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SYNTHESIZING SOLUTIONS:
AN EXPLORATION OF THE MODERN RELEVANCE OF SOCIALIST DESIGN PRINCIPLES THROUGH THE MEDIUM OF PLASTICS

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1. Introduction

Through the duration of a day, a person comes into contact with a long list of objects. How often does one stop and take the time to identify what materials these objects are made of? If you belonged to an average middle-class household, the majority of these objects would have been largely constructed from plastic. From the toothbrush that you put in your mouth in the morning to the packaging of the sleeping pills you pop at night, it is all plastic.

Plastic can be viewed as the defining material of the 20th century and the backbone of the manufacturing industry post Second World War. Most daily-use objects are conceived and designed by industrial designers. Plastic is one of the most versatile material known to man. It is used in massive range of applications, from toy airplanes to military grade stealth bomber fuselages. Despite its functionality, plastic has an undesirable reputation as a threat to the well-being of our planet. The problem lies not in the material itself, but the way we choose to use it. Why do we use a material that lasts forever to make stuff that we throw away after using once?

A throwaway culture has characterized and underpinned our economies for more than half a century. Too many goods do not last as long as they could—or should—do. Some fail, others become unwanted. Quality is compromised as companies cut costs to remain competitive. Poor design and externalization of costs have caused repair and upgrading to become fringe activities. The hallmark of linear product development is planned obsolescence—the opposite of any attempt to make products last. Products are designed to fail or become too expensive to use after a set period of time.[1] Perceived obsolescence is another factor: Corporations, through advertising, want consumers to believe that products within their home are inferior to those currently on the shelves at the mall.

Our societies were not always like this. Borrowing from David Orr, professor of environmental studies and politics, it can be argued that the emergence of consumer society was neither inevitable nor accidental. Rather it resulted from the convergence of four forces: a body of ideas saying that the earth is ours for the taking; the rise of modern capitalism; technological cleverness, and the extraordinary bounty of North America, where the model of mass consumption first took root.[2] If we equate profits earned by a corporation to national GDP (Gross Domestic Product), of the hundred largest economies today, fifty-one are corporations.[3] A telling anecdote comes from former United States President George W. Bush after the 9/11 terrorist attack on the World Trade Center. The then president encouraged his citizens to shop more so as to bring the country back to normalcy sooner.[4] In the current market economy, the primary way one's value is calculated is by how much one consumes and in-turn contributes to the GDP.

The problem of consumption is exacerbated by our choice of raw material in making mass-produced goods. Plastic, for instance, is perceived as a cheap or low-value material, a substitute to more exclusive materials. As it is inexpensive to purchase, most do not think twice about disposing it. On the other hand, petroleum, the raw material for plastic, is viewed as a material of great value. Nations in possession of petroleum reserves can dictate international trade.[5]

In 2011, I travelled across India, trying to understand the role plastic plays in the urban middle-class kitchen for a couple of projects involving Tupperware. The trip led to some interesting observations. Plastic kitchenware has come to be associated with urban nomads, who prefer it as it is a cheap option and can be easily disposed of when moving. Most individuals we interviewed for the project would have liked to hold on to their kitchenware. Nonetheless, they found it more convenient to purchase cheap utensils each time they moved cities. Even in pop-culture plastic is viewed as *ersatz* or fake. I bring to your attention a case in English club football (soccer). Soon after Chelsea FC unexpectedly came into money, plastic flags were distributed by the club during a game. As a result, supporters of the club were labelled as "plastic" fans by rival supporters.[6]

Plastic can be recycled. But, in the real world, plastic bumps into limits—limits of a broken economic system, limits of finite resources, limits of energy, limits of human rights, etc.[7] The various types and colours of plastics mean that they need to be sorted meticulously. Even a minor impurity causes the recycled plastic to lose its fidelity. Each time plastic is recycled, there is a carbon footprint it leaves behind. To quote Heather Rogers from her book, *Gone Tomorrow*: "The feel-good aspect is at the heart of much of the debate about recycling. Is recycling a con that keeps us deluded into feeling like we are helping the planet, while leaving the industry free to keep churning out ever more badly designed toxic stuff?"[8] For a single gar-

bage can of waste put out on the curb, seventy garbage cans of waste were made upstream in the production line. Our goal should not only be to recycle more, but to waste less. It is true that recycling is a good habit, that it helps the environment, but recycling merely delays the point at which materials become waste.

Plastic pollution is a systemic problem. To address it, our current economic system would have to be restructured in a holistic manner. The economic system can potentially be described as a game. A game that, we must admit, is broken. We need a game with a new objective, a game where the goal is not just growth, but socially inclusive growth. We need systems that try to include "players" left behind by the "old game"—players such as the vast informal and community-based businesses prevalent in developing countries. Social inclusion and free information have been a part of political discourse since the 18th century. The aforementioned terms were key components of Karl Marx's notable text, *Das Kapital*. To quote Marx, "capitalist production, therefore, develops technology, and the combining together of various processes into a social whole, only by sapping the original sources of all wealth—the soil and the labourer."[9]

History is a proof of the failure of communist states. I do not attempt to look at them through rose-tinted glasses. Many of these states were pseudo socialist, state capitalist, welfare dictatorships. Their leadership was incompetent, and their policies did not always reflect Marx's ideology. Through the following research, I look at elements that I believe did work, such as the design of plastic products, which could be applied to a future post-capitalist vision.

A dynamic example of such a relationship between socialism and plastic could be found in the former German Democratic Republic (GDR) also known as East Germany. The industrial designers from the Bauhaus movement in the GDR successfully convinced their citizens and government that plastic was a truly socialist material.[10] Market scarcity and ideology converged to make plastic manufacturing a key industry. But alas, bureaucracy and flawed governance held them back. I would like to question if the GDR's philosophy towards the design of plastic goods was conceived before complimentary technological and logistical means were available. With complementary technology growing at a rapid rate, is this ideology of the past a viable choice for the future?

2. Historical Overview

After the conclusion of the Second World War, the social conditions in Soviet-occupied East Germany were grim. Unlike the Marshall Plan implemented by the USA in Western Europe, East Germany did not receive substantial financial assistance from the Soviets. As a result, people were more concerned with pure survival than the expectation of a comfortable life. Dur-

ing the early 1950s, older East Germans looked to the pre-Nazi 1930s as the best times of their lives. Propaganda and brutality were used by the ruling *Sozialistische Einheitspartei Deutschlands* (SED) party to keep the masses in check.[11]

Nikita Khrushchev's ascent to power in the Soviet Union began to transform the Eastern Bloc politically, culturally, and economically. In East Germany, the former Stalinist system was known as *tonneideologie* (ideology of tons). It was characterized by fulfilment of production quotas of steel, coal, or machinery.[12] In order for Soviet socialism to succeed, it would have had to build a consumer class of citizens without abandoning principles of equal distribution of wealth, abhorrence of individualism, and personal accumulation of material goods. Under the shadow of what many termed a "capitalist economic miracle" in West Germany, planners and party members lumped consumer products together under the rubric "the 100 small things of goods and services."[13]

East Germany was a landlocked country without many natural resources. After the war, it also did not possess any colonies to exploit for resources. With a failing economy, the East German mark had little value on the international market. What East Germans did have, however, was a rich history in applied chemistry. It was this knowledge that allowed them to fight the war for so long. A prime example would be the formulation of the Haber-Bosch process that was used at the time for making explosives. Companies such as BASF, Agfa, and Bayer were founded in pre-war Germany. On November 3rd, 1958, a chemistry conference was convened by the then SED Secretary Walter Ulbricht to announce a campaign named the Chemistry Programme. This programme would power the consumer turn of East Germany.[14]

The rise of modernist design in East Germany began with the re-appearance of a number of former Bauhaus disciples. At the time, the state-controlled production sector had no trained designers on board. The discourses of aesthetics were looking to past German tradition for inspiration. It was hoped that this would establish a German working-class identity that the SED viewed as "authentically" German. The enduring Bauhaus ideology had been that design should reflect the times. The advent of a Socialist state meant that the era of rationality and functionalism had finally been ushered in.[15] At the time, plastic was known as an imitative material—used for the production of cheap imitations of older traditional designs and other *kitsch*. It was the Bauhaus designers who stepped in to alter this perception and stop plastic being wasted on cheap goods. As described by Eli Rubin, in his book *Synthetic Socialism*:

> Designers did not see themselves as artists but as scientists of taste, following 'laws' of taste and aesthetics. Second, seeing themselves as arbiters of an objective and trans-

> cendent truth of form and aesthetic judgment meant that designers had an obligation to spread knowledge of this truth throughout society.[16]

What is interesting here is to see how closely the paternalistic worldview of Bauhaus designers mirrored that of the SED. That, despite early conflict, state socialism and the Bauhaus were quite compatible.

East Germany's contemporary significance was boosted by "The Friendship Pipeline" connecting East Germany with the oilfields of the Soviet Union. Locked into the economic network managed by COMECON (the Council for Mutual Economic Assistance), East Germany's factories were to process this material, supplying plastic products for use in industry and domestic consumption throughout the rest of the Soviet Bloc. At the same time, oil was for the Kremlin, a means of propping up the East German economy in the face of Cold War competition.[17] A new wave of consumer goods appeared on the shelves of East German shops over the course of the 1960s; bright portable radios, camping and picnic equipment suggested new lifestyle opportunities, whilst colourful wipe-clean furniture and PVC flooring promised an efficient domestic landscape within standard housing. East German consumers would literally come to feel the pace of change in the smooth surfaces that now filled their lives and the drip-dry easy clean synthetic fibres, in which their bodies were now clothed. Here was the material evidence of socialist prosperity.

Advice and home décor magazines acted as propaganda mouthpieces of the government. Specialist plastic goods shops, Chemie im Heim, KONSUM, and 1000 Small Things retailed the latest state-approved designs. Magazines like *Guter Rat*, *Fur Dich,* and *Form + Zweck* stressed to its readers the superiority of plastic goods. They also answered reader questions and provided advice on the maintenance of plastic goods. Because the production of plastics involved complicated chemical technology, it was harder to understand its origins or have a meaningful relationship with the means of its production. The decision by popular comic book *Mosaik* to publish a comic strip depicting three characters making plastics was one response to this.[18] In capitalist societies, plastic often meant detachment from the original material or referent, as concluded by Roland Barthes in his essay *Plastic.*[19]

The GDR hosted an annual trade fair in Leipzig. This was a major propaganda event for the government. GDR trade authorities hoped the show would spread the word about the progress of socialism through capitalist circles and, most crucially, bring in enormous amounts of hard foreign currency. Western purchasers would convince GDR citizens that goods available to them were envied around the world. A vision of socialism would be twice sold—once in the

west, for money, and once in the east, for consent.[20] Alas, many of the objects displayed never made it to the GDR shelves. The best quality goods were exported; only lower quality versions reached local consumers. In the West, overproduction, plummeting cost and ubiquity relegated plastic items to the lowest status in the taste hierarchy of consumer goods. In the GDR, the underproduction of plastic items and a combination of functionalist design and government propaganda made them extremely hot commodities.

Emphasizing rationality and use, modern design in GDR represented a high point in modernist asceticism. In this regard modernist designers characterized their disdain for ornament in politically correct terms. An unknown soviet leader is quoted as saying:

> [. . .] in the USA [. . .] large amounts of plastics are produced. However, they are made into worthless, cheap and shockingly kitschy mass wares. Owing to their mania for ornamentation, these tend to be rendered quickly obsolete by something new and more fashionable. Efficient, inexpensive and rational design of plastic goods had by contrast the potential to be useful and profitable.[21]

To buy five suits and have them last twenty-five years was an ideal of socialist consumption.[22] Durability was of prime importance due to material shortages and economic policies. The official Soviet view on fashion during the Stalin years, as quoted by Hutchlings, was:

> [. . .] the Soviet Union kept or tried to keep itself aloof from sudden fashion changes. A sartorial aim of its rulers was to avoid capricious rises and falls in hemlines, just as an economic aim booms and slumps in business activity. Thralldom to Paris fashions were viewed as hardly less irritating than thralldom to Wall Street.[23]

Taking a broader worldview, the optimal kitchen held great symbolism during the Cold War years. *The American National Exhibition* in Moscow, 1959, was the setting for the notorious "Kitchen Debate" between USSR first Secretary Nikita Khrushev and US Vice President Richard Nixon. The USSR responded with a media campaign with the slogan: "Our kitchen is just as good as theirs."[24] Lifestyle images created using home furnishings became potent weapons. The starkest example would be in Berlin, a city at the forefront of the Cold War. The Marshall Plan had provided great prosperity to West Germany. In 1952, before the construction of the Berlin Wall, the USA decided to display an exhibit titled "*We're Building a Better Life*" (*Wir Bauen ein Besseres Leben*). The show would stress arguments for production, high wage, low unit cost, low profit margin, high consumption system; it gave East Berliners a glimpse of the

other side. Profit, according to Marx, was the unpaid labour value that industrialists appropriated from workers when manufactured goods were sold at retail price. To quote Marx:

> Political Economy has indeed analysed, however incompletely, value and its magnitude, and has discovered what lies beneath these forms. But it has never once asked the question why labour is represented by the value of its product and labour-time by the magnitude of that value. These formulae, which bear it stamped upon them in unmistakable letters that they belong to a state of society, in which the process of production has the mastery over man, instead of being controlled by him, such formulae appear to the bourgeois intellect to be as much a self-evident necessity imposed by Nature as productive labour itself.[25]

"*We are Building a Better Life*" arrogated Marx's concept of labour value and used it to express the amount of work hours needed to purchase the item rather than to produce it. The angry East German authorities did not miss this ideological subtext.

In the end it can be argued that East Germany was never a successful state. Many steps were taken to stabilize the plastic industry over the years with limited success. The crux of the problem was still the *tonneideologie*.

> Planning for their [plastics] secondary and tertiary processing meant co-ordinating thousands of different products with hundreds of different production technologies and processes. The big primary plastics and chemical factories like Leuna and Buna were essentially input-output equations, manifestations of the kind of brute math at which planned economies were skilled. Calculating that x tons of ethylene or phenol would result in y tons of polyethylene or phenol plastics was something that planners could handle. But, calculating then how many y tons of polyethylene would result in z tons of combs, z1 tons of buckets, z2 tons of ice cube trays, z3 tons of toothed gear wheels for radio alarm clocks, and so on, was difficult to the point of being impossible.[26]

The lack of co-ordination led to the waste of precious plastic and sub-standard goods. Due to numerous bottlenecks in production, items would mysteriously appear and disappear from shelves every fortnight. The VVB (*Vereinigung Volkseigenebetriebe*—Union of People's Own Factories) plastic processing umbrella body during the 1960s could only control 81 of the 312 manufacturing factories (VEB's[27]). The rest were either "half state" or privately owned, mean-

ing they were free to use plastics however they wanted. The industry could be best described as a symphony without a conductor.

The 1970s saw a change in leadership in East Germany. Along with it came an attempt to re-centralize the production of plastics. At the forefront were the governmental bodies MMW (Ministry of Material Economy, or *Ministerium fur Materialwirtschaft*) and AiF (Office for Industrial Design, *Amt fur industrielle Formgestaltung*) charged with the responsibility of managing production chains and aesthetics respectively. Martin Kelm, a prominent designer bureaucrat in the AiF implemented laws that forced the VEB's to hire state approved industrial designers to oversee their designs.[28] In 1975 the MMW introduced their third Five Year Plan. This plan contained the first mention of recycling of plastics so as to fully utilize limited resources. Recycling was going to save the *Volkwirtschaft* approximately one-twentieth the total import of oil.[29]

The government was successful in convincing the population that qualities of modern design that adhered to durability, proper use of different types of plastic, and ease of use was what made socialist design better than capitalist design. However, they were unable to make these idealistic socialist designs a reality for the people. Socialism did win their "hearts and minds" but did not live up to its own standards in many cases.[30]

3. Design Analysis

From the previous chapter we can conclude that product design was market-centric during the Cold War era in both the Eastern Bloc and the West. A substantial difference between the two, however, is that in the Eastern Bloc—the GDR being a good example—the designer assumed a state of material scarcity but an abundance of information about the product and material. The designer and state were willing to make every aspect of their designs visible and accessible to the customer. In the West, factors like carbon footprints and the finite nature of resources were not yet considered relevant. Multiple designers and manufacturers were making the same category of product, trying to outdo one another by using grand superficial styling and making the inner workings of their products a trade secret. What is fascinating about Eastern Bloc design is that market-forces inadvertently made their designs user-centred. Even today, irrespective of all the talk about human-centred design (HCD), the nature and existence of most products is dependent on the market.

Within this section of the paper, we look at the considerations of the designers behind the products of the GDR, the unique character of the products themselves, why people appreciate these products, and tangents between the past and the present.

We can gain some insight into the views and philosophies of GDR design by looking at two prominent GDR designers who are still around and speak of their work. Both Rudolf Horn, a national award winning furniture and interior designer and professor of design in former GDR, and Karl Claus Dietel, an industrial designer from former GDR and winner of the national award for design in united Germany 2014, offer value insight into the ethos of GDR design. Video and written interviews by these two recognized designers can be readily accessed on *Design in der DDR,* a comprehensive database on East German design compiled by design historian Gunter Hohne.[31]

Horn was of the opinion that architecture and design are not individual, impulsive acts, but services in the community for the community.[32] It was the philosophy that Horn lived by. He claimed the state supported his design ventures, as the state understood they were for the common good. He stressed the fact that a lone designer is insufficient to design good housing; that is, he was always a part of a team consisting of architects, doctors, sociologists etc. This could be seen as "co-design" before the term was coined. Today he encourages designers to identify the true needs of people and make the objects that fulfil those needs in a special way.[33]

Dietel, meanwhile, takes great pride in the fact that his designs can be easily customized by users to suit their individual needs. He calls this "open principle." He claims to have designed products with the consumer as top priority, not the state or corporation. The ease of repairing his products meant that the profit margin on after-sale services for the producer would be hampered. Acknowledging this fact, Dietel stuck by this principle at great personal risk. He speaks at length about the importance of ergonomics and is staunchly against planned obsolescence and styling.[34]

I summarise GDR design by describing its salient attributes. GDR design is accessible; it can be accessed by all, regardless of income or social standing. Accessibility promotes exchanges of innovation and involvement of the user. Access gives rise to honesty, clarity, and transparency. It is durable*;* the chosen materials and technical hardware must withstand the test of time in both appearance and function. This implies a shift away from hectic fast fashion based on trends. It is functional; all objects must perform their function, the best way they can. At best, they may even be multifunctional. Lastly, GDR design is minimal. Not only does simplicity lead to a user-friendly unobtrusive form, it also reduces the material required to make it.

Good design is present all around us. At times, the fact that we do not notice it is what makes it so good. Allow me to highlight such everyday objects from the GDR. The first is a shopping basket, designed by Albert Krause.[35] The second is a bucket, designed by Martin Kelm.[36] Both objects comply with the GDR ideology that "concise, streamlined, precise, simple,

light, are adjectives that correspond to the beauty of things in our technological age."[37] Both examples have no ornamentation. They appear to be a highly economic usage of the material, optimized for production considering the manufacturers of the time.

At the time that the aforementioned designers were at their most prolific, designers in the West chose to take a different approach. As a juxtaposition, we can consult the work of the American designer, Raymond Loewy. Loewy is widely considered the father of modern industrial design. He placed a great emphasis on styling. An apt design comparison would be between the Wartburg 353 car and the 1963 Studentbaker Avanti. The Wartburg 353 was designed by Dietel. It had the longest ever production run in the Soviet Bloc stretching from 1966 to 1988. It has a plain form with multiple cost saving plastic elements and earned the nickname of "Trustworthy Hans" in the Soviet Bloc.[38] Alas, its comfort was negated because of the GDR's technological and material limitations, making it a high emission liability. In contrast, observe the visually loud two seater, the 1963 Studebaker Avanti designed by Loewy. The aim of the designers was to create a "prestige car." Lowey boasted of it not having a single straight line, making it dynamic in appearance but this also meant a larger utilization of fibreglass and complex tooling.[39] The American automobile industry being the very antithesis of what Socialism stood for.

In the current day and age, designers with ideals similar to Lowey are the ones who gain popular recognition as "super-star" designers. An example of this would be the body of work by Philippe Starck. Starck has designed a myriad of objects; toothbrushes, toilet brushes, chairs, utensils, juicers etc. Starck claims his designs promote communication between people. His designs appear less about usability or problem solving (functionalism) and more about creating a desire for status symbols (emotionalism).[40] Starck was quoted as saying to a German magazine: "I have designed so many things without being interested in them. Maybe all these years were necessary so that I could see, ultimately, that we basically do not need anything. We always have too much."[41]

To conclude our analysis of design—and its historical limitations and catalysts—from the GDR era, we will look to what the citizens or consumers of the GDR thought about the products around them. In interviews conducted by Eli Rubin for his book, respondents Boris V. and Roberta W. appreciated the impact plastics had made in their life. They noted the convenience of the Intecta furniture set that was coated with the easy-clean Sprelacart plastic coating and PVC flooring when it came to upkeep and maintenance. They accepted that the furniture was far too standardised but found it good enough for their needs in the nation's time of hardship.[42] This was especially true when done in the spirit of what the Germans called "*Sparsamkeit*" or thriftiness.[43]

There were also people who rebelled against the state-approved plastic products. Interviewees Samantha C. and Angela K. felt their freedom restricted by the standardised products and felt they lacked "culture" and "tradition." They desired to express their individual freedom by obtaining antique wooden furnishings.[44] Meanwhile, another interviewee, Margarete, reminisced about GDR plastic products only after the fall of the Berlin Wall and the influx of disposable products.[45] The reappearance of GDR designs in Germany today is termed as *Ostalgie* (nostalgia from the east). However, it is not just older former East Germans who are purchasing these goods. People from across the country and beyond seek these reminiscent objects. There are entire thrift shop businesses that run on re-selling used GDR objects.[46]

In the late 1950s, GDR advice publications began printing instructions on how to deal with "outdated equipment," "such as Grandma's old chest for example. Breaking it down into functional elements and re-configuring the equipment into something contributing to the overall operation of the machine—covering it, for instance with a plastic table cloth and using it as a table."[47] This principle is applied in today's "maker movement," often termed as "hacking." In developing countries such as India, such ideas are called jugaad. A tech start-up from Silicon Valley would call it "frugal innovation."

The movement for sustainability in designed products has been gaining momentum in recent times. Attention in the domain has been largely focused on closing the material gap, going from new to recycled, back to (almost) new again. In the case of production, this has led to a combination of requirements with respect to efficiency and clean processing. During their period of use, sustainable products should consume a minimum amount of energy, and preferably produce some. They should be easy to disassemble and use only one kind of material for each part, so as to facilitate shredding and re-generation. A factor that requires greater attention is design for longevity: starting with a strong proposition and nourishing it in order to keep it alive.

The following are the six strategies that have been compiled by researchers at the Delft University in the Netherlands and published in a book titled *Products that Last* (2014) to improve the lifespan of products.[48] Most of them correspond to the design strategies employed by the GDR and other Eastern Bloc countries.

1. Design for Attachment and Trust

This is the Holy Grail for designers. It is near impossible to design with only this strategy in mind as many complex socio-economic factors beyond the control of the designer influence its success. The aforementioned *Ostalgie* is proof of the success of GDR designers in this category.

The classic chicken shaped plastic egg cups are even more popular in present day Germany than at the height of the GDR regime.[49]

2. Design for Durability

Durability was a hallmark of all GDR products. There is an interesting anecdote from design historian Gunter Hohne, in an interview where he speaks of an incident at a *Leipzig Trade Fair*: On observing the sturdiness of East German textile, West German buyers turned it down, as they were worried that it would last many years and reduce return customers and income from maintenance.[50] Today brands such as BuyMeOnce use this strategy.[51]

3. Design for Standardization and Compatibility

Having fallen under the state-controlled public sector, standardization and compatibility in production do not seem to be an issue in socialist economies, at least on paper. Popular modern examples are LEGO and Meccano toys. The entire bicycle industry works within the constraints that frames and components of different manufacturers can be mixed and matched by users. The most "socialist" example has to be the *Ver Bien Para Aprender Mejor* in Mexico. It is a series of unbreakable plastic spectacle frames, with easy swap colour options, that are distributed free of charge to underprivileged school children.[52]

4. Design for Ease of Maintenance and Repair

A prime example here is the Mokick S50 moped designed by Karl Clauss Dietel and Lutz Rudolph in 1967 for the Simson brand. These can still be spotted on the road today. The moped is designed so that an untrained individual could safely open, repair, and even customize the vehicles components.[53] I would say that it even fits into the next two categories.

5. Design for Adaptability and Upgradeability

A modern example would be the recent hype for modular cell phones. The most utopian is the Phonebloks concept by Dave Hakkens. Phonebloks was a speculative work that managed to gauge user demand for modular phones. Phones that have tried to satiate this demand are now trickling into the market. The first noteworthy example is the Fairphone. Their phones are made using ethically sourced raw materials and are built specifically for easy repair, disassembly, and up-gradation of hardware.[54] The most ambitious was Google's project Ara, that attempted to create an ecosystem of modular bits by collaborating with a wide range of electronics manufacturers. Their attempt was abandoned in 2016.[55]

6. Design for Dis- and Re-Assembly

One example in this category stands head and shoulders above the rest in application of this principle: the sinisterly notorious Kalashnikov or AK-47 assault rifle. It was designed in Soviet Russia just after the Second World War and was inducted into the Soviet Red Army. Over seventy-five million AK-47's have been produced around the world since then, not to mention another hundred million unlicensed versions derived from the original AK-47 design.[56] The design is so simple and effective that, unlicensed, even homemade versions can be found on the black market across the world, making the AK-47 a favourite weapon among terrorist networks. It does not break, jam, or overheat. It will shoot whether covered in mud or filled with sand. It is so easy that children can and do take lives with it.[57] The record set for disassembly and reassembly, the so-called "field strip" stands at around thirteen seconds, making it optimal for service in harsh conditions.[58]

4. Reflection and Conclusion

It is surprising how blue-sky future scenarios we envision today are strikingly similar to what was first envisioned by Karl Marx in the mid 1800s. Marx suggests in *The Fragment on Machines* that once knowledge becomes a productive force in its own right, outweighing the actual labour spent creating a machine, the big question becomes not one of "wages versus profits" but who controls "the power of knowledge." Given what Marxism was to become—a theory of exploitation based on theft of labour time—this is a revolutionary statement. Once you understand that information is physical, that software is a machine, and that storage, bandwidth, and processing power are collapsing in price at exponential rates, the value of Marx's thinking becomes clear. We are surrounded by machines that cost nothing and could, if we wanted them to, last forever. In these musings, not published until 1973, Marx imagined information would be stored and shared in something called a "general intellect"—the mind of everybody on Earth connected by social knowledge, with every upgrade benefiting everybody. In short, he had imagined something close to the information economy in which we live. Its existence, he wrote, would "blow capitalism sky high."[59]

I want to move away from a focus on plastics and products made of plastic and take an overarching view of means of production. As mentioned at the beginning of this paper, the 20th century was the age of the industrial revolution. The 21st century can be considered the age of technological revolution. The spread of information technology has brought in a whirlwind of change in the way our society operates. First, it has reduced the need for work, blurred the edges between work and free time, and loosened the relationship between work and wages.

The coming wave of automation, currently stalled because our social infrastructure cannot bear the consequences, will hugely diminish the amount of work needed—not just to subsist but also to provide a decent life for all.

Second, information is corroding the market's ability to form prices correctly. That is because markets are based on scarcity while information is abundant. The system's defence mechanism is to form monopolies—giant tech companies—on a scale not previously seen in the past two hundred years. Free, socially generated data is being commodified by corporations in a monopoly position and used to earn profit in the form of "rent." We do not use products like the iPhone because they are the best products on the market. Rather, we use an iPhone because it provides us access to a wider platform of digital utilities. In exchange for access to these utilities, Apple collects "rent" from a consumer. This "rent" is what can be termed as "surplus value" generated by the product.[60]

Third, we are seeing the spontaneous rise of collaborative production: Goods, services, and organisations are appearing that no longer respond to the dictates of the market and the managerial hierarchy.[61] It is the latter that is of most interest to me as an industrial designer. A major cause of failure of the GDR business model was the inability to manage the supply and demand of plastic products. With collaborative production, that problem is greatly reduced. Even plastic products, the definitive material of the 20th century, a backbone of the manufacturing industry, can now be produced and recycled at a cottage industry scale.

A perfect example of this is the Precious Plastic project by Dutch designer Dave Hakkens.[62] Precious Plastics is a collection of DIY recycling machines that allow anyone to transform plastic into useful objects. The machines can be easily built using basic tools and universal materials. The Precious Plastic package includes open-source instruction videos and blueprints so that anyone and everyone can start recycling plastic from home. Hakkens has designed four modular machines with components that can be easily replaced or repaired. The plastic shredder machine is the most useful because it shreds plastic into flakes, which are required when working with the other three machines. The extrusion machine can turn plastic flakes into plastic thread, which can be used in 3D printing or in any other creative way. The injection machine heats and melts plastic flakes into moulds—perfect for creating smaller or larger objects. Finally, the compression machine is an oven-like device that heats plastic and slowly compresses it into a solid form.

With the playing field rapidly changing, the old path beyond capitalism imagined by the Left of the 20th century is lost. However, a different path has opened up. Operating unseen within the cracks of the mainstream economic system, collaborative production initiatives that

rely on interpersonal relationships are cropping up. These ventures are unable to compete directly against multinational corporations driven by a profit motive. It would need the state to create the framework—just as it created the framework for factory labour, sound currencies, and free trade in the early 19th century. What these collaborations have achieved is the provision of the necessities of life such as food, shelter, clothing, and care to the communities within which they are based. These collectives use network technology to produce goods and services that only work when they are free or shared.

The physicist Ilya Prigogine put it beautifully: "When a system is far from equilibrium, small islands of coherence have the capacity to shift the entire system."[63] Our priority now should be to develop islands of coherence in individual contexts and connect with other islands when the need arises. It is within this new system or "new game," as I call it, that I wish to see more designers practicing in.

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