose and commitment.*" (Roth 2015, pp. 167). In this description, Roth outlines the working of a typical team in a flow organization.

He further mentions the transformation that this structure engendered in motivating each faculty since everyone was in charge and they all wanted to make it work. Thus, intrinsic motivation was activated, as opposed to hierarchically assigned incentives.

Leadership was activated based on this motivation. Roth mentions that those who cared for an issue took leadership in handling it. If there was nobody who cared, that issue was not considered important enough to be handled until someone wanted to have it resolved.

Moreover, organizationally the group had much greater influence in the department than before since all eight faculty members now represented the division's interests with one voice. The division did retain flexibility in its operation, so if a director was required for any specific occasion, they appointed one of the faculty members as "director for a day".

This example shows that there are ways in which a flow organization can be realized, sometimes even within a larger hierarchical organization.

5 Discussion: Organizational Transformation and the Augmented Human

In this chapter so far, we have examined the prevalent form of hierarchical organization including its advantages and disadvantages, and we have suggested an alternative form of a flow organization for the purpose of supporting design thinking teams pursuing innovation outcomes. We have examined the requirements for innovation organization, how the flow form achieves these requirements and have described an example from the design division at Stanford University. In this section, we discuss the underlying factors that need to be considered if an organization is committed to transforming from a hierarchical organization into a flow organization.

An organization by its very implication is a formal structuring of relationships, perception and action to achieve desired objectives. As humans, we have been conditioned to understand organizations through experiencing different organizations such as family, school, university, and clubs throughout our development from childhood to adulthood. To better appreciate the effect of these formational influences, it is helpful to reflect on the analysis of Michel Foucault in his book Discipline and Punish (Foucault 1977). Foucault analyzes the beginnings of the modern prison system and asserts that the carceral system as a form of discipline is not contained within prison walls, but derives from the society beyond those walls. In fact prisons resemble other institutions such as factories, schools, barracks and hospitals because the mechanisms of control, examination and classification are similar across these institutions and the institutions fulfill the same purpose of discipline through socialization and isolation. The transformation from a hierarchical to a flow organization necessitates overcoming this conditioning. This is not just a function of what we change in the structure or the environment of the organization, but also a function of how the individuals within it can be enabled to overcome their individual conditioning to become autonomous and augmented humans. This individual transformation involves the following:

Changing Perception of Power and Control

Current socializing processes appears to emphasize status seeking behaviors. Thus, there are people that could be described as high status and those that could be described as low status. This means that if they are put in organizations, they'll recreate the hierarchical organization without any further stimulus from the environment. This could mean that there are people that are high in social sensitivity, who are not really monitoring the external environment. They are not concerned with people outside their group. Whereas there are other people that could be concerned with people outside their group, and then there are some that are not concerned with

Table 2 A comparison between the rules of a production economy, and the rules of an innovation economy

Rules of the Plantation	Rules of the Rainforest
Excel at your job	Break rules and dream
Be loyal to your team	Open doors and listen
Work with those you can depend on	Trust and be trusted
Seek a competitive edge	Seek fairness, not advantage
Do the job right the first time	Experiment and iterate together
Strive for perfection	Err, fail, and persist
Return favors	Pay it forward

people but with the natural environment or with tools in their environments. Given this natural variation, one of the changes that we can expect to make is to change the relative ratio of presence of the different types of people in a team, its diversity.

Changing Perception-Action in the Ecosystem in Which the Organization Operates

In their book titled—The Rainforest: Secrets to Building the Next Silicon Valley, Hwang and Horowitt (2012) distilled the differences in the behavior of people in the Silicon Valley to a set of norms, which contrasted sharply with norms followed by entrepreneurs, investors, and other supporters elsewhere in the world. While most governments had followed the conventional wisdom of building industrial parks close to universities as a way to spark innovation in a geographical region—Hwang and Horowitt drew attention to the cognitive and affective changes required for the new knowledge economy. In Table 2 we list the differences between the norms in the form of rules: the rules of a production economy, and the rules of an innovation economy.

Flow organizations thrive when the participants perceive their ecosystem to be a rainforest and act accordingly, while hierarchical organizations thrive when participants believe their ecosystem to be a plantation and act according to the rules of the plantation.

These perceptual changes that allow what we could call an augmented human operating system are key to enabling a flow organization to develop. The factors mentioned in Sect. 4.2 such as the shaping environment, the team, intrinsic motivation, regulation, the team-tool system, and leadership are all operating on top of this underlying perceptual configuration that exists at an individual level.

6 Conclusion

We now live and work in a global environment that is more open, connected, complex, and dynamic. These changes have come about in a very short time. They have outpaced our social organization configurations that are now overwhelmed and almost unable to adapt to these changes. In the Hasso-Plattner Design Thinking

Research program, we have been observing these changes, and developing solutions to accelerate the rate of innovation in the new digital economy. The exploration led us to develop a set of requirements to be met by any organization wanting to adopt the idea of a flow organization. Going further, we developed the design of such a system and showed how it met the criteria. In the last section we took our eyes off the form of organization and instead looked at the various changes that individuals will need to make in order to participate in the new economy of the future.

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