Opportunities of frugality in the post-corona era

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Abstract: Objective of this paper is two-fold: first, we assess the likely impact of the corona crisis on the economic and societal choices of people, especially in relation to voluntary simplicity. Second, we contextualise the impact of those choices in the field of innovation management. Taking a normative-conceptual perspective we seek to understand in how far frugality, and inter alia, frugal innovations can play a role in better managing the after-effects of the corona crisis and what implications arise out of this for the relevant societal stakeholders. Frugality is likely to emerge as a mega-trend that may shape a frugal 'affordable green excellence' (AGE) as the dominant innovation paradigm. To realise this potential, however, it is necessary for frugal innovators and entrepreneurs to develop a more comprehensive and multidimensional understanding of affordability that is targeted at ensuring financial, societal, infrastructural and ecological affordability of frugal products, services, technologies and business models.

Keywords: corona crisis; COVID-19 pandemic; Frugality 4.0; affordable green excellence; frugal innovation; circular economy; voluntary simplicity.

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1 Introduction

The world is undergoing a societal upheaval of an enormous magnitude. Probably for the first time in the human history large parts of economic activity have come to a standstill simultaneously in almost all parts of the world (Gopinath, 2020). The 'lockdown', a term not known by many prior to the corona pandemic of 2020, has meant that populations have been (in some cases literally) forced to stay back at home and cut down on their social contacts due to fear of a community transmission of the COVID-19 virus (Deb et al., 2020). As a result, international and even domestic and local travel has largely come to a halt. Economic activity has been severally affected in most nations and many people have either lost jobs or have had to reduce their working hours, negatively impacting their disposable income (GCEE, 2020; IMF, 2020).

The International Monetary Fund (IMF) expects the corona crisis to hit the global economy like nothing else since the Great Depression. While the real gross domestic product (GDP) growth of the global economy shrunk by only 0.1% on a year-on-year (YOY) basis in the aftermath of the Global Financial Crisis of 2009, the global loss caused by the corona crisis was estimated by IMF at 3% of global GDP in April 2020 (Gopinath, 2020; IMF, 2020). GDP in advanced economies is projected to contract even more strongly by as much as 6.1%.; per capita income is expected to shrink in as many as 170 countries (Gopinath, 2020). The lockdown period has been extended since April 2020 in most nations, thus aggravating the economic impact even further.

According to Gita Gopinath, Chief Economist at IMF, the ongoing corona crisis "is a crisis like no other, and there is substantial uncertainty about its impact on people's lives and livelihoods" (Gopinath, 2020). In the face of this uncertainty, understandably, there is a growing demand for restoring 'normalcy'. However, there are also voices that warn against quickly returning to the 'old normal' as if nothing has happened that requires a serious reflection (e.g., Messner, 2020). Such voices plead for utilising the current crisis to develop a 'new normal' by utilising its opportunities, e.g., the unintended-yet-largely-positive environmental impact and the slowing down of the pace of life resulting in reduced stress levels for people who are in a position to better manage social and economic impact of the pandemic. In words of Prof. Dr. Dirk Messner, president of the German Environmental Agency ('Umweltbundesamt'):

> "In managing the coronavirus crisis, however, it is also important to not lose sight of the bigger challenges ahead: the impact of global warming, the excess consumption of resources far beyond what planet earth can cope with and the loss of biodiversity. We believe that the current coronavirus crisis offers a unique opportunity to rethink current models of business and to shape a new economic start on a more sustainable and future-proof basis." (Messner, 2020)

This paper makes a plea for a more holistic reflection over the causes and effects, including of the other urgent challenges facing the world that have been laid bare by

COVID-19, e.g., climate change, poverty, and diseases. In this current context, we take a closer look at frugal innovations, a concept that has grown in importance over the previous decade and has been known to enable affordable access to goods and services (Tiwari and Herstatt, 2012; Radjou and Prabhu, 2015; Agarwal and Brem, 2017; McMurray and De Waal, 2020). During the ongoing corona crisis, Margarete Schramböck, Austria's Minister of Digital & Economic Affairs, reportedly characterised frugal innovations as one of the possible options to deal with the effects of the pandemic due to their positive impact on the use of resources and for protecting the environment (Wiener Zeitung, 2020). The Austrian Research Promotion Agency (FFG), which is the national funding agency for industrial research and development, quoted the minister as saying that in such a situation, one has to concentrate on frugal innovations, i.e., finding simple solutions to the crucial challenges to the society (FFG, 2020). And in words of Gemünden (2015, p.4), "The desire to get more with fewer resources is an evergreen of management research and practice." It is in this context that we examine, if and how frugal innovations can be used to develop a 'new normal' that acts as an enabler of 'affordable green excellence'.

Taking a normative approach, we propose that affordability should be defined in a much more comprehensive manner to include financial, societal, infrastructural and environmental affordability. Further, a much closer interaction to the principles of circular economy is proposed. The overlap of frugal innovations and circular economy seems to provide an ideal space that should be strived by societal stakeholders. Products that target high environmental affordability without paying enough attention to monetary, societal and infrastructural affordability are as likely to face diffusion challenges as are products that are affordable monetarily and in other terms but whose environmental fit is questionable. Policy makers are called upon to create enabling mechanisms to promote affordable green excellence that is required in the post-corona world even more than it already was prior to the pandemic outbreak.

The remainder of this paper is structured along the following lines: we provide a brief overview of the still ongoing corona pandemic in Section 2. Section 3 deals with the likely financial and societal impact of the corona crisis. This section is divided in two parts: the first part provides a socio-economic snapshot from Germany as a proxy for economic hardships faced by people in the wake of COVID-19 that act as an enabler of frugality. The second part deals with the likely growing demand and acceptance for voluntary simplicity leading to frugality by choice. In Section 4, we briefly introduce the case of blue movement from the Netherlands and discuss the requisite transition to a new frugality approach that we call 'Frugality 4.0'. The paper ends with a discussion and summary in Section 5.

2 An overview of the pandemic

The outbreak of the COVID-19 virus was first reported from the Wuhan region in China towards year-end in 2019. According to official information released by the World Health Organization (WHO), its "China Country Office was first informed of cases of pneumonia unknown etiology (unknown cause) detected in Wuhan City, Hubei Province of China" on December 31, 2019 (WHO, 2020b). By January 20, 2020, the WHO was aware of 282 confirmed cases of 2019-nCoV "from four countries including China (278

cases), Thailand (2 cases), Japan (1 case) and the Republic of Korea (1 case)" (WHO, 2020b).

Since then, the disease has spread exponentially and fast turned into a global pandemic. As of June 6, 2020, there were confirmed cases of over 6.7 million infected persons in 216 countries and territories (Deb et al., 2020; WHO, 2020a), see Table 1.

Table 1 Societal and economic costs of the corona pandemic in the most-affected nations

Rank	*Country*	*Confirmed cases (June 6, 2020)*	*Confirmed deaths (June 6, 2020)*	*Estimated GDP impact (April 2020)*
1	USA	1,897,838	109,143	–5.9%
2	Brazil	614,941	34,021	–5.3%
3	Russia	449,256	5,520	–5.5%
4	UK	284,734	40,344	–6.5%
5	Spain	240,978	27,134	–8.0%
6	India	236,954	6,649	+1.9%
7	Italy	234,531	33,774	–9.1%
8	France	190,180	29,114	–7.2%
9	Peru	187,400	5,162	–4.5%
10	Germany	185,416	8,666	–7.0%
18	China	84,177	4,638	+1.2%
	Globally	*6,742,875*	*395,030*	*–3.0%*

As a result, governments around the world were forced to impose stringent lockdown measures including social distancing and restrictions on the movement of people in public space. A study conducted at the IMF suggests that the lockdown measures have caused enormous short-term economic costs but have also saved hundreds of thousands of human lives [Deb et al., (2020), p.70]:

> "Containment measures have had stronger effects in countries where the measures were implemented faster and resulted in less mobility – de facto, more social distancing – and in countries with lower temperatures, lower population density, a larger share of older population, and stronger health systems. Among different types of containment measures, stay-at-home orders seems to have been more effective in reducing the number of deaths."

3 Economic and social impact of the corona crisis

In this section, we first present a socio-economic snapshot of the current situation in Germany. This snapshot of economic hardships faced by many people in the society can be seen as a proxy for situation in many other countries/regions, as suggested, e.g., by the consumer surveys conducted by McKinsey & Company (2020) in several important economies, such as China, India, the USA, or the UK. Consumer sentiment in Germany is even rather well off. A much higher percentage of surveyed consumers in China and India report financial constraints in the wake of the COVID-19 pandemic. Therefore, it

appears to be a reasonable presumption that the analysis of situation in Germany, for which data is readily available, provides a somewhat generalisable background in terms of the general direction of economic hardships faced by people.

The results in Section 3.1 enforce the role of financial affordability as a core driver of frugality and frugal innovations in a conventional sense. In Section 3.2, we identify tendencies that relate to voluntary simplicity, whereby people embrace frugality 'by choice'. It is the latter that can act as a driver of a transformation process by which frugal innovations can get higher acceptance of societal groups that are more affluent and become agents of affordable green excellence (Tiwari et al., 2018).

3.1 Economic hardships: a snapshot from Germany

Even though Germany has arguably done fairly well in containing COVID-19 (see Table 1), the economic impact of the pandemic has been harsh, nonetheless. Germany's GDP in the first quarter of 2020 shrunk sharply by 2.2% on YOY basis. In words of the Federal Statistical Office ('Statistisches Bundesamat'; SBA):

> "The corona pandemic hits the German economy hard. Although the spread of the coronavirus did not have a major effect on the economic performance in January and February, the impact of the pandemic is serious for the 1st quarter of 2020. The gross domestic product (GDP) was down by 2.2% on the 4th quarter of 2019 upon price, seasonal and calendar adjustment. That was the largest decrease since the global financial and economic crisis of 2008/2009 and the second largest decrease since German unification." (Statistisches Bundesamt, 2020a)

The German Council of Economic Experts ('Sachverständigenrat Wirtschaft') made comparable estimates in a special report published in March 2020 and warned against the threat of an impending recession (GCEE, 2020). More recently in early June, Germany's central bank, the Bundesbank, has predicted a decline of 7% in the country's GDP in 2020, but expects it to recover within the next two years (Bundesbank, 2020).

Most economic indicators in Germany currently show a downward trend. In March 2020, production (price and calendar adjusted) decreased significantly by more than 11% on YOY basis. Similarly, new domestic and foreign orders in manufacturing were down by about 15% on YOY basis. Price, seasonally and calendar-adjusted figures in comparison to the previous month showed similar tendencies. The deceleration was even more pronounced in April 2020, when the new orders decreased by further 26% in comparison to the previous month, and by 37% in comparison to April 2019. The SBA said: "This is the largest decline since the beginning of the time series in January 1991." The pandemic has also affected entrepreneurship: the number of start-ups in Germany decreased by 7.7% in the first quarter of 2020 on YOY basis.

In continuation of this trend, turnover in the accommodation and food services industries in March 2020 registered a decrease of about 45% in real terms in comparison to both the previous month in this year and the same month in the previous year. The corona crisis has also impacted the labour market. The Bundesbank estimates that "[d]espite large-scale short-time working, unemployment will rise considerably for a period of time" (Bundesbank, 2020).

Prices of groceries, especially food products, have been increasing since the outbreak of the corona crisis owing to disruptions in the supply chain. A report in the German

newspaper Frankfurter Allgemeine Sonntagszeitung ('FAS') says that prices of items such as cauliflower, capsicum and zucchini in German supermarkets have increased between 50% and 100% on annual basis (Klemm and Scherff, 2020). The same report cites official statistical data from the German state of Hesse that suggests that prices of fruits (13%), meat and meat products (9.7%), milk (8.7%) and vegetables (2.8%) have significantly increased on monthly basis in May 2020, while the overall inflation rate was quite moderate with 0.3% in this period (Klemm and Scherff, 2020). The authors also pointed out limitation of the current methods of calculating inflation indices, e.g., while many indicators, such as restaurant prices and flight costs, could not be factored-in during the lockdown, and rental prices for real estate are under regulatory protection. This impact would potentially be seen once the lockdown measures are relaxed and normalcy is restored (see, Klemm and Scherff, 2020).

The transport sector has been hit hard, as well. The number of passengers at the major German airports decreased by nearly 63% in March 2020 on YOY basis. Traffic to and from regions that were (initially) particularly affected by the Corona pandemic declined substantially, e.g., the number of passengers on flights from China and Hong Kong fell by nearly 93%. The number of domestic passengers dropped by close to 69% on YOY basis.

A positive impact of the lockdown measures can be, however, seen in the reduction in the number of road accidents. The SBA reported a drop by 23% in the number of traffic accidents in March 2019 and attributed the decrease to the 'low traffic volume owing to the coronavirus pandemic'. There was also a reported increase of 12.5% in the sale of bicycles, sport articles and camping goods in April 2020 in comparison to the previous month. Overall, the German Environment Agency ('Umweltbundesamt') has observed some positive climate impact resulting from reduction in emission, e.g., through better air quality, but warns that these short-term gains would disappear once the lockdown measures are withdrawn and the 'old normal' returns (Umweltbundesamt, 2020).

German consumers are also increasingly turning to online transactions. According to SBA,

> "Since week 13 (23 to 29 March 2020), double-digit percentage increases have been recorded each week for online transactions in Germany, compared with the same week a year earlier. […] The increase started when the extended social distancing and stay at home orders to fight the coronavirus pandemic entered into force on 23 March 2020. Last week (week 18, 27 April to 3 May 2020), online transactions exceeded the transactions of the same week a year earlier by 50%, according to this new untested indicator."

The socio-economic snapshot provides a short but fairly comprehensive picture of how life has been disrupted in Germany in the wake of COVID-19. We think it is a reasonable assumption that the already well-established need for products, services, technologies and business models that enable a high level of (financial) affordability would be increasing significantly in the aftermath of the corona crisis. For previous investigations into the demand for frugal innovations in Germany, see Tiwari et al. (2017a). An account for Austria is provided in Tiwari et al. (2018). Kroll et al. (2017) have investigated the relevance of frugal innovations in the European context, while there is a multitude of studies for the relevance of frugal innovations in the context of developing and emerging economies (cf., Zeschky et al., 2011; Agarwal and Brem, 2012; Herstatt and Tiwari, 2017).

3.2 Voluntary simplicity: frugality by choice

Even if we are still in the middle of the corona crisis, it can already be assumed that the worldwide consequences will be enormous, both economically and socially. Even if this crisis too has some similarities with previous 'shocks' in terms of its effects, it is also different, and within a few weeks the world has experienced how a quasi-invisible virus has brought to a halt just almost everything that we had taken for granted until then. This crisis has shown how dependent we are all today on globally available products, processes and supply chains and how fragile many industries are when suddenly products and services are no longer produced, offered and demanded. But we have also seen that people around the world are still able to adapt quickly and learn to 'reduce' their lives to elementary, life-sustaining aspects. The effects on the individual level vary widely of course, from existence-threatening to liberating, and depend heavily on the financial and social status.

One thing that the corona crisis has in common with other previous crises such as financial crises, world wars and environmental catastrophes is the observation already mentioned that people usually have to cope very suddenly with considerably less or have to do without things they are used to. This forces them to ration, portion and even share with others. This conscious handling of food as well as other products and services that are suddenly available in much more limited quantities is an expression of a 'frugal life'. Once the crisis is overcome, most people with an affluent background are likely to again seek to catch up with the familiar, previous state of prosperity (to the extent they enjoyed it previously) and consumption. Others may not, especially if they have recognised a (new) meaning in their changed circumstances that they want to take with them into their future. Especially people who tend to see the positive in all situations in life will try to derive a meaningful explanation for what they have experienced and their future and create a positive narrative for themselves (Hamilton and Breithaupt, 2013).

Due to the lockdown, people had been taken out of their routines for weeks and had to reorganise their activities. Suddenly there was also more time to reflect about questions such as 'what is important to me in life' and contacts with one's own family or friends that one had perhaps not taken care of for a long time.

Current surveys on the well-being of the population in Germany, e.g., McKinsey & Company (2020), show a mixed picture. Many people have experienced acute economic hardship as a result of the lockdown (e.g., employees in the catering and hotel industry, tour operators or artists). Other people have experienced no or economically acceptable losses (e.g., civil servants). Many people have found the possibility of working from home and the disruptive change from face-to-face to digital working methods enriching, as commuting and travel times have been virtually eliminated and more net-time is left for the actual work and private matters.

Interestingly, many people have appreciated aspects of the more 'frugal lifestyle', refraining from the usual shopping and spending money for all kind of entertainments, because they have rediscovered or made the experience for the first time in their life that it is possible to cope with much less 'things' and still be happy (Chhetri et al., 2009). It is estimated that today an average European owns about 10,000 personal objects (Maas, 2017). However, these possessions do not bring only joy, they also cause a burden to more and more people (Paech, 2012); especially in times of moving or when housing conditions change, e.g., when older people have to give up their homes. More and more young people are questioning the meaningfulness of possessions and are consciously

reducing their belongings to a minimum (BrightSide, 2016). In this context, perhaps the success of the various shareconomy offers should be understood (Bachler and Franz, 2014; Belk, 2014; Hesseldahl, 2017).

What else can explain, why more and more people enjoy a frugal lifestyle? One further explanation might be that today many people in the economically developed world not only have everything or even much more than they need but the purchase and consumption of (more) products only gives them a short-term satisfaction, if at all (cf. Chancellor and Lyubomirsky, 2011). This is not really a new insight, of course, but rather the realisation-essence of Buddhism, for example, which has at times inspired ideas like 'Buddhist economics' (cf. Schumacher, 1966; Zsolnai, 2008). For a discussion of frugality in the context of ancient India, see Tiwari (2017). A global perspective can be found in Michaelis (2017) and Tiwari et al. (2017b). Witkowski (2010) provides an account of frugality discourse in the USA.

But human experience has also shown time and again how quickly the realisation of being happy and content with little is quickly forgotten in times of abundance (Galbraith, 1958). But do we really live in abundance? In terms of the overall ecological composition of the world, this can be hardly the case. But after all, due to the imposed lockdown, many people with affluent background, especially but not exclusively in the western, economically advanced world may have made such an experience for the first time. People experienced that 'less can be more' and that one can be even happier with much less spending for things, we eventually do not need anyway. This is also in line with research that reports an increasing feature fatigue, and calls for more simplicity as a sign of quality that emanates from reducing (avoidable) complexity.

The conscious reflection on what we need and the resulting decisions (purchase, consumption and disposal) is generally something very positive, because it sensitises us to treat ourselves, others and the environment, responsibly. We call this a frugal lifestyle (Tiwari et al., 2017b). In our understanding, a frugal lifestyle is the result of an active decision-making process in the spirit of voluntary simplicity and modesty, which sets a conscious counterpoint to a life determined by unhealthy consumption that is unhealthy for humans, animals and the environment (cf. Elgin, 1981; McGouran and Prothero, 2013). In this sense it is our own positive narrative, our positive footprint. In this understanding there is little room for products that endanger the health of humans, animals, and nature.

Frugal lifestyle, however, does not mean bare renunciation of everything possible, but conscious consumption. A frugal lifestyle should not be equated with the notion of anti-consumption that actively tries to not consume resources. A study by Michaelis (2017) puts forth a perspective that:

> "[…] frugal individuals are not anti-consumerist at all, but instead have a tendency to conserve already owned resources and put forth increased mental effort in making sure that newly acquired resources are of the best value. This regulation between conservation of existing resources and getting the best value when acquiring new resources during the venture creation process is a learned skill, reinforced over time. Thus, a frugal person may consume as much as a non-frugal person; it is how they consume resources, which differentiates the frugal from the non-frugal consumer." [Michaelis, (2017), pp.2–3]

This understanding of frugal lifestyles can have a high level of compatibility with the concept of circular economy. A circular economy is a regenerative system in which resource use and waste production, emissions and energy wastage are minimised by

slowing down, reducing and closing energy and material cycles; this can be achieved through durable construction, maintenance, repair, reuse, remanufacturing, refurbishing and recycling. Recycling is usually the means of last choice (Geissdoerfer et al., 2017).

The current discussion in connection with the corona crisis is understandably driven by the question of how to minimise negative economic and social effects. Many companies are looking for ways that lead back to the 'old normal'. Car manufacturers, for example, are developing incentive programs to motivate consumers to buy more cars again. Companies are looking for ways to reduce their procurement, production and distribution costs so that they can be competitive while reducing their reliance on global supply chains. These measures are still driven by the idea that production and consumption are determined by efficiency and mass production.

Today, economic growth at national level is still measured worldwide by increases in gross national product and GDP. However, this yardstick is not conducive to achieving climate goals and conserving resources. This insight is not new either (see, e.g., Meadows et al., 1972), but the current crisis is opening up once again and perhaps the last realistic opportunity to initiate necessary changes to 'save the world' with the relaunch of the global economy.

Any relapse into old patterns (the 'old normal') carries the inherent danger that countries and industries will continue to produce too many products that are unhealthy in the widest sense and which nobody really needs, thereby causing lasting, irreparable damage to the environment. For example, a good third of the textiles produced worldwide, mostly under questionable, and sometimes inhuman conditions, are never sold to end-consumers and are later even destroyed, while the cost of production, shipment and disposal are borne by consumers, and the excessive use of natural resources leads to negative effects for nature.

So if we want to see an opportunity in the current crisis to create a better, 'new normal', it would require a radical rethink of consumption and production taking frugality across whole value chains into consideration. Consumption would be characterised by a high consensus supported by society as to what we as the worldwide community of human beings need to and can afford without compromising the health of people, animals and the environment (Galbraith, 1958; WCED, 1987). The guiding principles of this economic approach are characterised by voluntary simplicity and affordability, green excellence in all stages of value creation in the spirit of the circular economy (Drabe and Herstatt, 2016; Geissdoerfer et al., 2017).

4 Transition to Frugality 4.0

This section at first presents briefly the case of blue movement from the Netherlands, which seems to have a large overlap with the concept of 'affordable green excellence' and thus with frugal solutions. This is followed by a discussion on a new approach to frugality and our understanding of affordability.

4.1 Example of blue movement

The company Bosch-Siemens Hausgeräte (BSH) has implemented an innovative business model, called 'blue movement', in the Netherlands that does not require the usual sale of

its products. It is fully in line with the idea of the circular economy. Blue movement provides consumers with high-quality household appliances on a temporary basis for individual use for an affordable rental fee. This rental fee is financially attractive and consumers do not have to worry about expensive basic purchase costs, maintenance, service and disposal. BSH retains product ownership and, therefore, collects the rented products back at the end of the contract period along with all parts, components and the underlying raw materials.

Since the product is virtually only outsourced to the user for the duration of the lease, this ensures that all materials used in the household appliances can be recycled again. This, in turn, is an incentive to use only the best materials from the outset, in the sense of subsequent reuse. It is also an incentive to create robust machines including parts that last for long periods and are not artificially aged in the sense of planned obsolescence which seems to the more typical case with such products (Slade, 2007; EESC, 2013).

In this business model, the consumer does not buy a washing machine, but rather washing cycles. This relieves him at the time of the purchase decision not only financially but also mentally, as he does not have to worry about any problems that are usually associated with ownership. Such machines are 'naturally' configured to the needs of customers, are robust and maximum eco-friendly. This combination of design excellence, affordability and ecological sustainability can be called frugal design (Herstatt and Tiwari, 2015).

The example of blue movement also shows the connection between circular economy, cradle to cradle (C2) and the frugal life style we have outlined earlier (Herstatt and Tiwari, 2015; Drabe and Herstatt, 2016). In connection with 'eco-correct' behaviour, consumers are often asked to generally renounce from the use of products. But this is not really necessary, consumers decide themselves how often they wash. The difference lies in the fact that this behaviour is not environmentally problematic, apart from the used water, which can be recycled. The point is to let people do what they want, but to provide them with products and services so that their behaviour does not cause environmental damage and overuse of resources. This is the core idea of C2C, but the motives customers drive to buy such healthy products have at least partly remained in the dark. Our concept of frugal life style is helpful here, because it is based on the active decision of people to reflect and adapt their previous consumer behaviour to the betterment of the world and their positive footprint-narrative. She is looking for simple, functional solutions that do not burden him further, and only give him what she is looking for at the moment of the 'buying' decision. This is also where the hedonist is served, if the product provided to him fulfils his needs for status and luxury without burdening him with future costs for maintenance/service, repair and resale/recycling. Products must be designed to last, but in accordance with the C2C principles.

4.2 A new approach to frugality

Frugality as defined by a considerate and prudent use of resources has been seen as a 'virtue' in much of the lifespan of humanity and by the most major world religions and philosophies (cf., e.g., Bouckaert et al., 2008). It was the Great Depression in the 1930s, where consumer frugality was made responsible by some for the economic downturn and companies were called upon to introduce planned obsolescence (cf. London, 1932).

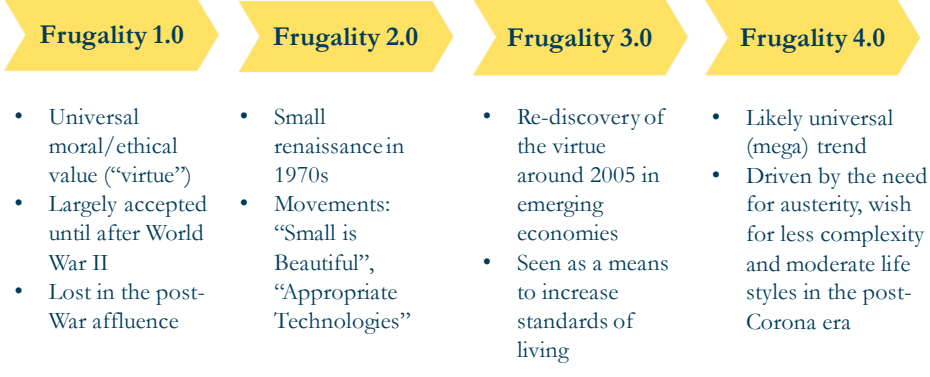
In the era of affluence and market-saturation after World War II more and more companies embarked on a path to promote consumerism and the prosperity of consumers

allowed to establish a negative narrative of an erstwhile virtue. A study of the frugality discourse in the USA by Witkowski (2010) during six different periods of the US history has shown changing perceptions of frugality. For example, in the late colonial times people "showed virtue by exercising self-restraint in the consumer marketplace" [Witkowski, (2010), p.46]. In the course of time frugality, thus, received a negative connotation of being associated with cheap products or miserly people, negating its original meaning of efficient and effective use of resources and thus being in the golden middle, which Adam Smith has expressed so beautifully in his *Theory of Moral Sentiments*:

> "[..] the virtue of frugality lies in a middle between avarice and profusion, of which the one consists in an excess, the other in a defect of the proper attention to the objects of self-interest." [Smith, (1759), p.274]

The concept of frugality seems to have undergone various phases in the societal discourse, see Figure 1. These phases have been described in greater detail elsewhere (Tiwari et al., 2017b; Tiwari, 2019; Tiwari and Herstatt, 2020). Here it may be sufficient to point out that the global society seems to be experiencing the fourth renaissance of frugality that we call 'Frugality 4.0'. The Frugality 4.0 paradigm is likely to be boosted by voluntary simplicity that seems to be setting-in in certain segments of the society. In conjunction with need for products, services, technologies and business models that are financially affordable, ecologically responsible and continue to provide technological excellence, Frugality 4.0 may well turn into a global mega-trend.

Figure 1 Transition of frugality in the societal discourse (see online version for colours)



Source: Own illustration based on discussions in Tiwari et al. (2016), Tiwari (2019), and Tiwari and Herstatt (2020)

This new approach to frugality is centred around a multi-dimensional and much more comprehensive approach to affordability. While most people and also research scholars of frugal innovation, including the authors of this paper, have previously associated affordability generally with the monetary capacity of the consumer to pay for a particular product or service see, e.g., (Singh et al., 2011; Tiwari and Herstatt, 2012; Weyrauch and Herstatt, 2017), recent research suggests that the concept of affordability in the context of frugal innovations must be transformed into something more wide-ranging and inclusive to ensure its own longevity and broader acceptance (Tiwari and Herstatt, 2020; Tiwari, forthcoming).

According the *Oxford English Dictionary* (Fowler et al., 1995), the term 'affordability' has its roots in the verb 'to afford', which can be understood as being 'in a position to do something (esp. without risk of adverse consequences)'. This understanding, to be able to use/own something without risking adverse consequences, lies at the core of the new approach to frugal innovations, as shown in Figure 2 and elaborated in the following:

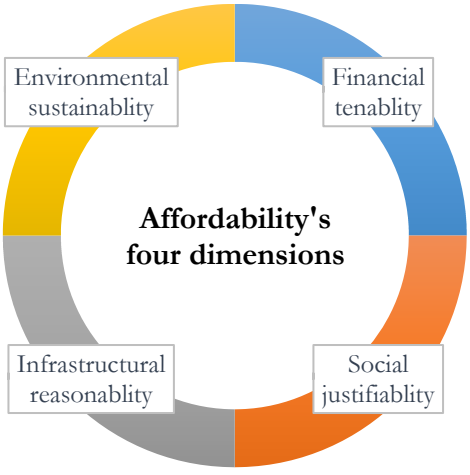
- *Financial tenability:* Monetary affordability remains a core criterion for frugal products, services, business models and technologies. It is, however, not important that the price point of a frugal product is necessarily lower than a comparable substitute product because it is not the selling price at the point of purchase per se, but the total cost of usage and/or ownership spread over the entire product lifecycle, including costs of purchase, usage, maintenance and disposal, that determines financial tenability of an innovative solution.

- *Social justifiability:* Innovative solutions that are based on frugality must be justifiable in a social context (Banerjee and Duflo, 2007; Karnani, 2009). For example, the state acts to positively incentivise diffusion of products that cater to greater societal good, while it imposes negative incentives on diffusion of products that it believes to have negative consequences for social welfare, e.g., tobacco products, alcohol or weapons. While developing frugal solutions, therefore, the focus should not be on creating cheaper products across all categories, but especially in those that are associated with public welfare, or at least those that do not negatively impact public welfare by counteracting against (welfare) objectives pursued by the state policy.

- *Infrastructural reasonability:* Technologies, products, services or business models that are created as frugal solutions must be careful not to make 'unreasonable' demands on the infrastructural prerequisites for their use. If new infrastructural conditions have to be created first for being able to use an innovative solution and those conditions are either prohibitively expensive and/or simply not possible in a given use-context, then the solution cannot be considered affordable for those users. For instance, if in a given region there is no access to stable electricity then trying to sell an electric car at a financially affordable price point cannot be considered a frugal solution. A frugal product should be able to circumvent infrastructural deficiencies of the target customer group and only make demands that can be met without jeopardising its overall affordability.

- *Environmental sustainability:* Frugal solutions must be responsible in the use of natural resources, as being wasteful of resources does not only violate the very principle of frugality, but it also endangers social welfare if cost reduction is merely used as a means to foster consumerism, leading to new problems such as rebound effects and planned obsolescence. The known example of ultra-cheap shampoos and other products sold in small sachets at the bottom of the pyramid is a good example of how such products can create environmental problems, e.g., in rural areas with little or no waste collection and recycling facilities (Karnani, 2007).

Figure 2 Four core dimensions of affordability in the context of frugal innovations (see online version for colours)



Emerging research, see, e.g., Agarwal et al. (2020), Ahuja and Chan (2020), and Tiwari (forthcoming), shows that it is possible to cater to all these dimensions of affordability while striving for technological excellence. Specially, new possibilities that emerge from the digital transformation in the society, e.g., artificial intelligence, big data and telecommunication technologies in general, hold the potential of enabling affordable green excellence.

5 Discussion and summary

Objective of this discussion paper was twofold: First, we assessed the likely impact of the corona crisis on the economic and societal choices of people; and second, we contextualised that impact in the field of innovation management. Taking a normative-conceptual perspective we sought to understand in how far frugality and frugal innovations can play a role in better managing the after-effects of the corona crisis and what implications arise out of this for the societal stakeholders, especially for corporates, policy makers and consumers.

The discussion in the previous sections has shown the importance of a finding a 'new normal' that should be based on a conciliatory approach in:

a ensuring an affordable access to products and services to the population

b society's consumption of natural resources

c striving for technological excellence.

This model can be characterised as 'affordable green excellence'. Based on the considerations in the previous sections, we make five core propositions for future research and policy measures:

1 Frugality, as defined by Frugality 4.0, is likely to develop into a global major trend, which would be driven by the necessity of having 'affordable green excellence'. This trend is likely to be co-shaped by voluntary simplicity on part of at least some consumer groups as well as by regulatory/normative approaches to product development.

2 Frugal innovations, as defined by 'affordable green excellence' would be necessary to deal with the challenges of the post-corona society, and to reach sustainable development goals including in the economically advanced nations.

3 Digital transformation will act as a key enabler of affordable green excellence. It will further reduce the role of geographical distance and the need for having economies of scale so that also small and medium-sized enterprises can partake in the avenues for frugal solutions.

4 The overlap of frugal innovations with the principles of circular economy could act as a driver for the latter, and environmental sustainability can only be achieved when it is married to the concept of frugality.

5 There would be an increasing need for a normative approach on frugal innovations. Interventions by the policy maker are needed to drive this transformation. Policy measures can include incentives such as preferential treatment in public procurement, support for repair-enabling product architectures, better funding opportunities for 'market-pull' innovations as opposed to the current paradigm of 'technology push' inventions, and for products that target a longer product life while shunning planned obsolescence.

Recently, *The Economist* (May 12, 2020) published an article, which said that "[t]hroughout history, pandemics have had profound economic effects," and the overall impact in the long-term does not necessarily have to be dreadful (*The Economist*, 2020). Connecting to this thought, we believe that if the society can take a turn to the 'new normal' and strive for affordable green excellence, then the corona crisis could also be used for something positive, despite the irreparable human and financial costs already incurred. We would like to conclude this paper by quoting Michaelis (2017, p.1) who has proposed that:

> "frugality has been used throughout history as a way for countries to bounce back from economic hardships following war and periods of economic decline."

There is no reason to presume that the corona crisis is an exception to that rule.

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Notes

1 COVID-19 is a short form for 'coronavirus disease – 2019'. The virus carries the official name 'coronavirus SARS-CoV-2'. More details can be found, e.g., in the glossary of the German Center for Infection Research (DZIF, 2020).

2 The speed of new infection continued to be very high: by early morning of June 15, 2020 (04:33 CET), The COVID-19 dashboard of the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University, was already showing 7.9 million confirmed cases of infections and close to 433,066 deaths.

3 Own construction based on CSSE (2020), stand: June 6, 2020, 09:33 CET; the data related to GDP is taken from the IMF's World Economic Outlook of April 2020 (see, IMF, 2020).

4 For the sake of better legibility, we do not provide reference to each data item cited in this section. All data cited in this section, unless specified otherwise, is sourced from Germany's Federal Statistical Office ('Statistisches Bundesamt'), which has created a dedicated website with collection of corona-related press releases (see, Statistisches Bundesamt, 2020b). The snapshot is partly based on provisional data that is subject to change.

5 For an account of workers' conditions in the textile and clothing sector, see European Parliament (2014).

6 Information has been collected, unless specified otherwise, from the company websites. Especially see [online] https://www.bosch-home.nl/bosch-ontdekken/bluemovement (accessed 9 June 2020).

7 There have been interesting studies in Germany to investigate patterns of planned obsolescence of products; see, for instance, Deutscher Bundestag (2013), Schridde et al. (2013), Schridde (2014), and Musall (2015).

9 Own illustration based on discussions reported in Tiwari (2019) and Tiwari (forthcoming); a circular approach is proposed to signal that all of these dimensions are important and that there is no ascertained basis for proposing a hierarchy of dimensions at this stage, especially because the dimensions can be seen as being interrelated.

10 In this connection, see, e.g., policy recommendations of the Austrian Council (RFTE, 2018) that are based on a study conducted with participation of the authors of this paper (Tiwari et al., 2018). Kroll et al. (2017) have made policy recommendation for the European Union, while Kalogerakis et al. (2017) have made policy recommendations for Germany. For the need and viability of a regulatory approach in promoting simplicity, also see Herring (2016).