

# Developing Digital Solutions Under Uncertainty: Crisis-Driven Agility

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February 2021, exactly one year after the Covid-19 outbreak, Aaron, COO of the Digital unit, and Tony, Director of the Digital unit, having their virtual happy hours after a webinar. In the webinar, the successful projects were presented. They and their teams worked hard during the last year. It was a rough year, and now time to celebrate the success. Although both were satisfied with the performance of their teams, they knew that the Group needed yet to cope with the uncertainty. They didn't know how long the situation will last. But they knew that the Group needed to enhance its ability further to sense and respond to changes quickly. While reflecting on the last year, Aron and Tony sought to answer many questions: "What are the main consequences of the outbreak for the Group? Is the "new normal" an opportunity or a threat? What did we learn from this tough year? What did help us to complete the projects with success? How we can still be more agile, flexible and responsive?"

# Overview

As digital transformation provides businesses with new ways to operate and create value for customers, businesses increasingly seek to embed and embrace digital solutions to remain competitive and reap the benefits of new market opportunities. Unlike many teaching cases and academic papers that explore how digital transformation reshapes the ways businesses create and capture values, this teaching case focuses on service providers who play a central role in the development, implementation, realization of digital solutions. This teaching case presents the story of Mashfrog Group (from now on, we refer to it as the Group) – a service provider dealing with challenges and issues in developing digital solutions especially during the health emergency (Covid-19). Considering the increasing demand of businesses to adapt their operations and processes to the changing business environment and reality of smart working, the Group had to increase speed and flexibility in the development of digital solutions. The main challenges for the Group were lack of physical interactions with clients, the demand for shorter-term projects, and assurance of the sustainability of solutions. Despite such challenges, the Group performed well during the health emergency. The company's managers were excited about the results. However, they were wondering how to remain agile and innovative as far as uncertainty exists.

The case introduces the concept of agile methods and agility. Especially, the case illustrates the drivers and enablers of agility and explains how organizations can attain operational agility (Sambamurthy et al. 2003; Conboy 2009; Walter 2020; Spagnoletti et al. 2021) as a diffused capability over time (Teece et al. 2016). Moreover, it highlights the challenges and barriers to attain agility. Finally, it provides an overview of the sub-capabilities that organizations must have in the digital era.

# Brief Summary of The Company

The group is a network of companies that are highly specialized in a diverse area of digital business. The group is a pioneer in consulting, designing, implementing and realization of digital solutions for businesses across different industrial sectors from banking and finance, manufacturing, telecommunication to healthcare and education.

The Group was founded as a communication company in 2008 with 25 employees. Over years, it has grown and now has more than 350 professionals in digital areas (see Table 1). The Group operates in different countries with a turnover of around 30 million in 2019.

The Group mission is *to go beyond technological to create innovative business models*. It focuses on three pillars creativity, strategy and technology for success in a fast-changing business environment.

The group operates in Europe, South America, Australia, the Middle East and North Africa. The Group has different business units specialized in Digital, SAP, CRM, ERP and Industry 4.0. The Digital unit is composed of four areas (each area has more or less 10-25 employees):

- software development: back-hand technologies such as 3D, blockchain etc.
- front-end solution website, mobile app, etc.
- communication
- digital marketing

Recently, the Group set up a new unit focused on data science as many clients asked for help in using their data. The unit is specialized in machine learning, clustering, visualization, normalization, analysis.

Relying on its network, the Group is involved in designing digital solutions and services that enable its clients to become data-driven businesses, enhance digital communication and online marketing, facilitate digital business transformation, and embed technologies in their day-to-day activities.

Year	Event
2008	Born as a communication company
2010	Become specialized in the development of applications for media
2014	The first change in the business model, expanding activities to system integration and implementation of ERP
2015	New research project on 3D technologies and augmented reality
2017	Launch a new service based on blockchain technology
2018	New branches in Spain and the United Arab Emirates
2019	Other two branches in Australia and Serbia
2020	The launch of two new proprietary platforms
2021	New branch in the US The launch of a new platform (event management)

*Table 1. Timeline of main events in the Group*

# Agile Approach at the Group

The top managers knew that traditional software development approaches become ineffective in the fast-changing environment, with unpredictable changes. This is because the traditional development process is lengthy, the developed products might not satisfy the client's requirements anymore. For instance, the waterfall approach leads to lengthy sequential processes due to detailed ex-ante planning for requirements documentation, development tasks, designing and testing. Thus, for the development of software and digital solutions, the Group has adopted the agile approach as an alternative to the traditional plan-driven approach (see Exhibit A). The agile method provided teams autonomy and enabled teams to be more responsive to requirement changes. The agile methods are based on self-organizing teams that interact and modify products through frequent update cycles. Agile development enables interaction with clients and speeds up time-to-market.

In particular, the Group set Scrum teams (see Exhibit B). Scrum is an example of agile method which is inspired by the metaphor of a rugby scrum, whose key practices are iterative development cycles named "sprints" that are used to evolve the product (Fitzgerald et al., 2006). Scrum focuses on customer involvement and centrality in software development, continuous control and monitoring of project progress, and autonomy of development teams (Dingsøyr et al., 2012). The scrum team composition depends on projects, in some cases, there are 2-3 developers, in other cases 7-8 developers, or even 20.

By gaining experience with the agile approach over time, the Group became one of the leaders in developing digital solutions and software in a shorter time. However, it is worth mentioning that some of their customers (mainly from the public sector) prefer the waterfall approach with defined milestones and upfront specifications.

Overall, the agile management philosophy helped the team collect customers' specifications, more frequently make decisions about design choices and adjust the product based on the feedback from clients and the management team. For instance, the development time reduced from 12 to 4 months.

# The Pandemic Hits Businesses

By October 18, 2021, the COVID-19 pandemic has reached different countries, with over 4,914,000 who have lost their lives<sup>1</sup>. Many businesses disrupted from the lock-downs. The health crisis disrupted parts of distribution channels and customer experience (restricted in-person interaction). Moreover, customer behavior changes. Considering together, these factors left executives with many unanswered questions. They found it challenging to cope with the uncertainty as the situation changes considerably fast and unpredictably. Despite the progress of the vaccine programs around the world, many businesses struggled and were forced to revisit their activities in different ways. In general, businesses without appropriate digital platforms and digital solutions experienced three difficulties:

- restricted interactions with their customers<sup>2</sup>
- intra-organizational collaboration and communication
- inter-organizational collaboration

To continue their activities, many businesses (including small and large, public and private) have relied on digital technologies. Businesses experienced (some for the first time) remote working to maintain social distances by using digital collaborative tools (such as Zoom, Teams and Webex). While they expected tailored solutions to be developed in a shorter time, many clients raised concerns about the sustainability of digital solutions (developed and delivered in a short time). To face such a situation, companies needed digital solutions to be integrated with the existing information systems (IS), and maybe to be expanded and developed in the future.

Some companies needed to reconfigure their operations to survive, while others sought to improve their business processes and develop new products/services to grow and sustain their competitive advantages. An example of the former is designing digital platforms that allow customers to order groceries, and the shift of schools and universities to virtual rooms. An example of the latter is the development of new tools such as facial recognition for access controls or adding new functionalities such as poll and peer-to-peer knowledge sharing to enhance productivity of online collaboration.

1. <https://www.statista.com/page/covid-19-coronavirus>.

2. For instance, entertainment sector (cinemas).

## The Challenges for the Group

The pandemic crisis has forced businesses to accelerate their digital transformation journey. This put further pressure on the Group. First of all, the customers not only demanded flexible and innovative solutions, but also expected a shorter time to develop and implement digital solutions. Second, it was difficult to get work done with entirely distributed team members. The team members had to organize the work remotely. Although remote working was not a new concept for employees (see Exhibit 3), planning and completing tasks entirely remote along the project was a new experience for teams. The distance among teams and team members made it difficult to coordinate, collaborate and communicate.



# How the Group Responded

***Predicting the changes-*** To cope with such uncertainty and speed in developing digital solutions, the Group launched some initiatives. It encouraged teams to frame the problem by putting the customers at the center of the business: what are the real needs and pain points of businesses? Then it organized brainstorming sessions for ideation and solving the ‘real’ problem. Agile experience allows teams to not only be reactive to change, but also proactive by making sense of a new range of opportunities to create value. The teams focused on different customer segments. Companies with different sizes and industrial sectors had different needs. The impact of the health crisis was severe in some sectors than others. For example, the retail sector has basically lost its interactions with customers. According to Aaron- COO, *“Many retails lost their interaction with their clients, so they need new tools to be in touch with their clients. Although, there were existing solutions such as zoom, google meet and teams by big players, the retails need to have a different tool to communicate. Also, the solution can be used for events (virtual events). The idea was video streaming that can be used as stand-alone product or be integrated to the existing system such as CRM [customer relationship management].”*

Aaron further provided a use case to describe better the real need and possible solution:

*“...there is a shop selling bicycles, one scenario is that customers know what they want to buy (they have all specifications and info), in another scenario, customers ask consultation. It is more based on trust, human interaction and even post-purchase assistance. But Covid-19 obstacle the buyer-customer relationship due to physical distance. So, video streaming can be used to reduce such distance.”*

Thus, teams were able to sense and anticipate changes, and accordingly react to changes (e.g. by developing new digital solutions).

## ***Digital capabilities***

**Cloud-based infrastructure** allows the Group to quickly scale up and down resources based on demand (see Box 1).

**Open source software and platform** enable the teams to develop complex solutions and ensure high-performing solutions in short times (see Box 2).

**Modular digital solutions** enable the teams to mix and match different solutions for different applications and sectors and facilitate “plug and play” a wide range of solutions (see Box 3).

***Support of top management teams*** – The top management team played a crucial role in making sense of the situation. By fostering innovation and agile mindset, the management team supported teams in understanding the opportunities and challenges related to changes. The management team dedicated each team resources to explore, develop, prototype and test new digital

solutions. For instance, teams were provided with a range of different tools for creating and testing prototypes.

**Partnerships** – Considering the complexity of digital solutions, the management team paid particular attention to business partners who possess complementary capabilities and resources. During the years, the Groups announced different partnerships with not only giant digital actors (such as Google and Microsoft), but also with small ones. The Group's partnered with digital actors to explore emerging technologies such as Big Data, Artificial Intelligence, Augmented Reality to invent new business processes or provide new digital solutions. At the same time, the Group exploited the existing technologies to reduce cost, enhance the efficiency and effectiveness of business processes. A wide range of partners (different in size and expertise) improved the ability of the Group to access required knowledge, resources and capabilities in a timely manner, and be able to respond quickly in a fast-changing business environment.

**New workforce and hiring** – The management team was involved in hiring individuals who have the agile mindset and entrepreneurial spirit. Aligned with its mission, the Group looked for candidates who had innovation mindset to support the creation of digital innovation and new business models. The Group recruited potential candidates who had a strong team working and problem-solving skills, and applicable knowledge in designing and developing software components and managing the projects. The managers believed that focusing on soft skills (such as team working and problem-solving) was even more important in coping with disruptive technologies. As Tony explained:

*“Before, the analysis team negotiate with clients, and developer teams focused on new product development. Now, the developer teams constantly are in contact with the clients. They, therefore, need negotiation skills even junior members.”*

This reflected the group's strategy.

**Iterative development process** – In solving clients' problems, the teams developed user stories (prioritizing tasks and main specifications). The teams often met with the client to understand better the expectations of the client in terms of time, budget, main features etc. Then the teams presented a prototype<sup>3</sup>/ a minimum viable product (MVP)<sup>4</sup> to their client. At this phase, the teams were able to configure the basic functionalities and specifications. Then, the teams together with

3. Prototype is a basis of the final product. Prototyping is a process to make ideas tangible and testing them at a very early stage with customers. Thus, it allows developer/designers to save time and money. Moreover, it ensures developers/designers that the solution is designed in a way that it really addresses the user's underlying need.
4. The minimum viable product (MVP) is the first instance of a product only with the basic features enough to satisfy the early adopters and learn from their feedback.

the client tested the prototype by presenting it to users. Such prototyping allowed the teams to test ideas quickly and with low cost and reconfigure the product/service based on the feedback of stakeholders (i.e. clients and users). In more recent projects, the teams develop MVP to interact also with early adopters and learn from their feedback. According to Tony:

*“For developing a new digital product, we should not think about all features now. First, we need to focus on the core functionalities. The MVP can be developed in the future.”*

One of the managers summarized the project phases as follows:

- Exploration phase
- Configuration phase
- Development phase
- Implementation phase
- Post-implementation phase

This approach supported in breaking down tasks, planning in the short term, responding to changes and measuring the results.

***The use of digital tools*** – The agile mindset enables teams to manage their activities in the new realities of video calls (e.g. Zoom/Skype/Webex) and online collaborative tools (e.g. Teams). This facilitated the cooperation between teams, and better prioritization of requirements for daily activity and consequently for project objectives. Moreover, the flexibility and openness of digital tools allowed teams to explore technologies that could be used for a range of work activities and practices. The ability of teams to sense, experiment and use digital tools resulted in effective collaboration among team members.

# “New Normal” and New Challenges

In February 2021, almost a year after the health crisis the Group held a webinar to discuss the challenges they faced related to the development and implementation of new digital solutions for their customers around the world. To open the discussion, one of the managers provided an overall picture by pointing the following issues :

- shorter time to develop and implement projects;
- uncertainty and risks related to time and resource investments;
- additional communication, collaboration, and control for remote working.

Then the manager left the floor to other managers to share best practices and several success stories in different sectors. In general, the management team was satisfied with the performance of the Group, as teams could not only design and implement new digital solutions in a short available time but also with high quality. Below read an example of a successful story.

## **A successful story**

The project was to migrate to a database management system for real-time data processing and analysis to enhance performance and decision making. The client was a manufacturer in polymer sector. The Group has started the project during the pandemic.

By harnessing digital capabilities and knowledge, the Group developed a standardised solution, where the solution can be plugged and played quickly. This allowed the Group to complete the project in just a few months with excellent results. It saved up to 75% time. The responsible team organized and coordinated the entire project mainly remotely. The team reduced maintenance costs by making the most of the new standard features.

The webinar was a good occasion to reflect on how the Group managed the development of digital solutions. Putting the different perspectives together, the key enablers to sense and address changes were as follows:

- a short iterative development approach to adapt quickly to the change
- the use of collaborative tools to get work done remotely
- a network of partners and qualified workforce
- agile approach

Although the Group had a high performance during the health crisis in terms of speed of development, time to market, and innovation, the top management realized challenges and opportunities. Future success relied on how managers refine the development processes and practices.

Like other companies, the Group lost its constant interaction and collaboration with customers. When the Group initiated some projects in early 2020, by mid of 2020 it became clear that despite having committed teams, they have not sufficiently maintained the interaction with customers. Some clients were concerned about the transparency of the project. The lack of control over the project progress and cost influence the trust, especially with new clients. The clients expressed

concerns about the absence of an instrument to monitor and measure the results of the ongoing project.

Another challenge that emerged was to deal with manager-team interactions. The absence of physical interactions between a manager and its teams influenced knowledge sharing, learning, and coordination. This was especially true for the new workforce as opportunities to learn from their mentors were limited to scheduled meetings. On the other hand, the ability of managers to coordinate teams remotely became important.

# Discussion Questions

1. What factors pressure companies to be agile (drivers of agility)? Why should organizations adopt an agile approach in developing digital solutions?
2. What are agile approaches? How agile approach is different from traditional project management?
3. How agile approach helps the organization to develop digital solutions? Explain the main aspects of an agile approach? What are the challenges and issues in agile digital solution development for both teams or management teams?
4. What are enablers of agility? At the organizational level, how organizations can build agile capability?

Further questions

5. What can we learn from the experience of the company?
6. In your opinion, what additional issues might companies face? How they can address these issues?
7. How should the group enhance further its ability to sense and respond to changes?
8. Is the “new normal” an opportunity for the Group? How?

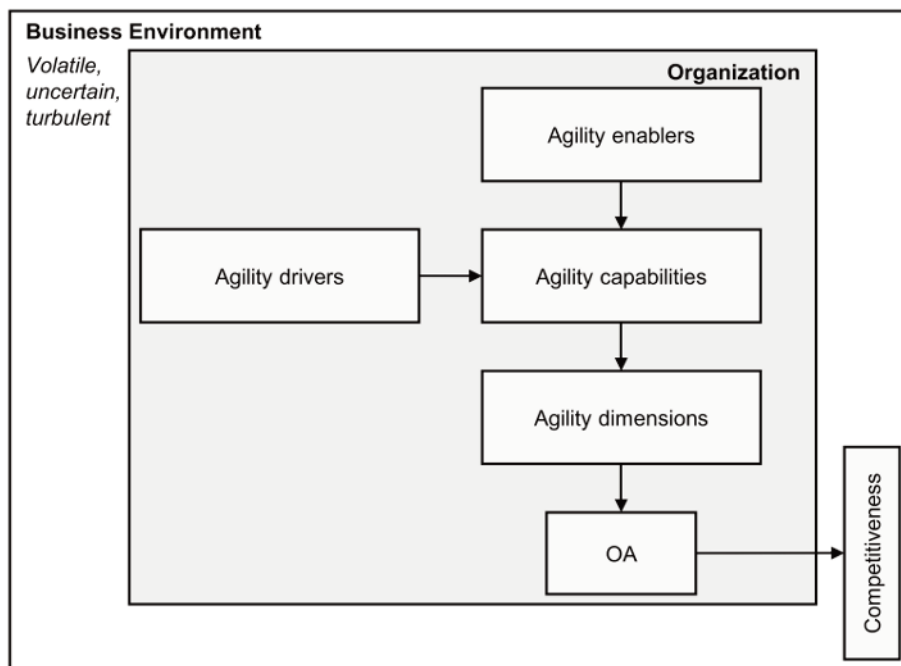


Figure 1. Basic framework—OA concept development Agility dimensions. Adopted from “Organizational Agility: Ill-Defined and Somewhat Confusing? A Systematic Literature Review and Conceptualization,” by Walter, 2020.

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[scrumalliance.org](https://scrumalliance.org), Accessed 18 Oct 2021

## Videos:

<https://vimeo.com/522945871>.

# Exhibit A

	Waterfall	Agile
Planning	<ul style="list-style-type: none"> <li>• Ex -ante planning requirement specification</li> <li>• For the whole project</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous gathering requirements</li> <li>• Planning at each iteration</li> </ul>
Customer involvement	Limited interaction with customers (at the early phased of the project and the final test)	Ongoing interactions with customers to ensure the alignment between project results and customer needs
Development cycle	Long timeframe	Short timeframe
Expecting changes in customer requirements	No	Yes
Developing team tasks	Often large size of tasks	Tasks are prioritized. At each iteration, the teams focus on a few tasks to be completed.
Management role	Centralized management	Teams are self-organizing. Management teams monitor the progress of teams.
Feedback	Customers provide feedback at the end of the project. The feedback can be used for the next project.	Frequent feedback is provided. The feedback is used in the next iteration.



# Exhibit B

## A quick overview on Scrum

### What is Scrum?

“Scrum (n): An [agile] framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value.” - Scrum Guide, November 2017 version

In Scrum, the product owner divides a large project into small requirements which need to be developed and delivered within a short time. In each development cycle, the teams work on a list of requirements with high priorities and adapt the service to meet customer needs. As the development cycle repeats, the teams focus on the development of new functionality.

Scrum is based on iteration and incremental improvement. In repeating development cycles, teams ensure that their design decisions lead to desired results and meet the expectation of customers. The teams develop and improve new features addressing customer needs. This leads to incremental innovation.

Watch this video to know more about Scrum in project management (<https://vimeo.com/522945871>)

### Benefits of Scrum

This allows scrum teams to get feedback, rapidly adapt each piece to change (i.e. change in customer demands), improve the piece in each cycle (is called sprint), and deliver the service in a shorter time.

### Scrum Events

At each sprint (i.e. iteration), there are different events in scrum (called activities or ceremonies):

**The Sprint** – It is one development cycle that scrum teams should develop and deliver components based on the project goals. The length of each sprint is short for instance a month.

**Sprint Planning** – The scrum teams autonomously set some goals to be achieved with a sprint. They need to determine what actions needed to be done, and how to allocate teams' resources to achieve the project objectives (who will do what).

**Daily Scrum** – Each day, often Product Owner (or Scrum Master) meets with the team to monitor its progress. In case of change in customer need, then Product Owner adapts the list of the requirements, and adjusts the planned actions of teams.

**Sprint Review** – Scrum teams interact with customers to ensure that the results are aligned with customers' needs and expectations. The scrum teams in this event collect feedback from customers. This allows teams to improve the service incrementally and address the changing customer needs.

improve

**Sprint Retrospective** – During this event, teams reflect on the previous sprint to identify the possibility to improve development processes, interaction within teams or with customers.

This allows teams to enhance the effectiveness and efficiency of their work.

### Difference between agile and scrum

To cope with uncertainty, agile methods have been introduced and widely adopted by practitioners especially in the software development context. After Agile Manifesto (Beck et al. 2001), agile practices have become popular and have been widely adopted in software development as an alternative to traditional plan-driven approaches.

“We are uncovering better ways of developing software by doing it and helping others do it.

Through this work we have come to value:

Individuals and interactions over processes and tools

Working software over comprehensive documentation

Customer collaboration over contract negotiation

Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more” - AgileManifesto.org

While Scrum is one of the methods/frameworks that organizations use to be flexible in an uncertain business environment.

Source: scrumalliance.org

# Exhibit C

## **Remote working at the Group**

The Group piloted remote working in 2019. The remote working as part of welfare program started with 50% of the employees which allows them to work from anywhere (WFA). In the pilot phase, individuals could work one day out of the office buildings. The program aimed to:

- Reduce commuting stress
- Improve life - work balance
- Enhance autonomy and flexibility

# Box 1

## Cloud services

Cloud computing as new outsourcing model enables accessing to computing resources as a software solution via internet, based on pay-per-use model (Mell & Grance, 2011). Cloud computing enables corporate to have remote access and share information while not relies on huge physical infrastructure.

## Cloud computing service level models are:

Infrastructure as a Service (IaaS): At IaaS level, providers of cloud computing offer infrastructure and enable the corporate to manage applications and programs by its own. The cloud provider manages and controls infrastructure while the control of operation system, storage and applications are in hand of the consumer like Amazon's S3 as storage service.

Platform as a Service (PaaS): At PaaS level, providers of cloud computing offer infrastructure and platform where the user can develop and manage applications without the need to build the infrastructure around it by enabling integration of different application components. The cloud provider manages and controls infrastructure and operating system while the consumer is responsible for application mainly. The consumers are able to control and manage software through internet like Microsoft's Azure services platform or Google App Engine.

Software as a Service (SaaS): At SaaS level, providers of cloud computing control and manage the infrastructure, platform and application, where applications can be accessed from various devices using a thin interface like Google Apps. Moving from IaaS to SaaS cloud solutions, an organization gain benefits of lower implementation cost while lose control on its data. SaaS is a new form of application service provision (ASP) and business service provision (BSP). SaaS model is becoming attractive for organizations specially for SMEs due to lower cost and ease of deployment. The report from Gartner shows SaaS would continue to grow and reach \$32.8 billion in 2016.<sup>5</sup>

Cloud deployment models are (Mell and Grance 2011):

- Public: Public cloud is based on shared service environment neither or low level of control over data.
- Hybrid: In hybrid cloud consumer can use public cloud for scalability and cost convenience as well as private cloud for storing sensitive data.
- Private: Private cloud is provided based on contract with higher level of control over data by cloud client.

5. Columbus, L. 2013. "Gartner Predicts Infrastructure Services Will Accelerate Cloud Computing Growth," *Forbes*, February 19.

## Box 2

### Open Source

Open source doesn't just mean access to the source code. The distribution terms of open-source software must comply with the following criteria:

1. **Free Redistribution:** The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.
2. **Source Code:** The program must include source code and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost, preferably downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a pre-processor or translator are not allowed.
3. **Derived Works:** The license must allow modifications and derived works and must allow them to be distributed under the same terms as the license of the original software.
4. **Integrity of The Author's Source Code:** The license may restrict source-code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.
5. **No Discrimination Against Persons or Groups:** The license must not discriminate against any person or group of persons.
6. **No Discrimination Against Fields of Endeavor:** The license must not restrict anyone from making use of the program in a specific field of endeavour. For example, it may not restrict the program from being used in a business, or from being used for genetic research.
7. **Distribution of License:** The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.
8. **License Must Not Be Specific to a Product:** The rights attached to the program must not depend on the program's being part of a particular software distribution. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.
9. **License Must Not Restrict Other Software:** The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.
10. **License Must Be Technology-Neutral:** No provision of the license may be predicated on any individual technology or style of interface.

Source: <https://opensource.org/>

## Box 3

### **Modular systems**

Modularity is a design principle. In a modular system, a “complex organization or technological system is composed of distinct interacting subsystems that are to some extent interdependent and independent. Interactions between the subsystems of a modular system weaker than those within them (Ethiraj and Levinthal 2004). A system with no (strong) interactions between subsystems therefore represents a perfectly modular (integral) system. Because neither extreme is observed in practice, it is more meaningful to conceptualize modularity as a continuum.” (Tiwana and Konsynski 2010).

In other words, a modular system is composed of loosely coupled subsystems that a change in one subsystem does not induce a change in other subsystems.