Ecosystem effectuation: Creating new value through open innovation during a pandemic

R&D MANAGEMENT

Ecosystem effectuation: creating new value through open innovation during a pandemic

Agnieszka Radziwon[1,2,*], Marcel L.A.M. Bogers[1,3,4], Henry Chesbrough[1,5] and Timo Minssen[6,7]

[1]Haas School of Business, University of California, Berkeley, Berkeley, CA USA. agra@berkeley.edu, m.l.a.m.bogers@tue.nl, hesbrou@berkeley.edu
[2]Department of Business Development and Technology, Aarhus University, Herning, Denmark. agra@berkeley.edu
[3]Innovation, Technology Entrepreneurship & Marketing (ITEM) Group, Eindhoven University of Technology, Eindhoven, The Netherlands.
[4]Department of Food and Resource Economics (IFRO), University of Copenhagen, Copenhagen, Denmark. m.l.a.m.bogers@tue.nl
[5]Maire Tecnimont Professor of Open Innovation, Luiss University, Rome, Italy. hesbrou@berkeley.edu
[6]Faculty of Law, Center for Advanced Studies in Biomedical, Innovation Law (CeBIL), University of Copenhagen, Copenhagen, Denmark.
[7]Faculty of Law, Lund University, Lund, Sweden. timo.minssen@jur.ku.dk

The severity of the COVID-19 pandemic confronts us with a global grand challenge representing an unprecedented crisis for health, economies, and societies. While digital champions are thriving, a large number of businesses and industries have been facing radical uncertainty, pushing some to the edge of collapse. This emergency calls for new ways to look at organizational ambidexterity and business model innovation. In this paper, we present and discuss a unique case study of a low-cost airline, AirAsia. With their fleet of aircraft grounded, and unable to pursue any incremental innovation opportunities, AirAsia decided to follow a radical ambidexterity path – focusing on exploration by building an innovation ecosystem. This case not only offers insights on a novel way to create value through open innovation but also extends the body of knowledge on entrepreneurial effectuation by introducing the concept of an ecosystem effectuation. AirAsia's case shows that, in financially distressed times, business model reconfiguration may not be enough, and instead of selecting means to attain goals, the goals may be created upon available means.

1. Introduction

The COVID-19 pandemic caused an unprecedented crisis for global health, economies, and societies. The formulation of new courses of actions was (and still is) fundamentally difficult due to a radical uncertainty of its consequences, which are ex ante unknowable (Wiltbank et al., 2006; Townsend et al., 2018). This radical uncertainty forces decision-making that extends far beyond being adaptive to

changes in the environment and balancing resource allocations between current and future businesses typically associated with organizational ambidexterity (Tushman and O'Reilly, 1996; Raisch et al., 2009). Instead of following a causation logic and selecting means to attain goals, the goals may be created upon available means following the effectuation logic (Sarasvathy, 2008; Berends et al., 2014). The severity of the crisis demands managerial approaches that will help organizations and entire industries to effectively respond to the pandemic while maintaining a growth infrastructure for the future (Chesbrough and Garman, 2009; Chesbrough, 2020). Engaging the ecosystem provides a critical resource for achieving this, way beyond well-known creative destruction and creative accumulation (Li-Ying and Nell, 2020).

Radical uncertainty used to be inherent to the entrepreneurial innovations (Sarasvathy, 2001; Grégoire and Cherchem, 2020) that led to the success of many large companies today. Suddenly, the pandemic pushed many of these well-established companies back into their entrepreneurial roots. Unable to ascertain their 'best' response, they chose instead to identify the best next step by assessing the available resources, which could help to achieve their goals (Sarasvathy, 2001; Townsend et al., 2018). Previous research highlights the importance of exploration strategies, which could help companies in financial difficulties to get out of the crisis (Osiyevskyy and Shirokova, 2020). However, the pandemic challenges exploration and exploitation strategies discussed in management literature over the past years (Raisch et al., 2009; O'Reilly and Tushman, 2013). Completely new and still unexplored in the literature is, e.g., the inability to employ exploitation strategies when an entire market disappears in pandemic lockdown.

A large body of literature in strategy (Burgelman, 2002; Monteiro and Birkinshaw, 2016) and innovation management (Jansen and Van Den Bosch, 2006; Alexiev et al., 2010) offers insights into how to organize for and implement exploration strategies in balance with exploitation. Before the COVID-19 pandemic, large companies would typically spin-off architecturally separated units dedicated to exploration (O'Reilly and Tushman, 2013). These units would have a distinctive and specifically designed business model, which, if successful, could lead to a business model reconfiguration of the incumbent (Massa and Tucci, 2013). In the face of the COVID-19 outbreak, these actions were insufficient to address the depth of the crisis. In many cases, developing the business model in line with the open innovation model, which relies on purposively managed knowledge flows across organizational boundaries, may help to accelerate such processes (Chesbrough and Bogers, 2014). This begs two questions: How can organizations effectively respond to a pandemic, and what role might open innovation play in that response?

To address these questions, we have looked for established companies that had to find completely new ways out of the crisis. The selection of a unique case (Siggelkow, 2007) of a champion in its league,[1] severely hit by the pandemic,[2] which nonetheless successfully pivoted to become a digital lifestyle company, helped us in better understanding and explaining a novel way of responding to a pandemic. The counterintuitive response to the pandemic offered by AirAsia, a Southeast Asia-based low-cost airline with its main HQ in Malaysia, not only helped the company to survive the pandemic but enabled the company to harness the crisis to accelerate a digital transformation that was already begun.

Through abductive theorizing, we further explore the notion of leveraging open innovation by an 'inside-out' development of an innovation ecosystem. The analysis of the AirAsia case led us to effectuation theory (Sarasvathy, 2001, 2008), which helps us in explaining the transformation taking place in a large firm (as opposed to a startup or SME (Berends et al., 2014)) and at the same time to respond to the call for studying the new theory of entrepreneurship from higher levels of analysis (Arend and Sarooghi, 2015). By building an ecosystem of companies openly collaborating and supporting one another, the low-cost airline champion transformed into a digital lifestyle company. To further explain this strategic change, we coin the term 'ecosystem effectuation', which we define as *an approach to making decisions and performing actions in the ecosystem emergence and legitimization process when* [similarly to the entrepreneur] *the ecosystem orchestrator identifies the best next step by assessing the available resources, which could help to achieve the ecosystem's goals*.

Our findings offer a new way to think about value creation outside of existing organizational boundaries by designing a completely new ecosystem business model and legitimizing it (Thomas and Ritala, 2021). In the absence of exploitation opportunities, which in turn hindered the business model reconfiguration process, AirAsia's collaborative efforts focused their activities on building the innovation ecosystem, even as they struggled to survive themselves. The AirAsia case outlines how, by recombining and repurposing the assets, reframing the scope of operational activities, and leveraging synergies among the ecosystem partners, companies could find a way forward to adapt to new realities. This new way extends the strategic portfolio of inside-out open innovation moves

proposed by Chesbrough and Garman (2009) and also introduces firm-level business model innovation constructs (Massa and Tucci, 2013) to the ecosystem level.

The outline of this article is as follows. Section 2 reviews the research on the organizational responses and strategic moves that organizations can undertake to effectively respond to lean economic times caused by crises. Section 3 covers the research methodology. Section 4 presents the case study and highlights the main findings. Section 5 offers a concluding discussion of limitations and a further research outlook.

2. Theoretical background

In response to abrupt global crises, such as a pandemic, firms need to rapidly adapt to new circumstances. Organizational ambidexterity, often viewed as a way to adapt and reconcile exploration and exploitation, has been perceived as a prerequisite of organizational survival and success (March, 1991; Tushman and O'Reilly, 1996; Raisch et al., 2009). Earlier smaller-scale crises informed management theory about firms' approach to tackling or even taking advantage of uncertainties. One of the first strategic choices that firms face in a crisis is to consider whether to employ exploration or exploitation as a response to the economic crisis (March, 1991; Gupta and Smith, 2006; Ngo et al., 2019). The exploration covers *'search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation'* in contrast to exploitation defined as *'refinement, choice, production, efficiency, selection, implementation and execution'* (March, 1991, p. 71). Even though exploitation may enhance short-term performance, exploration could help firms in increasing their ability to renew their knowledge base, which could address the potential shortcomings of inadequate responses to environmental changes (Leonard-Barton, 1992; Ahuja and Morris Lampert, 2001). This, however, entails a risk of entering a cycle of search and unrewarding change (Volberda and Lewin, 2003), which is specifically relevant during global emergencies, such as a pandemic. Studying a recent crisis in Russia, Osieyvskyy et al. (2020) argued that firms should explore rather than exploit ways to capitalize on a crisis when facing a severe revenue decline along with falling financial performance. However, the COVID-19 pandemic is different from previous financial crises. It is much more severe and diverse in limiting firms' exploitation opportunities, which destabilizes airline,[3] hospitality,[4] automotive,[5] and other industries. Lockdown measures devastated the underlying demand for these industries, and industry participants cannot know ex ante how long these measures will continue.

Changes in the business environment could be a strong motivation for exploring new business opportunities (Sund et al., 2016) that could consider both business design for new companies and business model reconfiguration of established firms (Massa and Tucci, 2013). Despite multiple barriers related to business model innovation, Chesbrough (2010) calls for the adoption of an effectual attitude toward business model experimentation. Following this suggestion, we tap into the theory of effectuation (Sarasvathy, 2001). Originally coined as an entrepreneurial action process theory (Arend et al., 2015) inspired by studying expert entrepreneurs, the effectuation theory explains the logic of floating goals and resource recombination that drives the evolution of the startup strategy through actions that identify the best next step. Effectual entrepreneurs do not plan or strategize about the future; instead, they enact it and learn from it while doing so. Following Sarasvathy (2008), expert entrepreneurs follow several specific principles of effectuation in the face of their decision-making process (see Table 1).

Building on the general principles of effectuation, the most important similarity between the entrepreneurial and ecosystem effectuation (see Table 2) is that in both cases the formulation of the course of (prediction based) actions becomes fundamentally difficult – if not impossible – because the conditions and/or factors of success are ex ante unknowable (Townsend et al., 2018; Grégoire and Cherchem, 2020). The questions that the entrepreneur and ecosystem orchestrator asks themselves are the same and center on the already possessed or ready to mobilize means, resources, and capabilities. During a pandemic crisis, the business environment changes in a highly unpredictable manner, making it hard for an ecosystem orchestrator to carefully plan and execute the process of achieving their set goals. Instead, the path forward is to observe, experiment, measure, and adapt (Chesbrough, 2010). That is why both an entrepreneur and the ecosystem orchestrator try to engage the world with the possessed means and convince others (both people and organizations) to join in these efforts (Sarasvathy, 2004; Sarasvathy et al., 2008; Sarasvathy and Menon, 2013). What sets entrepreneurial and ecosystem effectuation apart is not only the main action driver but also the locus of constraints. Unlike an entrepreneur, a large company operates in a relatively high means, resources, and capabilities context – building the ecosystem is a way to mobilize additional resources.

One way to extend the range of possibilities in testing new business models is to follow an open

Table 1. Principles of effectuation (Sarasvathy, 2008, pp. 15–16)

The patchwork quilt principle	'This is a principle of means-driven (as opposed to goal-driven) action. The emphasis here is on creating something new with existing means than discovering new ways to achieve given goals.'
The affordable loss principle	'This principle prescribes committing in advance to what one is willing to lose rather than investing in calculations about expected returns to the project.'
The bird-in-hand principle	'This principle involves negotiating with any and all stakeholders who are willing to make actual commitments to the project, without worrying about opportunity costs, or carrying out elaborate competitive analyses. Furthermore, who comes on board determines the goals of the enterprise. Not vice versa.'
The lemonade principle	'This principle suggests acknowledging and appropriating contingency by leveraging surprises rather than trying to avoid them, overcome them, or adapt to them.'
The pilot-in-the-plane principle	'This principle urges relying on and working with human agency as the prime driver of opportunity rather than limiting entrepreneurial efforts to exploiting exogenous factors such as technological trajectories and socio-economic trends.'

Table 2. Similarities and differences between entrepreneurial and ecosystem effectuation (inspired by Grégoire and Cherchem (2020))

	Entrepreneurial effectuation	Ecosystem effectuation
The nature of the action	Human (entrepreneurial) action	Organizational and inter-organizational action
The main action driver	Entrepreneur	ecosystem orchestrator
Resources level	Low	High
Uncertainty level	High/radical	High/radical
Management complexity	Low	High
Organizational size	Small	Large
Bottom line goal	Survival	Survival
Market type	Existent and non-existent	Non-existent or not-yet-existent
Innovation focus	Incremental and radical	Radical
Mobilization of resources	Through one's network	Through an ecosystem

innovation logic and consider involving external stakeholders in the process of shaping the model. In addition to shaping possible experiments by the focal firm, an ecosystem may also help to explore new avenues by receiving a spin-out project that the focal firm no longer directs (Chesbrough and Garman, 2009). If successful, this could either scale outside the firm or be taken back inside the firm as it switches from an old to a new business model (Chesbrough and Bogers, 2014).

In a major downturn, which typically follows a crisis, innovation spending gets hit very hard. Costs must be reduced, yet a severe cost-cutting approach may impair a firm's ability to innovate again when the markets recover. Chesbrough and Garman (2009) tried to capture a set of five open innovation inside-out moves that focus on continuous investment in the firms' innovative capabilities during the time of economic turndown. In particular, they highlight the inside-out aspect of open innovation as the way to refocus the firm by placing some of its assets and projects outside of its walls to sustain the growth infrastructure. This approach reduces current costs while preserving the ability to grow faster when the market recovery is underway. Like Sarasvarthy's (2008) effectuation principles, these inside-out moves involve existing means (assets, in Chesbrough and Garman's (2009) parlance). There is also the sense of urgency found in the bird-in-the-hand principle, as these moves are explored with those already in the ecosystem of the focal organization, such as current partners, customers, or suppliers. The pilot-in-the-plane principle applies both figuratively, through the use of existing actors to do new things, and literally, as some of these repurposed resources in the AirAsia example were in fact pilots.

The growth options proposed by Chesbrough and Garman (2009) provide a framework for getting the greatest value from firms' research initiatives during the lean times while retaining some optionality for the future (see Figure 1 outlining all 5 moves). In particular, they advocate for maintaining interesting projects (Move 1), ideas (Move 5), and non-strategic initiatives (Move 2) by first moving them outside of organizational boundaries into the firm's surrounding ecosystem. The same applies to making the intellectual property (Move 3) work for the firm and maintaining and growing its ecosystem (Move 4) by building on potential innovation partners. This framework specifically addresses the lean economic times caused by a financial crisis, yet the moves can also be relevant for the likely revenue decline that will result from a pandemic.

3. Methodology

To best showcase novel ways to curb the effects of the pandemic, we use a unique case study design (Yin, 2009) and focus on the abductive theorizing of the case of AirAsia, whose reaction to the pandemic does not fit with prior theoretical expectations and wider empirical patterns (Yin, 2009). The airline industry is one of the most severely affected industries by the COVID-19 pandemic,[6] and according to the International Air Transportation Association (IATA),[7] it is not expected to return to the 2019 levels until 2024 at the earliest. This continues to have a significant negative influence on the revenue and financial performance of all related businesses. Worldwide governmental lockdown restrictions caused most of the airline industry to cease operating most of their flights. Moreover, within this setup, the most natural decision of any airline would be to seek support on the national level to make sure that once the pandemic is over it will be able to resume its operational activities. An alternative path would be to consider introducing new offerings within the current operational activities (see 'Flight to nowhere'[8] offered by Qantas Airlines), which exposes the airlines to additional reactions from environmental activists. Instead of following any of these paths, as a result of the crisis, AirAsia transformed its business into an ecosystem of digital lifestyle companies that openly collaborate and support one another in the process of creating and testing new value propositions.

Given the nature of this context, this particular reaction of the AirAsia airline was highly counterintuitive, which provokes thoughts and new ideas (Siggelkow, 2007). AirAsia, a champion in its industry, did not have much more to optimize even before the pandemic, which completely ruled out other potential incremental adjustments to the pandemic. This made their situation even more extreme than in the case of other airlines.

As the pandemic put significant pressure on the airline business, we decided to base the data collection on online archival data (e.g., media articles, press releases, and online videos) from publically available data sourced through, inter alia, Nexis Uni and Factiva. We complemented these with AirAsia keynote presentations focusing on its digital journey (in April and October 2020). To ensure the data accuracy and validity, we triangulated the evidence between the co-authors' team and incorporated feedback provided by the AirAsia Group President. These steps ensured a good understanding of the decision-making process and actions performed by the company (Eisenhardt, 1989; Yin, 2009). The analysis process started with mapping important events and activities undertaken by AirAsia before the pandemic, which were already influencing the development of its innovation ecosystem. After the pandemic hit, we mapped the company's newly established ecosystem with the support of the AirAsia Group President, along with all the roles and activities carried out by each of the ventures, which directly contributed to new value propositions for the ecosystem participants. The collected data allowed us to capture a large number of emerging initiatives that, having been launched, are still under development as of the time of this writing.

4. AirAsia Group – the day before the pandemic

> Pre-COVID situation we flew 600 million guests (…) we had over 516 million people in our database (…) 160 destinations and over 280 aircraft (…) we carried over 100 million guests (…). So we were big. (Omar, 2020a)

The success story does not start with the first day of the pandemic (see the pre-pandemic timeline in Figure 2).

It is an effect of a series of risky strategic investments that began before the pandemic. AirAsia's transformation from an airline into a travel technology company to exploit data and offset cyclical volatility in airline earnings started in 2018 when it received the World's Best Low-Cost Airline award

Move 1: Become a customer or supplier of your former internal projects	**Move 2:** Let others develop your nonstrategic initiatives	**Move 3:** Make your IP work harder for you and others	**Move 4:** Grow your ecosystem, even when you are not growing	**Move 5:** Create open domains to reduce costs and expand participation
IF your business is pursuing an important capability that it can neither afford to develop itself nor acquire on the open market, *and* others in or beyond your industry also covet the capability…	**IF** your business is refocusing on its core activities *and* you've identified adjacent, complementary initiatives that drain too much attention, time, and capital but that might attract outside interest and investment…	**IF** a lot of your company's intellectual property sits on a shelf and generates no direct financial benefit *and* you understand that its value, to you and to others, will dissipate unless it is continually developed…	**IF** your company is an active innovator, continually engaging with its customers, collaborators, industry experts, trade associations, and others to identify future opportunities…	**IF** your internal ideas are likely to attract interest from valuable outside communities, potentially creating breakthrough advances or even changing the game within your industry…
THEN join with those others to fund, develop, and launch it as an independent business, and become its first customer.	**THEN** spin them out to investors who can take over the development burden. Others will fund the progress, and you can keep some equity in case they make it big. You can even reacquire the best ventures.	**THEN** let outside partners benefit from what you've created, continue its development, and pay you licensing fees. Many businesses recover 10% to 20% of their annual R&D spending in this way.	**THEN** build on your ecosystem of potential innovation partners. Be like Major League Baseball general managers, who always know which team will be interested in which player at what price.	**THEN** consider establishing open domains that either exchange information and ideas or provide shared facilities and services.
EXAMPLE Eli Lilly turned an internal project whose goal was to create a superior process for sourcing ideas and expertise for new-drug development into an independent venture that eventually became InnoCentive.	**EXAMPLE** Lucent Digitial Video was built upon technology that Lucent initially judged to be nonstrategic. Putting it up for adoption helped Lucent focus on its core. Once investors proved there was a strong global market for digital video encoders, Lucent brought the technology back inside.	**EXAMPLE** Faced with intense competition in the semiconductor business, Royal Philips Electronics shifted its strategic focus, stranding a wide range of innovation initiatives. It has developed a thriving licensing business around its more than 60,000 patents and has spun out nearly two dozen new ventures.	**EXAMPLE** Unilever has an incubation process that develops ideas either for internal placement in suitable business units or for potential spin-off as turnkey ventures. One spin-off, a purveyor of personalized wellness counseling called MiLife, delivers added value as a platform for advertising Unilever products.	**EXAMPLE** Philips turned its R&D facility in the Netherlands into an open campus, home to more than 7,000 researchers from a dozen other companies. Once a cost center and now a profit center, the campus expands the company's ecosystem and encourages knowledge sharing among the tenants.

Figure 1. Five open-innovation moves adapted from Chesbrough and Garman (2009).

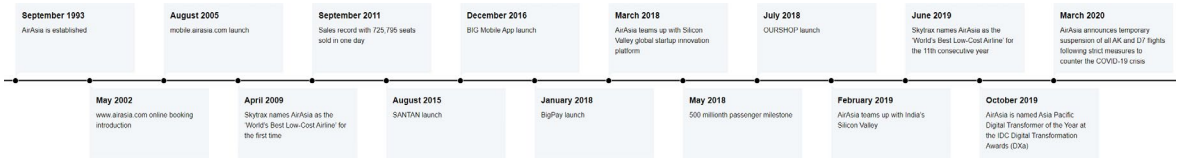

Figure 2. AirAsia Pre-pandemic timeline.

(according to the World Airline Awards) for the 10th successive year. Rather than resting on their laurels, they decided to rethink their most valuable tangible and intangible assets. This would prove to be critically important when the pandemic later arrived and led to the following four actions.

4.1. Repurpose and refocus critical assets

> AirAsia Digital is a combination of our entrepreneurial spirit, innovation, and technology (…) We incubate and growth strategic businesses some of which are spin-offs from AirAsia's business units. (Omar, 2020b)

In June 2018, AirAsia Group transferred its non-airline businesses to Redbeat Ventures (in 2020 renamed AirAsia Digital), one of its wholly owned subsidiary companies. Redbeat Ventures then entered into a Share Sale Agreement with AirAsia Berhad and AirAsia Investment Ltd and acquired nine non-airline digital businesses as well as their subsidiaries. The main reasoning behind the decision to place digital assets under Redbeat Ventures was to expand, monetize, and broaden AirAsia's digital footprint. The company knew that digitalization would generate new business opportunities and might require different business models. So creating a separate organization to house these ventures provided more management focus and reduced internal conflicts with the core airline business. By then AirAsia realized that its data comprised a bigger asset than the aircraft itself.

4.2. Reframe the scope of operations

> The data has become a real asset for us, and we discovered this many years ago, but we didn't know how we can actually make use of it and how we can actually create better businesses out of it, until about three years ago when decided to go on a real digital transformation. (Omar, 2020a)

As the corporate venture arm of AirAsia, Redbeat Ventures planned on working much closer with technology startups and looked out for investment opportunities in the high-tech and digital space to remain competitive and relevant in these rapidly changing commercial and technological environments. However, the main question of how to use the data for building new business areas, targeted offerings, and engagement with customers, remained unanswered. The natural way for AirAsia to frame this was to consider the typical way that industry solutions were developed to improve the tourist experience when tourists traveled. AirAsia decided that it needed to innovate by serving the current customers' day-to-day needs beyond travel. They started to wonder if

it would be possible to go beyond the scope of being just an online travel provider.

4.3. Identify complementary competences

> AirAsia and Redbeat Capital are on the lookout for the world's best and brightest to help us develop a travel technology ecosystem. What better place to start than right here in San Francisco. (Fernandes, 2019)

AirAsia knew that 'not all the smart people work for them'[9] so it explored ways to tap into the knowledge and expertise located outside their company. Thus, a year before the COVID-19 outbreak, Redbeat Ventures established a global $60 million venture capital fund, Redbeat Capital (RBC). RBC then entered into a strategic partnership with 500 Startups – a Silicon Valley venture capital firm and startup accelerator based in San Francisco. That same month, Reuters reported that the non-flying ancillary revenues made up about 20% of the group's revenue. To grow its competencies, AirAsia needed to find external experts that would help them in accelerating innovations beyond travel itself.

4.4. Leverage synergies among ecosystem partners

Prior to the pandemic, RBC's main focus was on post-seed-stage startups. They wanted to invest in scalable startups seeking to enter or expand their presence in Southeast Asia. The key vertical business areas of interest were Financial technology, Logistics, and Travel/Lifestyle. Additionally, RBC also invested in digital enablers to support these verticals. These included companies involved in artificial intelligence, cybersecurity, and the Internet of Things. Building an innovation ecosystem only makes sense when all ecosystem partners can jointly develop and deliver a value proposition that none of them would be able to offer alone (Adner, 2016; Jacobides and Cennamo, 2018). As a result, on the day before the crisis, AirAsia was orchestrating an ecosystem consisting of a set of new ventures outlined in Table 3.

Table 3. AirAsia's new ventures before the pandemic

New ventures	Core work
Teleport Cargo	Air freight, also last-mile delivery
BigPay	Fintech company, with a lending license
Big Life	Flight points redemption company, 300 partners in lifestyle & travel
Santan	In-flight food, airport restaurants
Ourshop	In-flight, duty-free online shop
Redbeat Ventures	Corporate venture arm (renamed AirAsia Digital)

These new entities were intended to position the company for new growth as the digital world advanced.[12] As we will now see, they also proved to be invaluable in responding to the pandemic.
Source: Orbis database last update 2019.

5. AirAsia during the pandemic – the recovery plan

The COVID-19 outbreak led to significant financial losses for the airline industry. Practically overnight, business and leisure travel was suspended and many airports were temporarily closed down to prevent the spreading of the coronavirus globally. As of May 4th 2020, the Stock Performance by companies within the airline industry witnessed declines of −56.85%.[10] Consequently, the industry was badly hurt. In some markets, such as the US and Germany, airline companies were lobbying aggressively for bailout funding through state aid. In other markets, such as India and Italy, airlines have entered into bankruptcy proceedings. AirAsia was not immune to these forces. Reuters reported that in the first week of April 2020, AirAsia had no incoming revenue and 98% of its fleet was grounded. In response, they implemented four main initiatives: reducing costs, re-purposing and relocating the labor force, and restrategizing.

5.1. Reduce the costs – the affordable loss principle

The biggest challenge for AirAsia arising out of the pandemic was the management of its fixed costs. By the end of Q2 2020, AirAsia managed to reduce airline operational expenses by 72% (AirAsia Q2, 2020). When most of its flights got suspended, the company's management had to enter *renegotiations with their business partners*, including lenders who leased the airplanes to AirAsia. Negotiations were sensitive, but, considering the strong interdependencies between these partners, winning a renegotiation battle by leaving the partners with nothing would potentially result in winning the battle but losing the war. Such a scenario would result in the neglected partners (1) getting bankrupt or (2) surviving, but losing their trust in AirAsia (and diminishing AirAsia's ability to recover after the pandemic). Moreover, aircraft leasing companies did not have other airlines looking for more planes to fly, so there was nowhere for them to shift AirAsia's leases.

> No virus will kill the spirit of AirAsia. We will continue to innovate, adapt, recover and come back stronger. (Fernandes, 2020)

In the cost-cutting process, preserving jobs was AirAsia's main objective. That is why instead of firing people, the next step was to *cut salaries*. The management started with cutting their own salaries. Both unpaid leaves, as well as 15% to 50% of salary cuts, were proposed to the employees (the more senior the executives, the deeper the salary cuts). Cabin attendants' salaries were based on their actual flights, so staff that did not fly were not entitled to any compensation. This would offer a cost-saving in the short run, but it would put AirAsia in danger once the lockdowns end and their market demand returns. Those airlines that retained their trained flight staff would be able to resume flying more rapidly and could gain a competitive advantage over those who had to rehire and retrain staff. This is where AirAsia's new innovation ecosystem came to provide tremendous support.

5.2. Retain and retrain the labor force – the bird-in-hand principle

> Embarking on all this digital transformation (…) we realized that (1) there's a lot of tech talent that we need (…) (2) it was very difficult to find good tech talent in this part of the world. (…) We felt that we need to firstly upskill our own staff (…). (Omar, 2020a)

To keep its flight staff engaged during the lockdown, AirAsia offered its staff free upskill and reskill opportunities in collaboration with Google. In this way, people that were currently not working could follow educational programs to reskill themselves for new work opportunities in areas such as coding, data analytics, or data science. In this way, AirAsia offered tremendous support to talented employees who previously could not afford to pay for their education. It also sustained the relationship between AirAsia and staff, which might become *key assets during a potential recovery*.

> During the pandemic (…) just two days after the lockdown, we had thousands of staff who just signed up for it. (…) They came from various backgrounds, from pilots to cabin crew baggage handlers. (Omar, 2020a)

5.3. Relocate the labor force – the pilot-in-the-plane principle

To manage through the downturn, AirAsia's oversupply of workers in the temporarily suspended aircraft business needed to be connected to an undersupply of workers in the other businesses within the AirAsia innovation ecosystem. *The current staff members were therefore offered a temporary job relocation* within the ecosystem, which would help them in maintaining a stable source of income during the time of the crisis. In some cases, airline pilots became drivers of delivery vehicles, to give just one example of this repurposing. Again, this approach maintained the relationship between the company and its employees while focusing on activities that could be controlled.

5.4. Look for weak growth signals – the lemonade principle

All of the recovery ideas inside AirAsia became part of the pandemic-related taskforces, with discussions taking place every day about how to respond to the pandemic. COVID-19 speeded up AirAsia's innovation ecosystem development and the company's own transformation. What largely started as a survival plan shifted into a recovery plan as the company prepared for the 'new normal'. This 'new normal' may require a lot more novel and innovative solutions than the 'old normal' prior to previous crises and recessions. *Identifying weak signals of new growth* is particularly important, as the initial results from these actions become available to the company. These weak signals, once identified and explored, will point the way forward to the new normal.

5.5. Collaboration through entrepreneurship – the patchwork quilt principle

Building an innovation ecosystem may offer many collaborative advantages, but it also comes with responsibilities for the survival and health of the ecosystem members. Tremendous external environmental changes such as a pandemic may be a good test for one's collaborative vision.[11] The innovation ecosystem built by AirAsia has been serving as an innovation platform to connect, support, and save small businesses and entrepreneurs during the time of the pandemic crisis (Cusumano et al., 2019). The vision of Redbeat Ventures has been *'to connect with the start-up community globally through collaboration to foster entrepreneurship and stimulate market-driven innovation that would benefit not just AirAsia's ecosystem but help lead the digital economy and lifestyle in ASEAN (The Association of Southeast Asian Nations)'*. During the time of the COVID-19 pandemic, AirAsia started to realize this

vision locally in ASEAN by opening up their innovation ecosystem and inviting entrepreneurs and also small businesses to join them.

> Throughout the pandemic, small and medium enterprises were struggling (…) [We] went on the safe Ourshop campaign in Malaysia and we opened up those platforms to small-medium enterprises and within a week about a thousand merchants sign up. (Omar, 2020a)

During the pandemic, the biggest challenges faced by small businesses are access to financing, end-to-end infrastructure, underdeveloped sales channels and skills, and digitalization know-how. All of these were able to be supported by the AirAsia innovation ecosystem. AirAsia offered its ecosystem members digital banking services, logistics support, online marketplaces, cloud kitchens, and digitalization training. To get in touch with entrepreneurs and small businesses, AirAsia used its communication business to launch a global information campaign. Table 4 features the key contribution to the ecosystem value proposition by each venture. Figure 3 offers the key highlights from the AirAsia recovery timeline in 2020.

Table 4. AirAsia ecosystem partners during the pandemic

New venture name	Contribution to the joint value proposition
Teleport Cargo	On demand delivery service through an e-commerce platform
BigPay	Virtual bank, remittances up 469% in the first half of 2020
Big Life	Personalized flight and accommodation platform
Santan	Ghost kitchens; fresh and frozen food delivery
Ourshop	Platform for third party merchants (renamed AirAsia Shop)
Format	Media training agency supporting digital businesses
Redbeat Academy	Upskilling and reskilling training center training digital natives
Ourfood	E-commerce platform connecting customers with restaurateurs; it takes orders via social media platforms
Ourfarm	E-commerce platform directly connecting farmers with customers

Entrepreneurs, small businesses, and farmers interested in joining the innovation ecosystem were offered access to digitalization training and assistance through Redbeat Academy. In this way, Redbeat Academy not only helped upskilling and reskilling the current workers, but its mission to empower, connect, and develop tech talents ensured that technology brought the opportunity to everyone. It served as an innovation lab for accelerating innovation as well as giving smart (but often poor) people a chance to reinvent themselves and recover their businesses. Along with the training, entrepreneurs and small businesses got access to the market that they could use to grow their business. In particular Teleport, the former cargo department of AirAsia, now operates as a separate logistics company and provides a marketplace for microentrepreneurs and small businesses. The latter was included as a response to COVID-19 when the marketplace both expanded and was consolidated with OURSHOP – a travel retail and duty-free shop.

6. Discussion

The typical exploration strategies employed by firms during a time of crisis focus on experimentation, risk-taking, and the overall discovery process that leads to new innovations and new business models (Chesbrough, 2010; Osiyevskyy et al., 2020). Business model innovation can generally be a challenge in the airline industry, but it is even more problematic in the face of a crisis (Bogers and Boyd, 2015). Tushman and O'Reilly (1996) define ambidexterity as the 'ability to simultaneously pursue both incremental and discontinuous innovation' (p. 24). The incremental innovation (focusing on meeting the needs of the existing customers) is exploitative, and the discontinuous or radical innovation (focusing on meeting the needs of the emergent customers) is explorative. However, what we observed in the case of AirAsia resembles radical ambidexterity combined with the adoption of paradoxical frames, which through embracing contradictions help in achieving

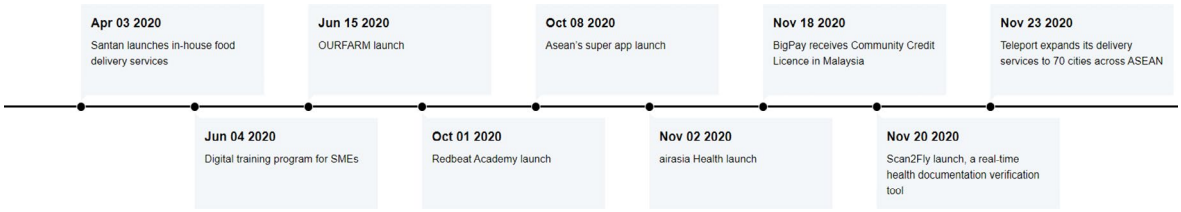

Figure 3. AirAsia during the pandemic (in 2020).

a superior firm performance among other industry players (Dragsdahl Lauritzen and Karafyllia, 2019). More specifically, AirAsia's existing customers' needs were no longer possible to satisfy by current or even incrementally improved offerings because the flying business was grounded. In particular, Q2 quarterly financial reports highlight that (1) the group revenue declined by 96% YoY, and (2) the capacity was reduced by 98% due to temporary hibernation and capacity cuts (AirAsia Q2, 2020). This ruled out any business model reconfiguration opportunities – at least during the time of stricter lockdowns and travel restrictions. Interestingly, instead of focusing on emergent customers, they followed effectuation principles and based their exploration activities on already possessed means – their current customer base along with the available and unused resources in its surrounding ecosystem, AirAsia focused on 'selecting between possible effects that can be created with that set of means' (Sarasvathy, 2001, p. 245).

Under these conditions of radical uncertainty, the theory of effectuation (Sarasvathy, 2001, 2008) helps to explain AirAsia's approach to making decisions and performing actions in the ecosystem emergence and legitimization process. Just as an entrepreneur only chooses her next step in the effectuation process (rather than projecting forward and reasoning back to select an optimal response), the ecosystem orchestrator identifies the best next step by assessing the available resources among the ecosystem participants, which could help to achieve the ecosystem goals. In some cases, these resources may be brought into the focal firm. In other cases, the focal firm may instead choose to place these resources outside the firm into the surrounding ecosystem, which makes the application of effectuation principles in the early stages of the ecosystem emergence similar to the entrepreneurial venture. This brings together diverse knowledge bases through a coordinated and collaborative effort in the face of a crisis. In line with research on open innovation, managing knowledge flows across organizational boundaries can enable successful innovation (West and Vanhaverbeke, 2006; West and Bogers, 2014), while a broader perspective on openness may be more generally applied to ecosystems, communities, industries, governments, regions, and scientific disciplines (Fecher and Friesike, 2014; Bogers et al., 2017).

Before the COVID-19 pandemic, the growing interest in ecosystems among both scholars and managers was motivated by their research and experience in managing customer expectations that no longer can be satisfied by a single company alone (Thomas and Autio, 2019; Thomas and Ritala, 2021). Nowadays, building ecosystems – as structures to jointly create value from innovations that none of the partners may be able to do on their own – could be even more important (Adner, 2016; Radziwon and Bogers, 2017; Jacobides et al., 2018). Good business ideas, solutions to urging problems, and even various types of resources (including human capital) can come from elsewhere, which makes openness an imperative in the time of a crisis (Chesbrough and Garman, 2009; Chesbrough, 2020). That is why companies can and should utilize the knowledge of other businesses or organizations (outside-in open innovation), as well as allow others to exploit their knowledge in their own innovation processes (inside-out open innovation) (Chesbrough, 2003). These could happen by ensuring that the knowledge flows across organizational boundaries (for monetary or non-monetary reasons) are purposively managed (Chesbrough and Bogers, 2014). Nevertheless, a remaining challenge is the legitimization of the emerging ecosystem (Thomas and Ritala, 2021) once this is done.

The AirAsia case complements Chesbrough and Garman's (2009) five-moves perspective by offering Move 6: *build an innovation ecosystem with a newly designed, data-driven business model*. It is a special case of building an ecosystem where several spin-offs – not just one – become their new ecosystem partners. Instead of architecturally separated units dedicated to exploration (O'Reilly and Tushman, 2013), AirAsia's ecosystem is an example of architecturally interconnected and interdependent units dedicated to this purpose. In this way, AirAsia took advantage of the data they have been collecting through their core flying business and supplied that data to an ecosystem of complementary partners. Analyzing the process with which this took place, we identify a perspective on ecosystem legitimacy emergence that is grounded in the main principles of effectuation (Sarasvathy, 2001) and that shows how an incumbent firm may overcome the tension between old and new business models (Sund et al., 2016). This sheds new light on Massa and Tucci's (2013) distinction between business model design and business model reconfiguration. While established companies would normally engage in the latter and startups by definition engage in the former, the AirAsia case essentially shows how an established company can engage in business model design through ecosystem effectuation, based on the particular conditions that were shaped by the pandemic. Even though value network and partners that constitute the ecosystem have always been an important part of the business model innovation, AirAsia neither permanently reorient their value network – as the business model reconfiguration would suggest – nor do

they simply follow Move 4: to build an ecosystem by spinning an idea off the organizational boundaries, but it builds a new value network in parallel to their core (flying) business.

7. Conclusions, limitations, and future research outlook

The AirAsia case offers a great example of how openness can speed up the innovation process, both for the focal company and for its surrounding ecosystem (Chesbrough, 2020). By leveraging open innovation principles before and during the COVID-19 pandemic, AirAsia has not only been on its way to recovery but now has an innovation ecosystem of companies openly collaborating and supporting one another in the process of developing a joint value proposition (Adner, 2016; Jacobides et al., 2018). However, given the inherent nature of the grand challenge it addresses, it cannot be known upfront which solution will be the best one, although a substantial level of coordination and collaboration will be required (George et al., 2016). This is where ecosystem effectuation as an approach to making decisions and performing actions in the ecosystem emergence and legitimization process (Thomas and Ritala, 2021) could significantly help the ecosystem orchestrator in identifying the best next step by assessing the available resources (Sarasvathy, 2001, 2008). Leveraging effectuation principles during the pandemic helped AirAsia in focusing on what is under short-term control, building an innovation ecosystem of strategic partners with a newly designed, data-driven business model, and exploiting emergent contingencies instead of selecting means to attain goals by enacting causation logic (Berends et al., 2014).

Open engagement with one's ecosystem can serve to identify and coordinate the allocation of financial resources, expertise, and capacity across private actors toward more valuable downstream uses. Taking the example of AirAsia, one can see how distributors, wholesalers, and retailers could interact much more effectively with suppliers and users through digital technologies than they do now. Early financial results indicated by AirAsia confirm that in the absence of exploitation activities, exploration could also positively influence firm performance. Here it happens through digital ecosystem ventures, which have boosted AirAsia's revenues by more than 500% in six months and created new opportunities for its ecosystem partners as well (AirAsia Q2, 2020).

Such changes will need to be supported by legal frameworks and tools that facilitate the creation of new knowledge and technology transfer (Price et al., 2020). These may involve both short-term reactions following the current legislation and more far-reaching legislative reforms that could help to govern, direct, and support a sustainable change from a long-term perspective. Typical examples of immediate legal reactions relate to the state aid rules in support of airlines, but also intellectual property (IP) and antitrust laws are relevant: There is, e.g., a risk that antitrust laws prevent or slow down certain forms of cooperation to protect free competition. In times of a crisis, however, it can be in the public interest that suppliers of essential goods communicate and collaborate without risking violating competition law (Szentesi, 2021). Therefore, competition authorities have granted special exceptions (e.g., so-called 'comfort letters') during the COVID-19 pandemic on a case-by-case basis and under certain conditions (Kakkar, 2020; Szentesi, 2021). During the COVID-19 crisis, many of these interventions were employed or considered in the medical sector. But there is a need to clarify how far such exceptions and interventions apply to other sectors (Minssen and Gerke, 2021) hit by the pandemic. The same applies to the legal frameworks that are needed to increase the interoperability, fairness, responsibility, sustainability, accessibility, and good governance of the new open innovation ecosystem (Dahlander and Gann, 2021; Minssen and Gerke, 2021).

Legal factors that may hinder or support sustainable change resulting from the pandemic are important since one implication of this study is that actions that respond to a pandemic may also help address societal grand challenges. AirAsia's activities directly address hunger prevention, for example, by supporting local entrepreneurs and farmers. They would not be able to run their businesses and share fresh food during a pandemic without a platform that would allow them to virtually connect with their customers and suppliers. The nature of the grand challenge necessitates a very large (and unprecedented) degree of openness and collaboration to collectively explore possible solutions for which the sources of innovation are not always known upfront (Felin and Zenger, 2014; Bogers and Chesbrough, 2020). Thus, openness is not only about the permeability of organizational boundaries to ideas, but also about the restructuring of organizational boundaries to increase permeability (Zobel and Hagedoorn, 2020). The latter can be operationalized by building the infrastructure for future growth through the novel inside-out

open innovation approach (Chesbrough and Garman, 2009). In line with previous studies on effectuation in small firms, the effectuation may dominate in earlier stages of the crisis, while causation may become more visible in later stages of innovation trajectories (Berends et al., 2014). The evaluation of openness and permeability of organizational boundaries in different stages of the innovation trajectories caused by a grand challenge could be an interesting future research avenue.

The AirAsia case offers lessons that other firms and organizations can further build upon while designing their own strategy, which will help them in overcoming the challenges caused by an external crisis. As we have discussed, the airline industry, which is a regulation-dependent business, shows the value that a dialogue between public, non-profit, and private actors could provide to other firms in financially stressed industries. In some situations, governments, which carry an obligation to support local businesses or farmers, may consider shortening the bureaucratic paths through the system. These may allow more flexible employment conditions or tax deductions/waivers for firms or individuals who decide to commit their time and resources to a non-traditional crisis-fighting solution. Also, once the immediate COVID-19 challenge is under control and lessons have been learned, additional effort and resources will be required to improve pandemic and grand challenge preparedness on a global scale.

Acknowledgments

The authors would like to acknowledge the contribution of Aireen Omar AirAsia Deputy Group Chief Executive Officer of Digital Transformation and Corporate Services, whose expert knowledge and comments were very valuable in the process of developing this article. Marcel Bogers has conducted scientifically independent research on 'Moonshot Innovation: A New Approach to Disruptive Technologies and Business Models' which is funded by the Carlsberg Foundation (grant number CF19-0474). Marcel Bogers would also like to acknowledge the support of the Novo Nordisk Foundation (grant number NNF16OC0021630). Marcel Bogers and Timo Minssen also acknowledge the support by the Novo Nordisk Foundation for the scientifically independent Collaborative Research Program for Biomedical Innovation Law (grant NNF17SA0027784). The funder had no role in the preparation, review, or approval of the manuscript and decision to submit the manuscript for publication. Last, but not least all co-authors would like to thank Anita M. McGahan the participants of the Berkeley Open Innovation Seminar and World Open Innovation Conference 2020 for their insightful comments on the earlier draft of this paper.

REFERENCES

Adner, R. (2016) Ecosystem as structure: an actionable construct for strategy. *Journal of Management*, **43**, 39–58. https://doi.org/10.1177/0149206316678451

Ahuja, G. and Morris Lampert, C. (2001) Entrepreneurship in the large corporation: a longitudinal study of how established firms create breakthrough inventions. *Strategic Management Journal*, **22**, 521–543.

AirAsia Q2. (2020) Analyst Presentation, Second quarter Results for the Financial Year 2020.

Alexiev, A.S., Jansen, J.J.P., Van den Bosch, F.A.J., and Volberda, H.W. (2010) Top management team advice seeking and exploratory innovation: the moderating role of TMT heterogeneity. *Journal of Management Studies*, **47**, 1343–1364. https://doi.org/10.1111/j.1467-6486.2010.00919.x

Arend, R.J., Sarooghi, H., and Burkemper, A. (2015) Effectuation as ineffectual? Applying the 3E theory-assessment framework to a proposed new theory of entrepreneurship. *Academy of Management Review*, **40**, 630–651. https://doi.org/10.5465/amr.2014.0455

Berends, H., Jelinek, M., Reymen, I., and Stultiëns, R. (2014) Product innovation processes in small firms: combining entrepreneurial effectuation and managerial causation. *Journal of Product Innovation Management*, **31**, 616–635. https://doi.org/10.1111/jpim.12117

Bogers, M., Boyd, B., and Hollensen, S. (2015) Managing turbulence: business model development in a family-owned airline. *California Management Review*, **58**, 41–64. https://doi.org/10.1525/cmr.2015.58.1.41

Bogers, M., Chesbrough, H., and Strand, R. (2020) Sustainable open innovation to address a grand challenge: lessons from Carlsberg and the Green Fiber Bottle. *British Food Journal*, **122**, 1505–1517. https://doi.org/10.1108/BFJ-07-2019-0534

Bogers, M., Zobel, A.K., Afuah, A., Almirall, E., Brunswicker, S., Dahlander, L., Frederiksen, L., Gawer, A., Gruber, M., Haefliger, S., Hagedoorn, J., Hilgers, D., Laursen, K., Magnusson, M.G., Majchrzak, A., McCarthy, I.P., Moeslein, K.M., Nambisan, S., Piller, F.T., Radziwon, A., Rossi-Lamastra, C., Sims, J., and Ter Wal, A.L.J. (2017) The open innovation research landscape: established perspectives and emerging themes across different levels of analysis. *Industry and Innovation*, **24**, 8–40. https://doi.org/10.1080/13662716.2016.1240068

Burgelman, R.A. (2002) Strategy as vector and the inertia of coevolutionary lock-in. *Administrative Science Quarterly*, **47**, 325. https://doi.org/10.2307/3094808

Chesbrough, H. (2003) *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston, MA: Harvard Business School Press.

Chesbrough, H. (2010) Business model innovation: opportunities and barriers. *Long Range Planning*, **43**, 354–363. https://doi.org/10.1016/j.lrp.2009.07.010

Chesbrough, H. (2020) To recover faster from Covid-19, open up: managerial implications from an open innovation perspective. *Industrial Marketing Management*, **88**, 410–413. https://doi.org/10.1016/j.indmarman.2020.04.010

Chesbrough, H. and Bogers, M. (2014) Explicating open innovation: clarifying an emerging paradigm for understanding innovation. In: Chesbrough, H., Vanhaverbeke, W., and West, J. (eds), *New Frontiers in Open Innovation*. Oxford: Oxford University Press, pp. 3–28.

Chesbrough, H.W. and Garman, A.R. (2009) How open innovation can help you cope in lean times. *Harvard Business Review*, **87**, 68–76. https://doi.org/10.1109/EMR.2012.6291580

Cusumano, M., Gawer, A., and Yoffie, D. (2019). *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power*.New York: Harper Business.

Dahlander, L., Gann, D.M., and Wallin, M.W. (2021) How open is innovation? A retrospective and ideas forward. *Research Policy*, **50**, 104218. https://doi.org/10.1016/j.respol.2021.104218

Dragsdahl Lauritzen, G. and Karafyllia, M. (2019) Perspective: leveraging open innovation through paradox. *Journal of Product Innovation Management*, **36**, 107–121. https://doi.org/10.1111/jpim.12474

Eisenhardt, K.M. (1989) Building theories from case study research. *Academy of Management Review*, **14**, 532–550.

Fecher, B. and Friesike, S. (2014) *Open Science: One Term, Five Schools of Thought*. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-00026-8

Felin, T. and Zenger, T.R. (2014) Closed or open innovation? Problem solving and the governance choice. *Research Policy*, **43**, 914–925.

Fernandes, T. (2019) AirAsia launches venture capital fund in the US and strategic partnership with 500 Startups [WWW Document]. URL https://www.redbeatventures.com/press-release-airasia-launches-venture-capital-fund

Fernandes, T. (2020) How CEO Tony Fernandes and AirAsia are looking to redefine the role of an airline in a post-COVID world [WWW Document]. URL https://www.businessinsider.com/airasia-redefining-role-of-an-airline-in-post-covid-world-2020-12?r=US&IR=T (accessed 2.10.21).

George, G., Howard-Grenville, J., Joshi, A., and Tihanyi, L. (2016) Understanding and tackling societal grand challenges through management research. *Academy of Management Journal*, **59**, 1880–1895.

Grégoire, D.A. and Cherchem, N. (2020) A structured literature review and suggestions for future effectuation research. *Small Business Economics*, **54**, 621–639. https://doi.org/10.1007/s11187-019-00158-5

Gupta, A.K., Smith, K.E.N.G., and Shalley, C.E. (2006) The interplay between exploration and exploitation. *Academy of Management Journal*, **49**, 693–706. https://doi.org/10.1108/S1479-067X20140000014020

Jacobides, M.G., Cennamo, C., and Gawer, A. (2018) Towards a theory of ecosystems. *Strategic Management Journal*, **39**, 2255–2276. https://doi.org/10.1002/smj.2904

Jansen, J.J.P., Van Den Bosch, F.A.J., and Volberda, H.W. (2006) Exploratory innovation, exploitative innovation, and performance: effects of organizational antecedents and environmental moderators. *Management Science*, **52**, 1661–1674. https://doi.org/10.1287/mnsc.1060.0576

Kakkar, A. (2020) COVID-19 and Competition Law Concerns | Competition Law [WWW Document]. URL https://competition.cyrilamarchandblogs.com/2020/03/covid-19-and-competition-law-concerns/ (accessed 3.26.20).

Leonard-Barton, D. (1992) Core capabilities and core rigidities: a paradox in managing new product development. *Strategic Management Journal*, **13**, 111–125. https://doi.org/10.1002/smj.4250131009

Li-Ying, J. and Nell, P. (2020) Navigating opportunities for innovation and entrepreneurship under COVID-19. *California Management Review*, **63**, 1, 1–6. https://cmr.berkeley.edu/2020/06/innovation-entrepreneurship/

March, J.G. (1991) Exploration and exploitation in organizational learning. *Organization Science*, **2**, 71–87. https://doi.org/10.1287/orsc.2.1.71

Massa, L. and Tucci, C.L. (2013) Business model innovation. In: Dodgson, M., Gann, D.M., and Phillips, N. (eds), *The Oxford Handbook of Innovation Management*. Oxford: Oxford University Press, pp. 420–441. https://doi.org/10.1093/oxfordhb/9780199694945.013.002

Minssen, T. and Gerke, S. (2021) Ethische und rechtliche Herausforderungen digitaler Medizin in Pandemien: Chancen, Risiken und Kompromisse. In: Reis, A.A., Schmidhuber, M., and Frewer, A. (eds), *Pandemien und Ethik: Entwicklungen-Probleme-Lösungen*, 1st edn. Berlin Heidelberg: Springer Verlag, pp. 179–219. https://doi.org/10.1007/978-3-662-63530-8

Monteiro, L.F. and Birkinshaw, J. (2016) The external knowledge sourcing process in multinational corporations. *Strategic Management Journal*, **38**, 2, 342–362.

Ngo, L.V., Bucic, T., Sinha, A., and Lu, V.N. (2019) Effective sense-and-respond strategies: mediating roles of exploratory and exploitative innovation. *Journal of Business Research*, **94**, 154–161. https://doi.org/10.1016/j.jbusres.2017.10.050

O'Reilly, C.A. and Tushman, M.L. (2013) Organizational ambidexterity: past, present, and future. *Academy of Management Perspectives*, **27**, 324–338. https://doi.org/10.5465/amp.2013.0025

Omar, A. (2020a) Pivoting in the Pandemic – Lessons from AirAsia Group [WWW Document]. Imperial Bussines Partners. https://www.youtube.com/watch?v=2_4PETyoGpI&ab_channel=ImperialBusinessPartners

Omar, A. (2020b) AirAsia Digital Introduction [WWW Document]. AirAsia. https://www.youtube.com/watch?v=c6ZGLIZixN0&ab_channel=airasia

Osiyevskyy, O., Shirokova, G., and Ritala, P. (2020) Exploration and exploitation in crisis environment: implications for level and variability of firm performance. *Journal of Business Research*, **114**, 227–239. https://doi.org/10.1016/j.jbusres.2020.04.015

Price, W.N., Rai, A.K., and Minssen, T. (2020) Knowledge transfer for large-scale vaccine manufacturing. *Science*, **369**, 6506, 912–914. https://doi.org/10.1126/science.abc9588

Radziwon, A., Bogers, M., and Bilberg, A. (2017) Creating and capturing value in a regional innovation ecosystem: a study of how manufacturing SMEs develop collaborative solutions. *International Journal of Technology Management*, **75**, 73. https://doi.org/10.1504/IJTM.2017.10006145

Raisch, S., Birkinshaw, J., Probst, G., and Tushman, M.L. (2009) Organizational ambidexterity: balancing exploitation and exploration for sustained performance. *Organization Science*, **20**, 685–695. https://doi.org/10.1287/orsc.1090.0428

Sarasvathy, S.D. (2001) Causation and effectuation: toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review*, **26**, 243–263. https://doi.org/10.5465/AMR.2001.4378020

Sarasvathy, S.D. (2004) The questions we ask and the questions we care about: reformulating some problems in entrepreneurship research. *Journal of Business Venturing*, **19**, 707–717. https://doi.org/10.1016/J.JBUSVENT.2003.09.006

Sarasvathy, S. (2008) *Effectuation: Elements of Entrepreneurial Expertise*. Cheltenham, UK: Edward Elgar. https://doi.org/10.4337/9781848440197

Sarasvathy, S.D., Dew, N., Read, S., and Wiltbank, R. (2008) Designing organizations that design environments: lessons from entrepreneurial expertise. *Organization Studies*, **29**, 331–350. https://doi.org/10.1177/0170840607088017

Sarasvathy, S.D., Menon, A.R., and Kuechle, G. (2013) Failing firms and successful entrepreneurs: serial entrepreneurship as a temporal portfolio. *Small Business Economics*, **40**, 417–434. https://doi.org/10.1007/S11187-011-9412-X

Siggelkow, N. (2007) Persuasion with case studies. *Academy of Management Journal*, **50**, 20–24. https://doi.org/10.5465/AMJ.2007.24160882

Sund, K.J., Bogers, M., Villarroel, J.A., and Foss, N.J. (2016) Managing tensions between new and existing business models. *MIT Sloan Management Review*, **57**, 8.

Szentesi, S. (2021) *COVID-19: Competition Law Implications of the Coronavirus Crisis*. Thomson Reuters.

Thomas, L. and Autio, E. (2019) Value co-creation in ecosystems: Insights and research promise from three disciplinary perspectives. In: Nambisan, S., Lyytinen, K., and Yoo, Y. (eds), *Handbook of Digital Innovation*. Cheltenham, UK: Edward Elgar, pp. 107–132. https://doi.org/10.2139/ssrn.3476925

Thomas, L.D.W. and Ritala, P. (2021) Ecosystem legitimacy emergence: a collective action view. *Journal of Management*, 1–27. https://doi.org/10.1177/0149206320986617

Townsend, D.M., Hunt, R.A., Mcmullen, J.S., and Sarasvathy, S.D. (2018) Uncertainty, knowledge problems, and entrepreneurial action. *Academy of Management Annals*, **12**, 659–687. https://doi.org/10.5465/annals.2016.0109

Tushman, M.L. and O'Reilly, C.A. (1996) Ambidextrous organizations: managing evolutionary and revolutionary change. *California Management Review*, **38**, 8–29. https://doi.org/10.2307/41165852

Volberda, H.W. and Lewin, A.Y. (2003) Co-evolutionary dynamics within and between firms: from evolution to co-evolution. *Journal of Management Studies*, **40**, 2111–2136. https://doi.org/10.1046/j.1467-6486.2003.00414.x

West, J. and Bogers, M. (2014) Leveraging external sources of innovation: a review of research on open innovation. *Journal of Product Innovation Management*, **31**, 814–831.

West, J., Vanhaverbeke, W., and Chesbrough, H. (2006) Open innovation: a research agenda. In: Chesbrough, H., Vanhaverbeke, W., and West, J. (eds), *Open Innovation: Researching a New Paradigm*. Oxford: Oxford University Press, pp. 285–307.

Wiltbank, R., Dew, N., Read, S., and Sarasvathy, S.D. (2006) What to do next? The case for non-predictive strategy. *Strategic Management Journal*, **27**, 981–998. https://doi.org/10.1002/smj.555

Yin, R.K. (2009) *Case Study Research: Design and Methods*. Thousand Oaks, CA: Sage.

Zobel, A.K. and Hagedoorn, J. (2020) Implications of open innovation for organizational boundaries and the governance of contractual relations. *Academy of Management Perspectives*, **34**, 400–423. https://doi.org/10.5465/amp.2016.0175

Notes

[1] AirAsia has received multiple awards, winning best low-cost airline each year for over a decade.

[2] The company was impacted by a 99% reduction in net cash used for financing activities in 2Q2020, and 98% of its fleet was grounded in that same quarter, unable to fly (AirAsia Q2, 2020).

[3] https://www.wsj.com/articles/an-industry-both-grounded-and-up-in-the-air-11588956443 (May 15th 2020).

[4] https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/hospitality-and-covid-19-how-long-until-no-vacancy-for-us-hotels (February 9th 2021).

[5] https://www.nytimes.com/2021/01/13/business/auto-factories-semiconductor-chips.html (January 13th 2021).

[6] The airline industry has long been an industry characterized by financial stress, even before the recent pandemic. The investor Warren Buffet once publicly stated, 'if a capitalist had been present at Kitty Hawk back in the early 1900s, he should have shot Orville Wright. He would have saved his progeny a lot of money.' https://www.forbes.com/sites/tedreed/2013/05/13/buffett-decries-airline-investing-even-though-at-worst-he-broke-even/#649024b13b5e (accessed 3 September 2020).

[7] https://www.iata.org/en/pressroom/pr/2020-11-24-01/ (accessed 18 February 2021).

[8] https://www.nytimes.com/2020/09/19/travel/airlines-pandemic-flights-to-nowhere.html (accessed 1 October 2020).

[9] This refers to Joy's Law, attributed to Bill Joy. His original statement was 'most of the smart people in the world work somewhere else', which can be restated to 'not all the smart people work for you' (Chesbrough, 2003).

[10] See https://csimarket.com/Industry/Industry_Performance.php?ind=1102 (accessed 4 May 2020).

[11] One of the enemies to collaborative vision could be a recent example of COVID-19 vaccine nationalism. See: https://www.ft.com/content/502df709-25ac-48f6-aee1-aec7ac03c759 (accessed 25 September 2020).

[12] Discussions of digitalization typically concern improvements in speed, scale, accuracy, and cost. Here, we add a new dimension, the optionality enabled by digitalization. Non-digital processes would not have allowed AirAsia to adapt so readily to the pandemic.

Agnieszka Radziwon is a Researcher at the University of California Berkeley, Garwood Center for Corporate Innovation at Haas School of Business, and at Aarhus University, Department of Business Development and Technology, Aarhus BSS. She obtained her Ph.D. degree in Product Design and Innovation from the University of Southern Denmark. Agnieszka has been a visiting researcher at the University of Copenhagen, Eindhoven Technical University, Chalmers University of Technology, and Vienna University of Technology. Her main research interests center on the antecedents and consequences of organizational collaboration. More specifically she is interested in the ways how knowledge is transferred within and across organizations, and in its role in the process of facilitating and hindering innovation. She has been studying open innovation, business models as well as ecosystems.

Marcel L.A.M. Bogers is a Professor of Open and Collaborative Innovation at the Innovation, Technology Entrepreneurship, and Marketing (ITEM) group at the Eindhoven University of Technology. He is also Affiliated Professor of Innovation and Entrepreneurship at the University of Copenhagen and Garwood Research Fellow at the Haas School of Business at the University of California, Berkeley. His main interests center on the design, organization, and management of technology, innovation, and entrepreneurship. More specifically, his research explores openness and participation in innovation and entrepreneurial processes within, outside, and between organizations. In this context, he has studied issues such as open innovation, business models, family businesses, users as innovators, collaborative prototyping, improvization, and university-industry collaboration.

Henry Chesbrough is the Faculty Director of the Garwood Center for Corporate Innovation at the Haas School of Business at the University of California Berkeley and Maire Tecnimont Professor of Open Innovation at Luiss University in Rome. Chesbrough is best known as 'the father of Open Innovation.' His book Open Innovation (2003) articulates a new paradigm for organizing and managing R&D; his second book, Open Business Models (2006), extends his analysis of innovation to business models, intellectual property management, and markets for innovation; and his third book, Open Services Innovation (2011), explores open innovation in services businesses. His newest book focuses on Open Innovation Results (2019).

Timo Minssen is the Director of the Center for Advanced Studies in Biomedical Innovation Law (CeBIL) at the University of Copenhagen and Senior Advisor at the law firm X-officio. As an expert in IPR-, Competition & Regulatory Law specializing in emerging health & life science technologies, Timo has been an advisor to national governments, the EU, and international organizations, such as the WHO and the Global AMR R&D Hub. He has been a Visiting Research Fellow at the Universities of Cambridge and Oxford, Harvard Law School, Chicago Law School, and he has been trained at the European Patent Office. Timo's research has been featured in The Economist, The Financial Times & Times Higher Education, and it has been published in numerous legal and science journals, such as Science, Nature Biotechnology, Nature Genetics, Nature Electronics, Nature PJ Digital Medicine, The Lancet Digital Health, PLoS-Computational Biology, etc. He is also a regular contributor to Harvard Law School's 'Bill of Health' blog.

