PRAGMATISM, MORPHOGENESIS AND INDUSTRIAL SUSTAINABILITY

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ABSTRACT

Population increase and climate change projections out to 2050 and beyond will constrain the way we live in the world. Materials will be scarce; most people will be living in urban centres that are hot, congested and polluted; extreme weather events threaten to disrupt global business operations. Consuming in a similar way as we do today will put unprecedented pressure on the biosphere and it is unlikely that the planet can support this level of exploitation.

Manufacturing is a key activity that provides 14% worldwide employment and contributes 16% to global GDP. Future projections relating to the state of the planet threaten to undermine these activities on national and global scales as resources become scarce and society is required to emit very few GHGs. Manufacturers need to find new ways to make old things and make old things in new ways.

Margaret Archer's morphogenetic approach describes how reflexive agents transform the social and cultural systems they find themselves in, explicitly modelling the power relationships that constrain or enable action. Pragmatism allows us to critically posit a plurality of solutions towards a socially desirable future without having to worry about a singularly correct solution. It is brought to life by the individual through democratic discussion and creative action. While this speaks to agency the pragmatic discourse often explicitly neglects discussions of power. By bringing aspects of these two philosophies together in a pragmatic manner, I argue, we are able to design interventions that show promise in meeting the key challenges of our times.

Keywords: morphogenesis, pragmatism, sustainability, power

INTRODUCTION

The world to 2050 and beyond is projected to be radically constrained compared to that today. Population growth to 9 billion people, with 3-4 billion shifting from a subsistence to a middle-class lifestyle, will place unprecedented pressures on the natural and manufactured world. Coupled with climate change it is likely that most people will be living in hot, polluted, congested cities; there will be competition for land and resources to support humanities' basic needs; and manufacturing supply chains, including those for food and consumer products, will be disrupted by extreme weather events, commodity prices and protectionism (OECD, 2012).

Although the inter-related impacts of climate change and population growth have not been precisely defined it is likely that they will be consequential and affect the way humanity lives and consumes in the future. It is likely that activities will be limited in the resources that they can use and the greenhouse gases they can emit. This has significant consequences for all industrial activities and necessitates that we conceive of new ways to make things: we need to ask what, how and where can we manufacture goods and whether we should in the first place.

The task ahead of us is enormous. We need to decarbonise our industrial systems by 80% and use far fewer virgin resources while ensuring that the standard of living for all of humanity is improved. Although technology deployment and development has a significant role to play this situation will not be fixed by technological optimism alone; we will need to reassesses our relationship with ourselves and the natural world as individuals and as society; and creatively and democratically develop a new way to consider growth and the limits of consumption (Jackson, 2009).

In this paper I use Margaret Archers' morphogenetic approach to describe how new systems emerge. I explore this in relation to the idea of "closed-loop manufacturing", a contemporary production concept appropriated from the study of ecosystems and used, in part, to address sustainability issues. Morphogenesis has little to say about how we should live in the world. I believe that ideas from philosophical pragmatism can be fruitfully integrated into Archers' approach in a way that radically normative perspectives can be entertained.

Both approaches share interesting similarities as a legacy of their ultimate grounding in evolutionary theory (Buckley, 1967; Archer, 1995; Menand, 2002). Both recognise systems as open, irreducible relational entities and understand that systems are transformed through the actions of reflexive agents. Both are critical and emancipatory, but differ in their understanding of critical transformation. Pragmatism is normative, charging reflexive agents with a duty to work towards social solidarity through democratic discussion (Rorty, 1989), but says little about the ability of agents to address power in society as part of change; the morphogenetic approach is descriptive and shows how the differential powers exerted by social actors are transformed as agents pursue their individual projects (Archer, 2012), but says nothing about the direction in which transformation should occur.

THE MORPHOGENETIC APPROACH

Informed by the development of educational systems in Europe Archer (1984) describes systems as a distribution of social (organisational, regulatory) and cultural structures (ideologies, norms, practices), that are endowed as "vested interests" to particular sections of society (Archer, 1995, 203). Individuals, in the pursuit of their individual projects, are presented with these structures, manifest as constraints or enablements, that condition action. Through reflexive deliberation agents chose particular courses of action

based on these constraints and the action results in the reproduction or transformation of the system (figure 1).

Individual agency is the generative mechanism by which the future unfolds, but social and cultural structures are also understood to be causal. This, however, is contingent as their causal power is effected only through agents' choosing to act and is silent otherwise. Although ontologically holistic, structures are seen analytically as existing prior to action by agents. Mediation by agents results in the reproduction or the elaboration of new structures that are considered to exist temporary after the action. Time is thus an explicit and necessary component of these systems.

Actions that preserve existing systems and *reproduce* the social and cultural structures inherited from the past result in *morphostasis*. This is contrasted to *morphogenesis*, where prior structures are *elaborated*, built upon and changed in particular ways. Elaborated structures result in a new distribution of vested interests. New systems thus emerge from the inter-dependent change in the relationship within and between social structures, cultural systems and agents, mediated by agents' concerns and actions.

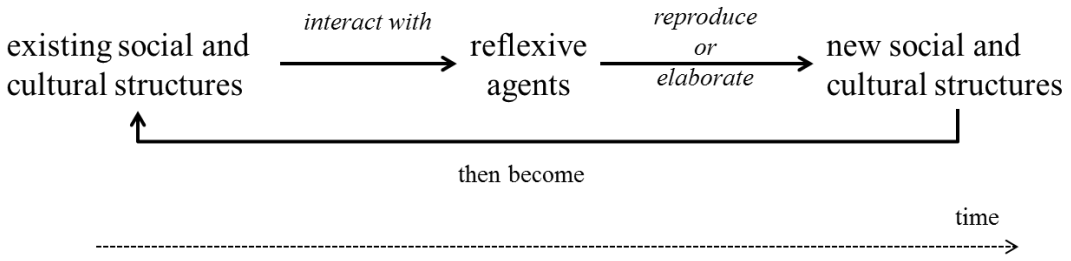

Figure 1. The Morphogenetic Approach

The Morphogenetic Approach: Change through Power

Power, in Archers theory, is the ability to effect morphostasis or morphogenesis (Archer, 1995, 297). It stems from the control of essential resources (first order power) and the relative bargaining positions of those with control of those resources (second order power). This interaction results in particular distributions of resources and ideas that can be seen of as constraining or enabling individuals to act out their concerns. The interaction between structure and agents (third order power) results in social reproduction or change.

First order power is dependent on an existing distribution of structural and cultural resources and the vested interests that arise from that. Those with access to the most wealth, the ability to restrict others' actions and expertise that allows them to exploit resources are in the best position to progress their own projects. Those with limited access to those resources have little power.

Second order power results from the interaction between the various vested interested that control the resources. One party may be totally reliant on another for particular resources or there may be some exchange between the two. The resultant distribution of resources manifests as constraints or enablements and acts to condition the actions of reflexive agents. Through the reflexive deliberations of their members, groups of agents with similar concerns transform the distribution of resources that they are presented with, in a manifestation of third order power.

Illustrating the Morphogenetic Approach: Industrial Manufacturing Case Study

In the following sketch I will describe a current movement in manufacturing, from a linear production system to one defined by a "closed-loops" (Braungart and McDonagh, 2009), through the lens of the morphogenetic approach. A linear system is seen as one that *takes* resources from the ground, including raw materials and energy, *makes* them into something of value, and *dumps* waste back to the land. On a finite planet with a rising population and few constraints on consumption this ultimately results in resource scarcity and pollution. It is believed that if we continue to consume in the future in the same manner as we do today then we will be using 2.9 planet's worth of resources by 2050 (WWF, 2012).

It is useful to initially explore the relationship that we have to manufactured products by noting that the role they play in our life is a diverse and instrumental one. They provide us with the means to do particular things and the value we place on them reflects the value that we place on the activity that they allow us to do.

As consumers these activities could range from keeping in touch with distant relatives (mobile phones, email), getting from one place to another (cars, bicycles), keeping fit (running shoes) and healthy (medicine), keeping from going hungry (food) or as a fashion statement (all of the above). For manufacturers a product's instrumental value is in the profits that it generates, which in turn allows the business to continue to exist and employees to be paid. The government sees the role of products as generating tax receipts through sales. This in turns allows it to pay for social security and infrastructure projects. Social structures include the products and who makes them and by what means, the mechanisms by which products are bought and sold, including who sells what; the regulations that determine safety and quality of products; and the ability for customers to pay for the products. Cultural structures include the range of a beliefs that agents have, including the belief that money determines value; that some brands of products are preferable to others; and that some activities are more worthwhile than others and require particular products to enable participation.

First order power is held by groups with vested interests in a number of places along industrial supply chains, including major suppliers and manufacturers; and influential stakeholders, including large customer-facing distributors and governments. The resources held are related to their ability to control raw materials; to produce particular products of appropriate quality; to influence users and consumers through branding; and

to regulate particular practices through the law. These abilities are complemented by the constraint of generating revenues efficiently.

The interactions between these vested interest groups distributes power based on each members' relative negotiating positions. This **second order power** is an emergent result of a complex set of relationships between those with first order power and is related to the ability of resources holders to negotiate better market positions than their suppliers and competitors. Supermarkets can leverage cost reductions from their suppliers due to their monopoly position in relation to customers. Large suppliers may be able to resist this influence by threatening a boycott. The resultant tussle redistributes power and this emergent distribution of structural and cultural properties is what conditions the behaviours of reflexive agents, who choose to act, or not, in particular ways based on that distribution.

Prior distributions of resources present reflexive agents with a set of constraints and enablements which condition how that act. They ignore or interact with and reproduce or transform these structures in a display of **third order power**, resulting in a reordering of distributions and power, which then starts the morphogenetic cycle over again. Individuals may decide, for example, to make a purchasing decision based on cost alone, benefiting manufacturers who can lower their prices the most. They may decide that it is more convenient to have their music collection on a portable electronic device, instead of as physical copies, ultimately resulting in high street music stores closing down as their share of resources is redistributed to others and diminishes.

As agents always have a choice about how they act, albeit constrained by prior structures, they introduce novelty into the system and the resultant structures that emerge from third order power are unexpected and non-deterministic. The implication of this is that once new systems have emerged and endure it may be difficult to revert to prior systems as the path to get there will be different from the one taken to leave it.

In a *morphostatic* social and cultural structures and agents' goals align in various ways that act to reinforce the existing system. In this example, reflecting contemporary society, there is alignment between the structures that allow cash transactions to happen so that products can be bought and sold, and the belief that money reflects value. All parties are constrained and enabled by this idea and, at the extreme, there are no other ways to structure transactions or talk about value. This can be seen in the hegemony of "the business case", an argument framed by the necessity to justify many activities in terms of financial benefits. In this society it can be recognised that structural and cultural resources are concentrated in very few places. There is little opportunity for systems change as the power to effect that change is distributed amongst a set of homogenous agents, who act to protect their shared prior vested interests. This notion is further supported in Foster's "The Fabric of Society": the innovativeness of British textile manufacturing in the 19th Century decreased as financial resources were concentrated in the commercial sector (Foster and Jones, 2013).

Morphogenesis, on the other hand, occurs when resources are more evenly spread. Numerous powerful groups with different vested interests can compete for a larger share of the resources. Depending on to what extent their interests align social change can more easily emerge as a result.

Constraining and Enabling Manufacturing

In contemporary society the relationship that we have to products is mediated, *inter alia,* by access to capital. Money constrains or enables the way that things are produced. In linear production systems when money signals that commodities are abundant then input costs into the manufacturing process are low. This also determines what we consider to be waste, or unwanted by-products of the manufacturing process. At low input costs it is cheaper to buy new commodities and make more products. Waste is considered to have zero value to customers, manufacturers and governments its fate is of no consequence. If commodity prices rise to an extent that the prices of finished products cannot be passed on to the customer then manufacturers have to implement programmes so that materials are used more efficiently, decreasing waste. Waste now has negative value until its production is minimised.

*Structurally first order power (*who has what*) and second order power (*bargaining power*) is unlikely to have changed as commodity price increases are not passed onto customers. Although they have risen the manufacturers have implemented methods to successfully mitigate against these.*

Previously waste had no value and we had no relationship to it. However, this can change if its role changes. Waste may become a pollutant if it has deleterious effects on the biosphere; it may become a health hazard when in unregulated dumps. In these cases a well-run government will impose a tax on disposal. As exemplified by the landfill tax in the UK this creates an additional financial burden on manufacturers. Coupled with high commodity prices this will further push a manufacturer to maximise efficiency programs and reduce costs. However, if these are insufficient to allow revenue to be generated then waste is seen as a negative cost of doing business. Different business strategies will have to be sought, which may include stopping production of a particular product, going out of business, or redefining the relationship with waste.

First order power is redistributed. Manufacturers that cannot adapt through efficiency programmes have to divert resources from external activities to internal ones. This results in a weakened second order bargaining position as they have fewer resources to devote to production than manufacturers who can adapt. If the costs to business are high enough to force some manufacturers out of business, or to restrict their product portfolio, different emergent structures are presented to reflexive agents.

Redefining the Role of Waste Opens up New Opportunities for Systems' Change

McDonagh and Brungart (2009) wrote that, as a response to sustainability, efficiency programmes are insufficient as they result in "doing less bad". The example of the linear production system above exemplifies this: waste is being minimised. Further, they recast

"waste as food", changing the relationship with we have with it. By elaborating the *cultural* system society now has access to new ideas through analogy, opening up a new vocabulary that can be applied to production systems. Waste is now seen as having value as it is nourishing; if of high enough quality it can be fed back into the same production cycle, or into other cycles. This "closed-loop manufacturing" has the double effect of reducing what would otherwise go to landfill and reducing the need for raw materials, both saving the manufacturer money and increasing its second order power.

Although a new set of ideas has been introduced and these condition future action this is still conditioned by (stronger) financial considerations, as seen in the linear production system example. Implemented strategies are still a rational response to price signals: if a particular initiative would result in a loss of revenue then it is unlikely that initiative will be implemented.

The attractiveness of a particular by-product to re-enter the production stream is determined by its quality. A manufacturer will want to use materials of the appropriate quality and those of lower quality should be disposed of or costly resources used to upgrade them, depending on the relative marginal costs of both strategies. In this case the overall cost of using a by-product in a particular way determines its fate.

Conditioned by elaborated cultural enablements, including financial constraints, a number of structural elaborations can be made:

- developing production techniques that maximise the quality of the by-product so that it requires as little extra processing as possible before being put back into the production cycle;
- designing products that use modular components across a portfolio, reducing waster through standardisation;
- using materials that they allow for alternative processing, including upcycling, downcycling or composting.

The strategies above focus on by-products of the manufacturing process. Products at the end of life can also be seen as good supply of resource. Ensuring that these come back to the manufacturer and can be easily *disassembled for repair or remanufacture* then becomes a valid strategy.

Conditioned by both prior cultural and structural constraints, further cultural elaborations can be developed, including:

- business models that create incentives for people to return goods at the end of use;
- business models that prioritise leasing over ownership to the customer. Products have to be returned as the manufacturer owns the physical assets;
- business models that sell services rather than products. This could include buying effective flying hours instead of owning aeroplane engines; the ability of a solvent to clean instead of owning the solvent; or comfort instead of heating and cooling.

The introduction of the "waste as food" analogy thus elaborates cultural resources and allows agents to use a set of words that open up opportunities for the development of new production techniques (structural elaboration) and new business models (cultural elaboration).

Importantly, the hegemony of the "ownership" model is disrupted. Resources that were previously concentrated around this concept now compete with lease and performance concepts, changing the distribution of first order and second order power. This gives agents the opportunity to develop novel relationships with manufactured artefacts and allows the elaboration of new structures based on these lease or performance models through third order power.

CLOSED-LOOP MANUFACTURING AND SUSTAINABILITY

Closed-loop manufacturing changes the relationship that we have with waste. Ownership of products can decline as leasing is introduced as an alternative, and the longevity of products is increased as reusing, repairing and recycling become part of the portfolio of activities complementary to manufacturing. Both of these initiatives hedge against commodity price volatility and reduce or avoid disposal costs. With a single metaphor a set of structural and cultural changes have occurred that both increase some choices, in this case the ability to use raw materials and waste in the production cycle, and ownership and leasing as ways to achieve particular goals; and restrict others. Systems restrictions have not yet been realised, although theoretically could be. For example, Riversimple, an automotive start-up in the UK, only lease their fuel-cell cars. They thus have an incentive to ensure that the cars perform appropriately and to minimise all maintenance costs. In effect, they sell mobility and not a physical product. If all car manufacturers followed this lead then there would be no choice but to lease a car, even though there could still be as many different cars available to choose from. Thus the distribution of resources available to future agents is changed.

Is closed-loop production sufficient when we consider manufacturing in the context of a broad definition of sustainability? Ownership is a perceived as a sign of affluence and there will be an extra 3 billion middle-class consumer on the planet by 2030-2040. In the extreme it is unlikely that the planet will be able to provide cars, mobiles phones, meat and grain for the 9 billion people projected to live on the planet by 2050 even with the most closed-loop of systems. It is likely that this project will require radical structural and cultural change in order to live well under the conditions projected. Given the temporal nature of change described by the morphogenetic approach it seems unlikely that radical change can happen in time without a rapid, radical redistribution of resources and contemporary vested interests potentially ceding their positions of power. This is unlikely to happen.

Pragmatic Resolutions

Despite its undoubted successes a consequence of the unreflective pursuit of the ideals of the industrial revolution is our current state of planetary unsustainability. There is no

guarantee that we can 'solve these problems using the same type of thinking that created them', despite our technological optimism. Technological innovation will be necessary to tackle interdependent "mega-trends" (KPMG International, 2012) and this will have to be understood in the context of social development.

Archer observed that high concentrations of power constrain innovation by restricting the pool of competing ideas and ways of organising. Monopoly conditions ensure that even those with power are unable to access alternatives as they are locked in by their own vested interests. Not only are businesses, including manufacturing, and governments locked into the rhetoric of economic growth at all costs, but even education is increasingly driven by "the market, managerialism and performativity" (Ball, 2003), further decreasing the pool of competing ideas from which to draw. The concept of "sustainability" has likewise been co-opted, with corporate and policy decisions being made on the "business case for sustainability", subordinating planetary health and social development to financial considerations.

Pragmatism offers us a way out of this dilemma. Celebrating pluralism and thriving on democratic discussion we must see this monolithic system as just one way to describing how to act in the world. We need to consider a future that is better than that we find ourselves in currently, one that will "astonish and exhilarate" (Rorty, 1999, 28). Instead of constraining an individuals' ability to enact her own projects we should nurture a society based on trust, tolerance and open-mindedness, where individuals come together to discuss issues and where individuals' desires are balanced with societies' needs (Soltis, 1991).
A plurality of competing ideas will act to increase the cultural resources and structure choices available to reflexive agents. A meme currently competing with "sustainability" is "flourishing" (Ehrenfeld, 2008), which allows access to an optimistic and humanistic vocabulary, where we *care* for the planet and each other. Implications for how we live in the world are profound: manufacturers would have to reflect on the types of products that they make and whether they should make them in the first place. Individual agents would have to reflect on whether "having" is more appropriate than "being"(Ehrenfeld, 2008). Of course, it may be that some environmental destruction is necessary, but this should be open to democratic discussion and not based blindly on a foundational ideology (Minteer, 2012).

Conclusion: Change through Reflexivity and Irony

Who is to effect these changes? Throughout this paper I have described how "reflexive agents" mediate between prior and future structures, but who are those agents and what is the nature of their reflexivity? Archer (2012) describes reflexivity as the "internal conversation" that we all have when planning, debating, clarifying or imagining the projects we could engage with. *Communicative* reflexivity is associated with individuals who want to replicate the existing system; *autonomous* with those who wish to work within, but refine, the existing system; *meta* with those who critique and aim to disrupt the system; and *fractured*, with those who have a poor reflexive capability and are

doubtful about their future plans. Individuals may demonstrate any and all of these modes at various times and during the same activity.

When we talk about sustainability as radical change meta-reflexives are of most interest as they have the potential to effect morphogenesis and elicit systems change. These are similar to Rorty's "ironist", the individual who appreciates that the vocabulary with which she describes the world is contingent and provisional and is open to using new vocabularies if they seem better suited for the task (Rorty, 1989, 73). The ironist reflects on consequences of thought and action and considers "not only what we [reflexively] choose to say and do, along with their effects, but also what structures those choices" (Cherryholmes, 1988, 14). The meta-reflexive and the ironist are similarly led by their values and want to work towards a better society, whatever that may mean at the time. This does not mean that they want change for the sakes of change, but that they believe change should be a possibility. As was noted at the start of this paper, the ironist manufacturer will ask whether we need to make particular things in particular ways, rather than abdicating responsibility to the rhetoric of economic growth.

Morphogenetic change, then, is found at the locus of the individual, and that individual is somebody who critiques existing social structure, cultural systems and, reflexively, themselves, experimenting with new ways of describing organising and new norms that are better than those that were used in the past. These individuals bring variety into structural and cultural systems, competing with incumbent ideas and potentially bringing about change if these ideas can gain purchase. It may be that significant change will not be undertaken in time to meet 2050 projects, that contemporary vested interests will continue to dominate and competing ideas will end up as "unstructured aggregations" (Elder-Vass, 2007) instead of enduring emergent structures. Of course, drawing from the morphogenetic approach, having new ideas and a new vocabulary is necessary, but not sufficient, for enduring change. The elaborations that this vocabulary affords us need to be supported by a range of allies so that first order power and the ability to negotiate a position relative to incumbent cultural resources are maximised. Only then can society be transformed through the reflexive deliberations of agents.

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