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Working Paper

2022/59/STR

(Revised version of 2021/63/STR)

Human-centric Organizing: A Perspective from Evolutionary Psychology

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We argue that evolution has shaped human brains in our ancestral selection environments to prefer modes of organizing ourselves for group activities that are “nearly decentralized”- minimizing differences in the influence each member has on the choice and implementation of designs, yet tolerating some asymmetry to exploit unique strengths and produce convergence in group behavior. We posit that this process of Nearly Decentralized Organizing (NDO) is an attractor in the space of possible design processes, which appeals intuitively even to modern humans; all else being equal, the attractor describes how we would like to organize ourselves. This is an explanation for the disproportionate (relative to economic significance) mindshare occupied by contemporary attempts to organize in a decentralized manner, such as non-hierarchical firms, open-source communities, and decentralized autonomous organizations (DAOs). However, the attractor by itself is by no means a blueprint, as it may be unsuitable to produce designs that meet modern organizational goals. We propose that the central challenge for human-centric organizing is to make decentralized organizing effective for large, complex and diverse groups (rather than fix the problems created by centralized organizing). We discuss the role of algorithmic technologies in this endeavor.

Electronic copy available at: <http://ssrn.com/abstract=3959703>

We acknowledge helpful comments from Julien Clement, Vivianna Fang He, Tianyu He, Ozgecan Kocak, Mike Lee, Nikhil Madan, Jan-William Stoelhorst and Stefan Thau. Members of the Darwin Society provided helpful feedback in a seminar.

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1. Introduction

The evidence is now compelling that evolutionary forces – which we take here to include gene-culture co-evolution (Boyd & Richerson, 1988; Richerson, Boyd, & Henrich, 2010; Jordan et al, 2013) – have endowed humans with several psychological adaptations that facilitate a particular form of organizational life: living and pursuing collaborative projects in groups of kin and non-kin (Buss, 2015; Stoelhorst & Richerson, 2013; Wilson, van Vugt & O’Gorman, 2008). Such psychological adaptations – by which we mean functionally-specialized mental programs to overcome the challenges that ancestral humans faced to their survival (e.g., obtaining food) and reproduction (e.g., mating strategies) -- are near universal and widespread across cultures, though cultural variations modify how these adaptations express themselves in behaviors (Brown, 1991; Christakis, 2019). These adaptations also reveal their evolutionary origins because they appear in at least some rudimentary form in human infants as well as in other primate species (Van Vugt & Kameda, 2013; Tomasello, 2010).

In this essay, we argue that it is essential for organization designers to understand the human psychological adaptations that pertain to living and working in groups for at least three reasons. First, a hallmark of evolved mental adaptations is that they are likely to be intuitive and automatic- requiring little conscious deliberation in responding to contextual cues. This means that the behaviors these psychological adaptations generate very likely feel natural to humans. For example, how we communicate, who we trust and defer to, how much risk and variety we seek are to some extent driven by evolved impulses (Pinker, 2003; Van Vugt & Kameda, 2013). To the extent we care about creating organizations that feel comfortable to their inhabitants, being aware of these adaptations is useful. This is the first sense in which we might aspire to adopt human-centric organizing.¹

¹ The definition of “human centric design” used by the International Standards Organization (ISO) is as follows: “*Human-centred design is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques. This approach enhances effectiveness and efficiency, improves human well-being, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance.*” ISO 9241-210:2019(E). This definition highlights both the importance of human preferences as well as the recognition of human limits in attaining human centricity.

We argue that evolution has shaped human brains in our ancestral selection environments to prefer modes of organizing ourselves for group activities that are “nearly decentralized”- minimizing differences in the influence each member has on the choice and implementation of designs yet tolerating some asymmetry to exploit unique strengths and produce convergence in group behaviour. We posit that this process of Nearly Decentralized Organizing (NDO) appeals intuitively even to modern humans and is one explanation for the disproportionate (relative to economic significance) mindshare occupied by contemporary attempts to organize in a decentralized manner, such as non-hierarchical firms (Lee and Edmondson, 2017), open-source communities (Puranam et al, 2014), and decentralized autonomous organizations (DAOs) (Hsieh et al, 2018).

Second, merely because some behaviours have their origins in evolutionary adaptations do not necessarily make them either useful or desirable today. Nearly decentralized organizing faces formidable and well-known challenges when groups are no longer “small, similar and simple”- i.e., as they grow large, varied in their membership, and feature complex interdependencies. Further, in-group favouritism, groupthink, homophily and a tendency towards gendered division of labour may all have evolutionary origins, but modern management techniques aim to counteract these tendencies. Organizational design processes therefore need not only be “along the grain”, and we might sometimes decide explicitly to go “against the grain”- embrace inconsistencies between our evolved proclivities and contemporary designs, to make organizations effective, inclusive and fair.

Nonetheless, it is useful to know that an organization design that goes against human evolutionary adaptations will likely face resistance and difficulty in evoking desired behaviours. This is a second and different sense in which we might think of organizing being human-centric. An engineer would not design a structure without knowing the properties and limits of the materials that it will be made of- the loads it can easily bear as well as the frictions and strains it cannot (at least without reinforcements). No organization designer should, either.

Third, a renewal of interest in human-centric organizing (specifically, an organization design process that is based on an awareness of evolved human psychology) is urgently necessary, as we confront rapid developments in algorithmic technologies (particularly artificial intelligence) after many

false starts (Hawkins, 2021; Tegmark, 2018). Increasingly, such technologies have the potential to both displace as well as supplement human workers in organizations (Csaszar & Steinberger, 2021; Raisch & Krakowski, 2020; Shrestha et al., 2019). Currently their adoption seems to be agnostic to human preferences, with a focus merely on efficiency gains. We believe the speed of adoption of AI technologies in organizations makes it imperative that we improve our understanding of what human centric organizing would look like to effectively shape the choices surrounding AI adoption, rather than be faced *fait accompli* with its consequences. This is the third sense in which we might aspire to keep organizational designs human centric.

We offer several concrete suggestions on how algorithmic technologies can be used to promote human centric organizing, that sacrifice neither what we value (e.g., fairness and inclusion) nor what we need (e.g., effectiveness). Specifically, we propose that algorithmic technologies should be directed towards making decentralized organizing effective for large, complex and diverse groups, rather than remedying the problems created by centralized organizing. While these may appear to be two equally valid approaches to the application of technology to organizing, we explain why our evolutionary history makes them asymmetric.

We are certainly not the first to argue for the importance of human-centricity in organizing. Historically, this view emphasized the importance of personal growth and self-actualization as objectives for organization design (McGregor, 1960; Argyris, 1973). As writers in this tradition have eloquently argued, an organization whose design takes cognizance of the preferences of its members for particular organization designs, not only improves the motivation and coordination of its members (Schein, 1980), but also can also attract and retain talent more effectively. We strengthen these arguments by elaborating on the evolutionary foundations of universal human preferences for organizing, as well as linking these to the rapid changes to organization designs that digital technologies catalyse (e.g., Adner et al, 2019).

The rest of this essay is organized as follows. We first demonstrate that the groups in which human beings spent a significant amount of their evolutionary history are indeed a form of organization (section 2). Next, we argue that these ancestral organizations were shaped by evolution to feature nearly

decentralized organizing (section 3). The fourth section of this paper makes the case that nearly decentralized organizing in our ancestral environments has implications for modern organizing because it acts as an attractor in the landscape of design processes. It is not however a blueprint, because this mode of organizing may not match modern contingencies. Next, we discuss how algorithmic technologies can be used to correct this mismatch between our evolved proclivities and modern circumstances (section 5). Finally we summarize our conclusions and contributions (section 6).

2. Ancestral human organizations

Group living is understood today as an evolutionary adaptation for humans – a so-called major transition in our evolutionary history – that enhances our survival and reproductive prospects, thus increasing the chances for the propagation of our genes. Group living occurs not only in humans and other primates, but also in insects, and indeed humans and insects have both achieved ecological dominance (Wilson, Van Vugt, & O’Gorman, 2008). In the case of humans, the benefits of cooperative hunting and cooperative breeding have been proposed to be the evolutionary triggers for the major transition to group living with intense forms of collaboration and sharing of resources within groups (Van Schaik, 2016).

It is now widely accepted that humans mostly -- though not exclusively -- lived in groups of highly cooperative hunter-gatherers from about 2.5 million years ago to about 13,000 years ago (until agriculture began to diffuse widely) (Boyd & Richerson, 1988). The reason to distinguish the time periods before and after agriculture is to emphasize the significant changes in social life brought about by the agricultural revolution thereafter. Though there is evidence of some variety in social organization before agriculture as well the timing of the adoption of agriculture itself (see Graeber & Wengrow, 2021), there is consensus today that humans spent a significant period of their evolutionary history in small *hunter-gatherer* societies (Gintis, Van Schaik & Boehm, 2015).² These are a form of group living

² Gene-culture co-evolution occurred after the agricultural revolution as well, but the impact is considered to be modest relative to that of the preceding far longer period of life in hunter-gatherer societies.

in which the primary means of subsistence depends on foraging and hunting of plants and animals without significant recourse to the domestication of either (Kennett & Winterhalder, 2006).

Definitions of what an “organization” is vary somewhat across authors (e.g., Aldrich, 1979; Burton & Obel, 1984; Etzioni, 1964; Scott, 1998; Stinchcombe, 1965; Weick, 1969), but the different conceptualizations have always preserved some common features: they portray an organization as a goal oriented, multi-actor system whose members make contributions towards the system’s goals (Puranam, 2018) – in other words, a system of collective action. By this definition, the social units that ancestral humans lived in for large portions of our evolutionary history are a type of organization.

Social structures do not fossilize, but we have learnt indirectly about those in which our ancestors may have lived by synthesising evidence from studies of current hunter-gatherer societies,³ and recent advances in archaeological, genetic, neurological and psychological research (Buss, 2015). For instance, the current evidence concludes that ancestral hunter-gatherer groups were relatively small and comprised of both kin and non-kin (Apicella et al, 2012; Dunbar, 1998). In fact, all primates today live in groups larger than the immediate family. Analysis of contemporary human hunter-gatherer communities shows a structure (see Figure 1) in which different families (typically with an identifiable head of the family) live together in camps of 20-25 people, with camps occasionally gathering into bands of between 100-150 individuals that might undertake collective projects (Johnson & Earle, 2000). Such a structure has been found across a diversity of cultures and geographies, strongly suggesting its evolutionary roots (Hamilton, Milne, Walker, & Brown, 2007; Hamilton, Walker, & Sandeford, 2020). Other characteristics of group living among hunter-gatherers include the lack of significant stocks of material possessions, routine food sharing, participative decision making and communal child care (Kelly, 2013).

Insert Figure 1 here

³ There are contemporary people who live a hunter-gatherer lifestyle (e.g. the San of Namibia; Hadza of Tanzania, and some aborigines of Australia). It is unlikely that these exactly represent ancestral organizational conditions; however it has been argued that the social organization of these contemporary people is at least informative about ancestral hunter gatherer communities, whilst acknowledging their diversity (von Rueden & van Vugt, 2015).

Viewed from a design stance (Dennett, 1995)- by which we mean seeing the products of an evolutionary process as possessing design even if there no designer- the typical social structure of a hunter-gatherer society has one ultimate goal: to maximize the chances of reproductive success of the genes the individuals within these societies carry given the ecological niche they find themselves in. This goal is not explicit, and none of the members of the group may have had any conscious awareness of this goal. On the other hand, these groups must have had explicitly articulated and flexible proximate goals that were a function of the task environment- such as locating and acquiring food sources (hunting and gathering), warfare with a neighbouring community and migration. There are good reasons to infer that these were typically cooperative, communal activities in which the adult members of the community had to divide subtasks and thereafter combine and integrate their efforts (e.g., hunting large game, cooperative breeding; Van Schaik, 2016). We might therefore think of these groups as *implicit* organizations (Puranam, 2018): the constituent actors are not necessarily aware of the ultimate goal of the organization, that is to propagate the genes of its members. Nonetheless, these were multi-actor, goal-oriented systems- and therefore - organizations. We refer to these social structures in our deep history as ancestral human organizations.

Next, we consider in more detail what the designs of these ancestral organizations may have looked like and how they arose.

3. Nearly decentralized organizing in ancestral organizations

Every organization - by virtue of its existence- has a design, which is the set of specific solutions (see Figure 2) to universal problems of organizing. Puranam, Alexy & Reitzig (2014) break down the well-known problems of division of labor and integration of effort (Mintzberg, 1980; Burton & Obel, 1984) more finely, and show that any existing organization comprising non-omniscient and at least somewhat self-interested actors must have solved (at least to some acceptable degree) these fundamental and interlinked problems.

Insert Figure 2 here

The partitioning of the overall goals of the organization (which are themselves contingent on its environment ⁴) into sub-tasks is *task division* (von Hippel, 1990). The problem of assigning sub-tasks to individuals and groups, possibly on the basis of their specialist expertise is *task allocation*. For aggregating and synthesizing the joint efforts of organizational members, the designer must also consider the problem of *distributing rewards* (both material and otherwise) for individuals, to motivate their actions and direct them towards collectively fulfilling the goals of the organization. Next, there is the problem of creating *information flows* that enable agents to execute and coordinate their actions. Coordinated action requires the flow of information necessary for interacting individuals to be able to accurately anticipate each other's actions (Schelling, 1960) so that organizations must feature opportunities for communication, interaction and knowledge transparency, besides of course relying on standards, procedures and systems for managing information.

Finally, there must be in place mechanisms for resolving problems on an ongoing basis as the need for *exception management* arises – that is, for dealing with failures of information flow, reward distribution, task allocation and task division. This includes the selection of new solutions in response to the inadequacies of the old, as well as *ab initio* design when the organization first comes into existence. Exception management is in this sense distinct from the other four, as it involves the problem of how to find (initial and new) solutions for the other four problems- it encompasses the process of organizing itself.

Puranam et al (2014) pointed out that while these problems are universal, modern organizations can differ in the sets of solutions they employ i.e., in their specific organization designs. For instance, some organizations may reward their members for their contributions primarily through money, whereas others may do so through providing status benefits (e.g., a corner office); some may minimize explicit reliance on authority to increase the autonomy of subordinates, while others rely heavily on authority; some modularize work to reduce the need for coordination, others invest in channels of interaction to increase the effectiveness of coordination. Second, this partition of the problems of organization design underlines the point that collective action in general does not begin and end with

⁴ Evolutionists call these environmental contingencies “niche parameters”- see for instance Jordan et al, 2013.

cooperation (i.e., the alignment of interests); searching (i.e., the discovery of better collective actions) and coordinating (i.e., mutual predictability of actions to produce aligned behaviour) are also important in finding and implementing solutions to the universal problems.

We add the argument that the process of finding solutions to each of these problems -the process of organizing- can vary in the extent to which it is centralized. Centralization indicates inequality in how much individuals can affect the group's behavior (Argote et al., 1989; Bunderson, 2003; Hage & Aiken, 1967). Group members are considered central relative to others when their influence on group decisions is higher than that of their colleagues, thereby potentially disproportionately impacting group choices and performance (Bunderson, 2003). While there are multiple origins of this inequality — e.g., formal authority, informal power, status, expertise — ultimately it is manifested as a difference in the number, direction and strength of ties that individuals have in the network of social influence within a group. If the influence ties are strong enough to produce conformity, then we might say there is also a concentration of decision rights in the hands of the individual who influences others but is not influenced by them. For instance, even if every member in a group has a vote in a decision, but all members fully conform to a central actor in their voting behavior, then this is equivalent to only the central actor having a vote.

Centralized influence in selecting and enforcing solutions to the universal problems of organizing has two potential advantages: first if the central actor is in fact the most knowledgeable, then the group can benefit from their superior expertise in terms of the search for good solutions. Second, centralization even without any differential wisdom of the central actor promotes rapid convergence, which can be beneficial when swiftly coordinating on a solution is important, not only finding the best solution (Kocak, Levinthal & Puranam, 2022). However, centralization also creates a potential challenge for coordination and cooperation, as it can contribute to an uneven distribution of rewards. This is clear in the case of the problem of reward distribution itself- an influential self-interested actor who conducts reward distribution for the group is at greater risk of appropriating a disproportionate share of the group output. The same reasoning applies to the other universal problems as well. Division of labor that is conducted by an influential central actor is at risk of producing task division and allocation that favours that central actor (for instance, by imposing lower costs of effort on themselves).

Even information can be opportunistically hoarded, and exceptions can be resolved in a self-serving way. In sum, the more centralized the process through which decisions about the universal problems of organizing are made, the more feasible it is for the central actors to capture a disproportionate share of the value generated from the consequences of those decisions. In turn, this is likely to motivate competition and perhaps conflict within the group to recapture the surplus value that the central actors have captured relative to others.⁵

The cumulative evidence from evolutionary psychology points strongly towards our ancestral designs being the result of an organizing process that optimized this trade-off between centralized and decentralized organizing in a manner that favoured the latter. Specifically, the organizing processes underlying our ancestral organizations appear to have been nearly, but not entirely decentralized. Choices about task division and task allocation were likely to have been made autonomously through self-selection, or based on lateral communication and consensus, rather than the centralized influence of a coordinator (Henrich & Gil-White, 2001; Van Vugt & Kameda, 2013). Solutions to information provision and reward distribution also appear to have emerged and been enforced in a decentralized manner: motivation arose from the affiliation of each member to the group, rather than as series of principal agent relationships with a single principal (de Waal, 2008; Jordan et al, 2013). Coordination relied heavily on horizontal and dense communication flows, rather than on a central coordinator (Tomasello, 1999; Henrich & Gil-White, 2001; Henrich, 2004). Some have described the resulting organization as a “super-organism” – in which members of a group made their self-interest subservient to that of the group in certain circumstances (i.e., altruism), allowing the group to act as an integrated entity (Wilson & Wilson, 2008; also see Kesebir, 2012).

Nonetheless, differences in individual expertise were recognized and weighted; (Van Vugt & Kameda, 2013; Henrich & Gil-White, 2001). For managing exceptions- both in terms of initiating a

⁵ It is also possible that an unequal distribution of rewards arises from a decentralized process of solving the universal problems of organizing. For instance, groups may reach a consensus (or everyone may autonomously reach the same conclusion) that certain individuals deserve a greater share of the value the group creates- a greater share of rewards, more favorable task allocations or terms when exceptions arise. However, this is less likely to cause conflict within the group, as the inequality was not imposed by one or a few, but rather is the consequence of the will of the many.

design and resolving conflicts arising from imperfect existing solutions, the evidence shows that ancestral organizations relied mostly on decentralized peer-to-peer mechanisms. But the role of centralized influence, though modest, was not absent (Boehm, 1999; Chudek & Henrich, 2011). The role of an authority figure who impartially resolves disputes among subordinates can be found not only in human groups, but also in macaques and chimpanzees, indicating its possible evolutionary origin (Flack, Girvan, de Waal, & Krakauer, 2006; von Rohr, Koski, Burkart, et al., 2012). Authority figures and leaders serve not only to control incentive conflicts and free riding, but also help to produce convergence among otherwise cooperatively motivated actors. Leaders who direct followers- quite literally in terms of choosing direction of travel- are found not only among primates but also in elephants, zebras and hyena's (Fischhoff et al, 2007; van Vugt, 2006; Li, van Vugt & Colarelli, 2018).

Further, in times of urgency and crisis, when search, coordination and cooperation can all become challenging, a degree of centralization in exception management was accepted, and mechanisms also existed to keep its adverse consequences – for instance, exploitative behavior by leaders- in check (Van Vugt, Hogan & Kaiser, 2008). For instance, hunter gatherer societies often accord legitimacy to leaders based on prestige (accorded to those who contribute to group welfare) rather than dominance (Price & Van Vugt, 2014; Van Vugt & Kameda, 2013). Ethnographic observation of hunter-gatherer societies has found that the exercise of authority is domain-specific and temporary—for instance, competent hunt or war leaders may have no special say in areas outside their domain of expertise (e.g., in internal dispute resolution or food distribution). Further, members of hunter-gatherer societies are often depicted as having a strong aversion to dominance – no individual can tell another person what to do- and a strong preference for participative decision making. Note that this does not preclude asymmetric influence by prestigious leaders- everybody has a voice but not all voices may be equally loud (von Rueden & van Vugt, 2015). They are also likely to utilize a set of “levelling mechanisms” such as coalition building among subordinates, gossiping about and mocking the leaders to “keep them in their place”, turn-taking and forms of temporal limits that reduce power differentials. In the limit, if subordinates can simply exit and pursue outside options, the power of

superiors is also kept in check. This can effectively produce what is known as a reverse-dominance hierarchy (Boehm, 1999)- in which the weak collectively subjugate or at least keep in check the strong.

We refer to this mode of organizing as Nearly Decentralized Organizing (NDO). It involves decentralization as a default, with some centralization in restricted scope and/or temporarily accepted as an expedient. To be clear, there is not necessarily one ancestral design- foragers likely used different approaches to divide labor, integrate effort and manage exceptions. Rather, the uniformity is in the idea that these varying sets of solutions- designs- emerge and are enforced commonly through a nearly decentralized organizing process.

Evolutionary psychology also offers a theoretical explanation for why NDO may have been selected for, based on multi-level selection operating in ancestral environments that had particular features. The central tenet of multi-level selection theory is that individuals not only compete with other individuals for resources, but groups also compete with groups (Wilson and Wilson, 2008). Therefore inter-group selection can produce genetic and/or cultural adaptations that promote within-group cooperation, without suppressing within group competition entirely (Henrich, 2004; Johnson, Price & van Vugt, 2013; Sober & Wilson, 2005; Wilson & Wilson, 2008). Multi-level selection gives advantages to groups that can enhance cooperation within groups in order to compete more effectively with other groups. Specifically, in-group competition is suppressed by minimizing differences in influence on how the groups organized themselves. At the same time, group cohesion and viability requires asymmetry in influence for convergent action and the exploitation of differential expertise or strengths. This creates a trade-off between the costs and benefits of centralization.

Given the task environment our ancestors faced (in terms of resource availability and risks and opportunities), organizing processes that emerged to confer advantages for groups competing against groups was likely to have optimized this trade-off (Gowdy, 1999). There are three reasons to believe that NDO may have been that solution. First, resources gathered by foragers in our ancestral environment were spatially distributed rather than locally clustered. This allowed for largely autonomous choices in terms of task division and allocation, not requiring extensive coordination through centralized influence. This may have pushed the optimal process of organizing towards

decentralization, by lowering the benefits of centralization. Second, the resources were highly variable – with the risk of some members obtaining nothing being ever present. This made inequality in resource distribution a significant danger to group cohesion. This also pushed towards decentralization, by increasing its benefits. Third, the resources were mostly of the “immediate return” type, producing few opportunities for hoarding by the few individuals who occasionally found themselves to be favored with disproportionate influence on the group’s design. Some degree of centralization could therefore be compatible with low conflict, since permanent inequalities were unlikely. This pushed towards a degree of centralization, by lowering its costs.

This combination of circumstances, we believe, favoured a nearly but not perfectly decentralized organizing process -one in which for most issues, most group members had comparable influence on the choice and implementation of solutions to the universal problems of organizing, with a tolerance for exceptions where superior expertise or the capacity to create convergence within the group allowed for some individuals to have greater influence than others, in a manner that benefits the group (and with safeguards against this asymmetry becoming exploitative).

In the next section, we derive implications of this property of ancestral organizing for how contemporary organizations work and their designs.

4. Nearly decentralized organizing as an attractor in the space of organizing processes

We argue that the ancestral mode of nearly decentralized organizing (NDO) casts a significant shadow on modern organizing, via the evolved abilities and preferences of human beings for organizing themselves in this way. In evolutionary accounts of human psychology and behavior, the ultimate goal is always to increase the chances of reproduction and the forces of evolution do not necessarily “care” about human well-being or satisfaction per se; any effects along these dimensions, and indeed group living itself, are all adjunct to the successful propagation of genes. However, to the extent that particular social structures enhance the chances of successful reproduction of the genes of its members, they are likely to be supported by adaptations that are carried forward genetically (Johnson, Price & Van Vugt, 2013). An extensive literature in evolutionary psychology documents psychological adaptations -

functionally specialized mental programs manifested as individual abilities and preferences- that support the nearly decentralized mode of organizing in ancestral human organization (Johnson, Price & Van Vugt, 2013). These range from the abilities of humans to do means-end decomposition, recognize expertise, engage in shared intentionality and symbolic communication, as well as preferences for fairness, in-group altruism, and egalitarian decision making (Jordan et al, 2013). A detailed discussion of each of these adaptations is beyond the scope of this paper, but they are summarized in Table 1.

Insert Table 1 here

Since these adaptations support the mode of NDO that may have been widely prevalent in hunter-gatherer societies, we propose that this mode can be thought of as an “attractor” in the space of organizing processes (which could potentially include more centralized as well as more decentralized versions). In any search or optimization process (of which organizing is an instance), there are points on the fitness landscape that exert an attractive force through a combination of the gradients on the surface and the rules that guide movement on the landscape, such as gradient descent (Kauffman, 1993; Levinthal, 1997). These act as attractors, such that the searching or optimizing agents are very likely to be drawn to them once they are in their neighbourhood. We believe the NDO is an attractor in this sense because it is a mode of organizing which contemporary humans find themselves drawn to and perhaps see as “natural”. This is because of our evolutionary heritage, as instantiated in the abilities and preferences summarized in Table 1, that form our suite of adaptations for group living. In a nutshell, we propose that there is an evolutionary basis for a human preference for NDO (also see the concept of *self-design* in Weick, 1979).

To illustrate the power of the attractor and how it might operate, consider that modern hierarchies of authority in corporations exemplify centralization, as the apex actors can affect a group’s behavior more than others. This is at odds with our evolved psychology which supports NDO, in which the role of centralized influence is minimal. Evolution has shaped us for life in at most 2-level (i.e., leaders and followers), prestige-based, modestly centralized structures with little or no inequality in material wealth and possessions between leaders and followers. Yet we find ourselves living today in multi-level dominance hierarchies with decision rights at most loaned (i.e., delegated) to those at the

bottom (always subject to being overruled through managerial fiat) and with significant pay dispersions. This is possibly the root cause for our ambivalent relationship with hierarchies of authority (van Vugt, Hogan & Kaiser, 2008).

The striking similarities between the NDO attractor and how contemporary self-consciously non-hierarchical firms organize are worth enumerating. In non-hierarchical as well as in ancestral organizations, as Table 2 shows, authority is exercised with a relatively light touch.

Insert Table 2 here

Critically, it plays a very limited role in solving the basic problems of division of labor and integration of effort. Instead, decentralized approaches such as self-selection (in non-hierarchical forms) and social norms (in ancestral organizations) seem far more important in deciding who does what, how and why. ⁶ Common to both, authority appears to be restricted primarily to a dispute resolution/consensus building role. Further, this authority is conferred from below, on the basis of expertise and prestige, rather than delegated from above on the basis of legality, and it tends to be domain specific. In contrast, in the modern organizational hierarchy, the solution to all the fundamental problems of organizing, namely, how to divide tasks, allocate them, motivate individuals, coordinate them and manage exceptions relies on centralized solutions based on formal authority.

However, we would not automatically recommend NDO as a normative blueprint for modern organizations, as that would be a version of the naturalistic fallacy: the ancestral approach to design may be neither effective nor ethical in a modern context, even if it is “natural”. Evolutionary psychologists refer to this as the problem of mismatch- what may have been adaptive in ancestral environments may be maladaptive today (Li, Van Vugt & Colarelli, 2017). Instead, we advocate recognizing that since humans inevitably bring their adaptations derived from their ancestral past into the modern social groups – organizations- they belong to and work in, it is useful for organization designers to know how these may interact with the designs they are attempting to implement. The last column in Table 1 outlines some of the challenges created in modern organizations by our inherited

⁶ This difference may be a function of the nature of membership- by hiring, for finite tenure in the former vs. by birth and lifelong membership in the latter.

adaptations. As we have noted, this awareness of the evolutionary heritage in terms of organizing may be useful either to design today “along the grain”- leverage what comes naturally (e.g., in-group cooperation), or “against the grain”- suppress what comes naturally but is not desirable (e.g., gendered division of labor). Put simply, designers may choose to reinforce or weaken the pull of the attractor, but they must know it exists and how it operates.

To decide when to do what, let us consider why modern hierarchies of authority look the way they do (and do not continue to look like ancestral organizations). The basic mechanism that generates the multi-layered branching authority structure of modern hierarchies involves limits on the maximum span of authoritative control (Gittell, 2001; Mintzberg, 1979; Colombo & Delmastro, 2007). If a manager can effectively organize and supervise only a certain number of subordinates, it follows that as the organization scales in size, more layers of management will become necessary. The two corollaries to this are that a) as the capacity of individuals to supervise individuals decreases or b) as the ability of subordinates to manage themselves in a decentralized manner without the need for authoritative intervention decreases, the need for multi-layered authority hierarchical structures to manage an identical number of individuals will necessarily increase (Puranam, 2018, Chapter 6; Lee & Puranam, 2022).

As a consequence, if the nature of production activity becomes more complex because of finer task decomposition to exploit economies of scale, it is likely that individuals become more interdependent and conflict-prone, and the increased scale of production requires that many of these individuals will be relative strangers to each other. Therefore, the effective span of control must decline, and authority structures must become multi-layered. This appears to have been the broad trend when we compare the production functions of hunting and gathering, to those in agriculture and industrialization – there has been an increase in both the complexity of production and the scale (e.g., Smith, 1776; Stigler, 1951; also see Rubin, 2003).⁷ This may have created significant increase in the

⁷ The demand for production output may itself increase with output; therefore, production complexity can increase because of, as well as cause an increase in population. A corollary is that if birth rates had outpaced feedable scale by a large extent, famine and extinction would have resulted. It is because the gap has so far always been filled by technological innovation (e.g., ploughs, wheels, irrigation systems)

number and layers of hierarchical control in agricultural and industrial societies relative to that in ancestral organizations.

An implication is that the “soft touch” authority in NDO (both in ancestral organizations as well as modern non-hierarchical organizations) should be most effective in coordinating *small* groups (Weber & Camerer, 2003; Gavrillets, Auerbach, & Van Vugt, 2016), or internally *similar* groups (because norms are easier to establish and enforce within them) or groups with relatively *simple* (i.e. low interdependence between actors) technologies of production (which produce fewer potential conflicts). Large but homogenous and simple groups may manage fine with NDO, just as heterogenous but small and simple groups might as well. But when groups are neither “small, simple nor similar”, centralized organizing in the form of a (multi-level) authority structure may become unavoidable to maintain group level integration. The widespread prevalence today of multi-layered authority hierarchy can be seen as a consequence of groups increasing in size, heterogeneity of composition and complexity of the technologies of production they employ, as we have gone from hunter-gatherer societies to agricultural and industrialized societies. But our evolved psychology has not had sufficient time to make the necessary adjustment through gene-culture co-evolution. This produces the mismatch between what we want and are good at and what we need to do now.

That we are able to recognize this mismatch as a species is already grounds for optimism- since it gives us the choice to do something about it. Specifically, we construe the broad design challenge as being that of preserving decentralized modes of organizing since these match the evolved abilities and preferences of humans, without bearing the costs associated with decentralization (such as the inability to leverage superior expertise, or failure to reach convergence, or diminished accountability in multi-layered structures), even when organizations are not small, simple or composed of similar members. **Put differently, the goal for human-centric organizing might be to make decentralized organizing effective for large, complex and diverse groups.**

that we live to tell the tale. But our point is that the widely told story of relentless technological progress is one told by survivors.

We note that this is not symmetric to the goal of making centralized organizing less prone to producing power differentials and inequality (for instance through better checks and balances), precisely because our evolved abilities and preferences favor decentralized rather than centralized organizing. Even if one could ensure that centralized organizing does not degenerate into exploitative power differentials (a tall order by itself), we believe our evolved sensibilities will still leave us uncomfortable with highly centralized organizing, producing losses in motivation and coordination. Therefore, we believe that attempts at human centric organizing should produce more satisfying results when addressing the limits of decentralization, rather than those of centralization. This is a testable proposition.

We elaborate on the implications of this approach for contemporary organization design in the next section.

5. The role of algorithmic technologies in enabling human-centric organizing

Technology is often cast in opposition to human-centric values and forms of organizing. The fourth industrial revolution with its developments in algorithmic technologies is no different, with legitimate concerns about automation leading to job losses and the dehumanizing of work. However we believe this need not be the only possibility. We highlight how machine intelligence- in particular machine learning algorithms that can help solve problems through data mining and pattern recognition (see Shrestha et al, 2020 for an accessible introduction to these algorithms, and Csaszar & Steinberger, 2021 on their relationships to organizations and organization science)- can be useful in the efforts to increase human centric organizing. We discuss two broad approaches to the use of algorithmic technologies to promote human-centric organizing despite the potential mismatch between NDO and modern conditions.

Correcting the limitations of decentralized organizing

Consider the adaptations we rely on for decentralized division of labor- specifically expertise recognition, in order to allocate tasks to those who are best at them (possibly ourselves). We know that the cues we use to infer expertise are often fallible. Human groups are known to impute higher status to members on the basis of cues such as gender, race, educational background, facial features and

attractiveness and physical characteristics such as height, size, and physical strength (Blaker & Van Vugt 2014), not to mention behaviors such as speaking first, responding quickly, speaking in a confident tone, choosing to physically occupy the position at the head of the table, being verbally fluent, and expansive body language (Anderson et al. 2012). National cultures moderate these effects – for instance in shaping which specific cues are relevant (e.g., age and tenure in organizations in Asia, Zhang & Bond, 1998). It is quite unlikely that any of these cues are task relevant, in most modern circumstances, whatever their merits as the bases for expertise recognition in ancestral human organizations. This is an instance of mismatch between our evolved proclivities and what is adaptive today.

Managerial interventions that can recognize and rein in the processes that incorrectly impute competence, can offer improvements over how groups would spontaneously conduct themselves. This would instantiate a centralized approach- ultimately a few powerful individuals act to correct the errors. However, an alternative decentralized approach could take inspiration from studying how machine learning algorithms are used to form ensembles – in which individual algorithms cast weighted votes to make a prediction (Anderson, 2019, Brown, 2010). The weights are determined to optimize group accuracy, based on past individual decision quality (for instance, successful predictions or forecasts). One might use such algorithms at the aggregation stage, to weight human decision maker’s views, perhaps more effectively than the weighting algorithms that natural selection has endowed us with (i.e., for assigning status and prestige in order to assign greater weights to some voices). This is in principle feasible when decisions of a similar type are repeated, which allows data on past successes to become the basis for weighting future decisions (for instance, see Brown 2010 on ensemble learning and Reeve & Brown, 2018 on negative correlation learning). In some estimation tasks, weights on expertise can be derived even in a single iteration of the task, because expertise is correlated with the accuracy with which a group member can forecast the forecasts of other members (Palley & Satopaa, 2022). Crucially, these algorithmic interventions can be set up to support decentralized human decision making about organizing, rather than centralize the decisions in the hands of a single powerful individual (or algorithm).

Another domain in which mismatch has powerful consequences is in how we gather information and build understanding. Specifically, our evolved information gathering adaptations are under stress from technologies like social media. We know of at least two broad mechanisms that produce this stress. First, when who we are connected to becomes strongly correlated with similarity of our views (because of adaptations that produce ingroup homophily and parochialism), the possibility of becoming exposed to divergent views declines, perhaps catastrophically- and echo chambers are created. Second, quorum sensing – which is an adaptation that leads us to do what our local majority is doing- is misleading if the correlation between accuracy and popularity of information is broken. Social media technologies allow ideas to become widespread and permanent with no transmission losses despite the invalidity of these ideas, whereas face-to-face human communication tends to cause information to decay from collective memories in inverse proportion to its accuracy (Hawkins, 2021). A bonanza of lasting bad ideas is the result. Changing technologies of communication in organizations and society at large to re-establish the correlation between popularity and accuracy of ideas – whether about the efficacy of vaccines, climate change, or the legitimacy of elections- is therefore an important agenda item for the development of algorithms to aid human-centric organizing.

Other algorithmic technologies that can correct the weaknesses of decentralized organizing because of their mismatch to contemporary conditions include technologies for reaching agreement rapidly among a large number of peers with minimal conflict, and to support self-design and self-management by a group (Malone, 2018).

Reducing the need for centralized organizing

An alternative and indirect approach to human-centric organizing is to change organizations and their contexts in a manner that makes centralized organizing less necessary. Technological innovation in our post-industrialized world can also reverse the pressures towards centralized organizing. Automation can produce smaller human groups if some humans are replaced by non-human agents and others must collaborate with machines as colleagues and supervisors (making groups *smaller*). Smaller groups need less centralized organizing than larger groups. Modularization of work, through embedding parts of it within algorithms can lower the interdependence between human agents

and therefore potential conflicts among peers, making centralized dispute resolution less necessary (making groups *simpler*). This is how “version control” and “continuous integration” distributed software development projects work (Choudhury et al, 2020). It is also potentially how blockchain technologies could work (at least in theory) to create distributed autonomous organizations (DAO’s) in contexts that currently feature complex analogue interactions among people (Hsieh et al, 2018).

Algorithms can be used to compose groups based on similarity of values (while preserving demographic diversity), which could allow groups to resolve disagreements in a peer-to-peer fashion without the need for escalating to a source of authority (i.e., increasing *similarity* within groups). Compatible grouping of employees can create effective norms for lateral dispute resolution, which are critical for self-management (Ostrom, 1990). Finally, machine intelligence as an aid to managers can help expand the span of managerial control. For instance, a manager assisted by algorithmic assistants for scheduling, evaluation and selection, should be able to manage a larger number of subordinates and enjoy a larger effective span of control.

Each of these forces can make it possible to not only flatten but also decentralize multi-layered hierarchies (Lee & Puranam, 2022), without having to give up on their effectiveness. A major frontier for human centric organizing is therefore the use of artificial intelligence technologies to design organizations that may rely less on centralization than their predecessors, yet compromising on neither what we value (e.g., equity and inclusiveness) nor what we need (e.g., effectiveness and efficiency).

6. Discussion & Conclusion

We have suggested that understanding our evolutionary adaptations for organizing may help us make progress towards human centric organizing. To be sure, we are not the first to attempt building a bridge between evolutionary psychology and modern organizations (e.g. Stoelhorst & Richerson, 2013; Van Vugt, 2017; Wilson, Ostrom & Cox 2013). However, we make three unique contributions.

First, we summarize the results in evolutionary psychology pertaining to the social structure of hunter-gatherer societies- our ancestral organizations- in terms of nearly decentralized organizing (NDO) - which evolution appears to have adapted us to. This involves the selection and enforcement of

organization design solutions in a decentralized manner as the default, with an acceptance of centralization when expedient for limited duration and scope. The organization designs that arise from NDO can be best described as egalitarian because they minimize differences among group members. Choices about task division and task allocation were made autonomously through self-selection or based on lateral communication and consensus rather than on centralized influence. Decisions about exception management are likely to have been consensual as well. Distribution of outcomes and status-based rewards were geared towards producing low disparity in rank and rewards.

NDO can be seen as a result of multi-level selection forces acting in ancestral environments that had particular features that made it viable, such as the distribution, variability and immediacy of resources. Multi-level selection does not eliminate competition within groups completely, merely suppresses them. NDO is therefore not a result of each individual necessarily preferring egalitarianism per se, but rather the result of striving among many to gain ascendancy over the rest, and the successful decentralized attempts by the rest to curtail the power of the few (Boehm, 1999).

Our emphasis on universal evolved features of humans is not to deny the large variations that can exist across cultures in preferences for organizing, but we do not believe that all possible organization designs are feasible for Homo Sapiens. As the biologist EO Wilson famously remarked, communism as a form of organizing large-scale societies was a great idea but for the wrong species- it might have worked better with ants. Similarly, there are designs that are so far from our evolved proclivities- whatever their merits if implemented with a group of preference-free robots- that they are simply bound to fail in human organizations. But this also implies that there must be others that are more likely to succeed, and we aim to uncover them. Our stance is based on the recognition that culture itself is the joint product of the evolved features of human minds and the environments they encounter (Boyd & Richerson, 1988). Prioritizing cultural compatibility of designs is equivalent to enshrining and perpetuating the impact of the properties of the task environments of the past, and we see no compelling moral reasons to do so (whatever the benefits may be in terms of expediency). Put differently, culture is learned and potentially can be unlearned; the biological hardwiring of our minds cannot as easily be changed. We therefore believe the latter offers a more robust set of design criteria. Further, when the

criteria for human centricity are expressed in terms of preferences that can be associated closely with a particular cultural context, their global applicability and legitimacy come into question (e.g., is the desire for autonomy universal or a Western cultural value?). We avoid this problem if we can rely on universal human preferences as design criteria, which strongly indicate that the desire to avoid dominance arising from centralization is universal.

Second, we propose that NDO is an attractor in the space of organization design processes and the associated preferences humans have over this space, but it is not necessarily a blueprint. As we have taken pains to highlight, human-centric organizing does not necessarily mean either pandering to human preference and tendencies nor overruling them. Rather it calls for organization design that begin with a robust understanding of those preferences and tendencies, and so an informed choice about whether to design along or against the grain. We have argued that NDO may be inappropriate for modern organizations in at least two ways: it may simply fail to produce organizations that accomplish their goals, because of the scale, complexity and heterogeneity of modern organizations, or else it may produce design solutions that violate contemporary values (e.g., a suppression of diversity, gender based stereotyping, outgroup hostility).

This line of reasoning has important testable implications for organization science and practice. For instance, given that nearly all organizations of significant scale today rely on centralized organizing, we should expect that their employees should on average express preferences for greater levels of decentralization than what currently prevails. Further, since people make trade-offs when satisfying their preferences, we should expect that the closer an organization is to NDO principles, the lower the material compensation that employees will be willing to receive, all else being equal. There is also likely to be both individual and cultural variation in the preference for decentralization (i.e., how close to perfect decentralization does “nearly” mean?) that should be directly traceable to circumstances that signal the benefits of centralization- such as disorder, urgency, or large differences in expertise, but also to the availability of mechanisms that prevent centralization in design translating into differences in power and outcomes (i.e. the availability of levelling mechanisms). Finally, since NDO is best suited

to particular task environments (for instance those in which resources are distributed, variable and of the immediate return variety), its adoption is most likely to be effective in contexts with these properties.

Finally, we have indicated the possible ways in which algorithmic technologies may be useful for designers to practice human-centric organizing. We propose that an important form this will take is to allow for broader usage of NDO by compensating for its weakness. Put simply, the agenda is to build algorithms that can allow humans to adopt NDO in organizations that may be neither “small, simple or similar”- without sacrificing either organizational effectiveness or ethicality. These algorithms should allow for effective division of labor, integration of effort and exception handling in a *decentralized* manner even in large, complex and heterogeneous organizations, while safeguarding against side effects such as parochialism, echo chambers the suppression of diversity and polarization. The design constraint of decentralization is crucial here; the temptation will be to produce technological solutions that are driven by the gains in economies of scale created by centralization. However, algorithmic technologies that solve the problems of organizing and impose those solutions on humans violate entirely the spirit of NDO. Rather what we need is technologies that allow humans to organize themselves in a nearly decentralized manner. Overcoming human distrust of algorithms, or in fact heightening it where necessary will therefore both be important to this project ((Dietvorst et al., 2015; Glikson & Woolley, 2020).

To be clear, there is no shortage of scenarios in which algorithmic interventions in organizations can perpetuate biases, curtail human autonomy and strengthen the control of the powerless by the powerful. However, we have chosen to focus on how algorithms can be used to improve our organization designs- including in terms of how comfortable humans are in them- by a better understanding the nature of the attractor in the landscape of organizing processes that evolution appears to have fashioned us for.

Conclusion

In sum, the ability to organize may be humanity’s oldest General-Purpose Technology (Rosenberg 1982) and yet it remains one of the least understood or reliable; failure rates for new

ventures and re-organizations both remain extremely high. We believe a path towards improving this most fundamental of technologies may lie in human-centric organizing- which involves paying close attention to the psychological adaptations for coordination and cooperation that humans are endowed with for organizing their activities in groups as well as their possible evolutionary roots.

THE SOCIAL STRUCTURE OF HUNTER GATHERERS

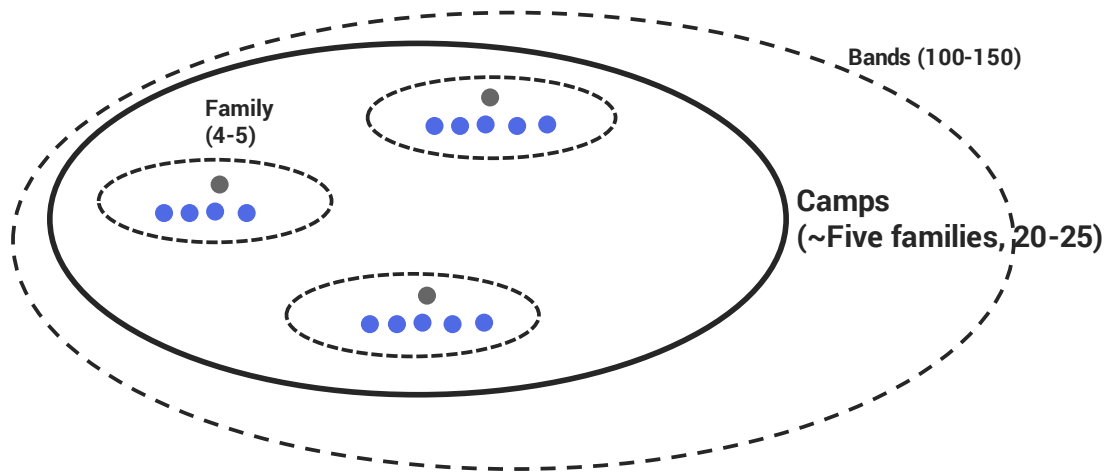


Figure 1: Contemporary hunter gatherer's live in nested groups (based on Hamilton et al, 2017)

The Universal Problems of Organizing



Figure 2: The Universal Problems of Organizing (from Puranam, 2018)

Universal problems of Organizing	Instances of Evolutionary adaptations (i.e., individual abilities and preferences) that support Nearly Decentralized Organizing	Implications for contemporary organization designs
<i>Task division</i>	<ul style="list-style-type: none"> • Decentralized task division based on means-end decomposition <p>(e.g., Henrich and Gil-White, 2001; Van Vugt & Kameda, 2013).</p>	There may be a motivational gain from allowing decentralized task division, but the heuristics used may be inappropriate (e.g. excessive reliance on object based division of labor).
<i>Task allocation</i>	<ul style="list-style-type: none"> • Decentralized task allocation based on expertise recognition <p>(e.g., Henrich and Gil-White, 2001; Van Vugt & Kameda, 2013).</p>	There may be a motivational gain from allowing decentralized task allocation, but the heuristics used may be inappropriate (e.g. inaccurate cues to infer expertise).
<i>Reward provision</i>	<ul style="list-style-type: none"> • Reciprocity • Fairness preferences • In-group altruism • Shared intentionality <p>(e.g., de Waal, 2008; Jordan et al, 2013; Wilson & Wilson, 2008; Kesebir, 2012))</p>	Practices that enhance group identification (e.g., opportunities for interaction, common objectives, shared external threat) can trigger in-group altruism and can lower costs of centralized monitoring and compensation; but may also result in parochialism and inter-group conflict.
<i>Information provision</i>	<ul style="list-style-type: none"> • Symbolic communication • Joint attention • Quorum sensing • Learning, teaching, imitation <p>(e.g., Tomasello, 1999; Henrich and Gil-White, 2001; Henrich, 2004)</p>	Allowing decentralized information flows can economize on the capacity for centralized information processing, but inter-group communication can be challenging because of differences in conventions for symbolic communication; preferences for face to face, synchronous communication makes distributed working challenging; quorum sensing is misleading if the correlation between accuracy and popularity of information is broken (e.g., on social media)
<i>Exception management</i>	<ul style="list-style-type: none"> • “Norm psychology” that promotes conformity and harmony within the group • Deference to legitimate (prestige-based) authority; dislike of dominance • Participative decision making <p>(e.g., Boehm, 1999; Henrich and Gil-White, 2001; Van Vugt, Hogan & Kaiser, 2008; Van Vugt, 2017)</p>	Nearly decentralized solutions to exception handling can produce motivational gains, but there are risks of pursuit of status and prestige by individuals at the expense of the group. Conformity can become a problem when search is more important than coordination

Table 1: The impact of evolutionary adaptations on modern organization designs

	Modern “hierarchical” firm	Modern “Boss-less” firm	“Ancestral” Organization
<i>Task division</i>	By managers with the formal authority to set priorities	By employees deciding which tasks are important	Menu of tasks is stable.
<i>Task allocation</i>	By managers with the formal authority to make staffing decision	Self-selection by employees based on personal taste	Self-selection by members based on social norms
<i>Reward provision</i>	Salaries, bonuses promotions determined by managers; Emphasis on extrinsic incentives and monitoring	Compensation decisions based on peer evaluations. Emphasis on both Intrinsic and Extrinsic motivators	Compensation decisions based on peer evaluations. Emphasis on both Intrinsic and Extrinsic motivators
<i>Information provision</i>	Formal communication channels controlled by managers	Lateral & informal communication channels	Lateral & informal communication channels
<i>Enforcing solutions and Exception management</i>	Managers do so based on formal authority	Employees do so based on peer-to-peer agreement and informal authority based on expertise, contributions, founding	Members do so based on peer-to-peer agreement and informal authority based on expertise, status.

Table 2: Comparing forms of organizing

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