A practical guide for practitioners seeking to create value with big data

Pierre Dal Zotto

1. There is a gap between research and practice

In recent years, practice and academia have been urged to foster their reciprocal engagement (Bartunek *et al.*, 2001):

- On the practitioners' side, intensified competition has made practitioners more receptive to ideas – academic or otherwise – that might make them and their organizations more effective.
- On the academics' side, increasing changes in resource dependencies have fostered higher education's reliance on the private sector for both research and teaching support.

As "practitioners largely ignore academic literature and do not use it" (Teubner, 2007, p. 105), research is sometimes perceived as irrelevant or too complex for practitioners to implement (Bartunek and Rynes, 2014). We created Game of Streams to demonstrate that bridging this gap is possible while allowing practitioners to manipulate research conclusions in their contexts to develop IT-dependent strategic initiatives with big data and Digital Data Streams (DDS) (Pigni *et al.*, 2016).

Even researchers showing results as readily available to practitioners and making them actively used failed to bridge the gap (Steinbach and Knight, 2006, p. 290). Academics interested in bridging the gap may search for ways to motivate and enable practitioners to process and use their findings, even those with direct implications for them. Bartunek *et al.* (2001) also demonstrated the importance of face-to-face interactions for disseminating as well as creating knowledge. Nonetheless, articles and traditional face-to-face interactions are generally considered as the only means of communication between researchers and practitioners.

Gamification has demonstrated its potential in driving behavioral changes fostering new practices and developing knowledge transfer (Werbach and Hunter, 2012). We followed the design science research methodology (Goes, 2014) principle for the development of this approach. We were searching and designing an artifact to solve a real business problem, how a practitioner can generate valuable business ideas from their data and not for theory building. According to Gregor and Hevner (2013), a design science research perspective fits well for a situation in which artifacts required in a field are suboptimal and where effective artifacts may exist in related problem areas that may be adapted to a new problem.

To craft the Game of Streams, we followed six main steps according to Werbach and Hunter (2012, p. 83) (Table 1).

In this research, we expose both the use of a gamification framework to develop a boundary object, and this boundary object, Game of Streams, that can be used by practitioners to generate IT-dependent strategic initiatives to create value with big data.

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Table 1 The Game of Streams design following gamification framework

Design steps	*The Game of Streams*[a]
Define business objectives	■ Raise potential of value creation with DDS ■ Help knowledge retention and creation regarding DDS and value archetypes ■ Foster the use of the research in practice
Delineate target behaviors	■ Learners ask questions regarding research concepts and their understanding ■ Learners reflect upon the research concepts ■ Learners use research in specific context ■ Learners implement in their practice research concepts
Describe your players	Practitioners or learners from undergraduates to MBAs in an information system class specifically about big data and Digital Data Streams as well as value creation with data
Devise activity cycles	1. Each learner identifies three potential DDS when explained by the instructor (Figure A4) 2. Each learner identifies three categories of customers when introducing value creation by instructor (Figure A4) 3. Then the instructor gives them the DDS cube while discussing DDS archetypes 4. Then learners throw the cubes to generate a combinatory space of elements and they have to come with business ideas (Figure A5) 5. They discuss and choose the better opportunity for them in a collaborative manner
Do not forget the fun	■ They manually build the cube as *when they were young*[b] (Figure A2) ■ They may enjoy throwing it and selecting faces (Figure A3) ■ They discuss and challenge each other to select the better idea for them (Figure A7)
Deploy the appropriate tools	Non-computer-based gamification. They will use cardboard cube, pen and stickers or glue and scissors for the printable version. They also need an idea sheet (see Figure A5 for an example) and a pen to write their results. A place where small groups (three to five) can work and discuss as team is compulsory

Notes: [a]The author is willing to provide complete rules of the game and more content upon request; [b]Following this link, you can download and see an accelerated video on the building process of a cube during the case MasterStudentsFR, available at: https://goo.gl/wia5r6

In this article, our goal is twofold:

1. to detail our original approach, Game of Streams, for any practitioner to use; it has been tested five times and demonstrated its potential in generating valuable ideas; and
2. to demonstrate that academia can bridge the gap between research and practice thanks to the creation of boundary objects based on gamified mechanisms following Werbach and Hunter's (2012) approach.

We present in the next section how we developed Game of Streams.

2. Using gamification to support knowledge transfer about big data and Digital Data Streams

After an introduction on the core concept, namely, DDS and value creation archetypes – we detail how Game of Streams supports IT-dependent strategic initiatives with the use of big data.

2.1 Digital Data Streams and value archetypes

Digital data, such as online customers' feedback or transaction records, have become central in a firm's value creation either enabling new value proposition or empowering existing products and services. Pigni *et al.* (2016) have advanced a taxonomy of the value propositions firms leveraged to extract value from the increasing flow of digital data generated by an increasingly pervasive use of digital devices. This taxonomy aims to guide practitioners' actions in extracting value from big data. These DDSs refer to a specific aspect of big data relating to the continuous flows of digitally encoded data, available in real-time and describing a related class of events. In their study, the authors identify five different categories of value archetypes representing the generalized blueprints for digitally enabled strategic initiatives (Piccoli and Ives, 2005). Value archetypes represent generalized categories of ways firms used to uniquely combine products, services and DDS to create customer value. Five archetypes were identified by Pigni *et al.* (2016):

1. *DDS generation*: firms create value by originating the data stream, either recognizing or stumbling upon valuable digitally represented events, for instance providing the GPS location of a car.
2. *DDS aggregation*: firms collect, accumulate and repurpose DDSs to create value through information services and platforms, for instance, the aggregation of all GPS locations of the vehicles from a specific area.
3. *Service*: firms merge and process DDSs to provide new services or to improve existing ones, for instance, the provision of the fastest route considering real-time traffic emerging from smartphone and GPS data.
4. *Efficiency*: firms merge and process DDSs to optimize internal operations, for instance, the city adapts traffic lights when a vehicle approaches.
5. *Analytics*: firms merge and process DDSs to enhance decision-making by producing superior insight, typically through dashboards, data mining and data visualization, for instance, the preventive maintenance of a car thanks to feedback and analysis from different sensors.

Value archetypes can be used as generalized categories helping practitioners in situating an opportunity for data exploitation within the context of value propositions. In this sense, understanding the five "value archetypes" can help practitioners better frame their strategic objectives and challenge their current business model to seize opportunities afforded by the emerging DDSs.

As practitioners desire "rich prescriptions to be applied in their specific situations that capture the uniqueness and complexity of their own organizational settings" (Benbasat and Zmud, 1999), we wanted to make them work with the concepts detailed above in their context. This will foster the appropriation of the categories identified in the academic literature. We use a boundary object, known for being useful in bridging gaps between social groups, developed with a gamification framework.

2.2 A boundary object to bridge the research/practice gap

"Boundary objects are objects both plastic enough to adapt to specific group and needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across groups" (Star and Griesemer, 1989). The Game of Streams, and more generally the gamification of learning, constitutes the creation of a boundary object between researchers and learners/practitioners. "Researchers have suggested that effective boundary objects are those which are tangible, concrete, accessible, and up-to-date" (Levina and Vaast, 2005). The Game of Streams is aligned with these criteria:

- Based on the crafting of cubes, it is tangible and concrete.
- Based on recently published articles, it is up to date.
- Based on game elements, it is accessible to people who ever played.

The use of the boundary object perspective in research focusing on teaching information system to impact practitioners is a promising perspective as the "creation and management of boundary objects are a key process in developing and maintaining coherence across intersecting social worlds" (Star and Griesemer, 1989).

2.3 Using gamification to develop a boundary object

Gamification is defined as "the use of design elements characteristic for games in non-game contexts" (Deterding *et al.*, 2011). Gamification is a known approach in multiple domains, especially in education science, that is still emergent in the information system field (Cheong *et al.*, 2014). The willingness to bridge the gap between research and practice or teaching experiences has increased the interest from management research community (Bansal *et al.*, 2012; Burke and Rau, 2010). Gamification is a useful approach in fostering people engagement and learners' contribution to the class (Liu *et al.*, 2017). In this sense, this research is about crafting a gamified artifact and assessing its relevance in bridging the research/practice gap.

To assess this artifact based on gamification, we conduct three case studies.

3. Testing Game of Streams in real life

While discussing with colleagues about their DDS research, we were convinced that a playful approach would foster practitioners' and learners' knowledge transfer. We also wanted to foster the impact of research allowing practitioners to contextualize it while using collaboration to support engagement and discussion for better learning (Prince, 2004). Thus, we transformed recently published research (Pigni *et al.*, 2016) into a playful experience.

Starting in late 2015, we first discussed and iterated about this Game of Streams and developed the first prototype in six months. The artifact was then tested in 2016 and again in 2017 (see Table 2 cases descriptions for details) and 2019, and finally, the released its version in November 2021 (it does not appear in our case, as it is a trial on the version proposed here and no updates were made from that final experiment). The different iterations of the game were informed by participants' feedback to improve it. We released the final Game of Streams (Figure A8), presented here, in January 2021. It is available for free under a creative commons license.

3.1 Cases to support Game of Streams and gamification

The Game of Streams was designed in 2015 and tested six times. During each of the trials, the agenda was the same. First, the instructor explained the research with a slides-based presentation and questions to the audience.

When the instructor presented the value archetypes (cf. 2.1), one handed out the DDS Cube with the archetypes (Figure A6). The instructors also asked the learners to consider their own customers, internal or external, as possible targets of their innovation (Figure A4). Then, when DDSs were introduced, the instructor asked learners to identify potential DDS (Figure A4) they believed they could exploit.

Learners were then divided into small teams (from three to five persons) and started crafting three cubes: one grouping the DDS, one with their customers and one with the value archetypes printed on. Then, each group rolled the cubes as follows:

Table 2 Cases descriptions

Cases descriptions	*Case 1: AutoFactoryUK*	*Case 2: B2BFactoryFR*	*Case 3: MasterLearnersFR*	*Case 4: PatronITFR*	*Case 5: PatronCustFR*
Context	The modernizing effort of the global IT department for a European automotive manufacturer based in the UK	An open innovation seminar organized by a B2B information sharing community in France Participants were from a research center and an automotive part manufacturer in France	A class dedicated to big data value creation opportunities with a group of learners with different background – management, computer science and engineering	The patrons of the chair Digital Organization & Society, supporting the development of the approach, were testing it It is a business process service provider	A partner of the chair Digital Organization & society wanted to experiment with the approach It is a supplemental pension plan company in Switzerland
Profile of practitioners/ learners	High potential from the IT department	Mixed profile – engineers, marketing – from automotive part manufacturer and a research institute in France	Master degree learners from a digital marketing-oriented MSc in a French Business school	People from information systems and marketing department as well as the Digital Privacy Officer and the CEO of the business unit	People from information system department, marketing and sales as well as the Data Privacy Officer
Detailed agenda	First part with a traditional presentation by a DDS researcher regarding digital change, big data, DDS and value creation During the presentation, practitioners have to find DDS and customers to prepare their own cube Then he presented value archetypes Once done, a DDS researcher explained the process and practitioners played with the cube Once each group of practitioners came up with one idea, they presented it to all the others	First part with a traditional presentation by a DDS researcher regarding digital change, big data, DDS and value creation During the presentation, practitioners have to find DDS and customers to prepare their own cube Then he presented value archetypes Once done, we explained the process and practitioners played with the cube Once each group of practitioners came up with one idea, they presented it to the others Then each practitioner voted for its best idea with an emphasis on selecting one that seems easy to build, and professors selected their favorite	First part with a presentation by a DDS researcher regarding digital change, big data, DDS and value creation with IS During the presentation, practitioners have to find DDS and customers to prepare their own cube Then a DDS researcher presents value archetypes Once done, we explain and learners played with the cube After each group came up with one idea, which they presented to the others, each learner voted for its best idea and professors selected their preferred	First part with a presentation by a DDS researcher regarding digital change, big data, DDS and value creation with IS During the presentation, practitioners have to find DDS and customers to prepare their own cube Then a DDS researcher presents value archetypes Once done, we explain and learners played with the cube After each group came up with one idea, which they presented to the others, each learner voted for its best idea	First part with a presentation by a DDS researcher regarding digital change, big data, DDS and value creation with IS During the presentation, practitioners have to find DDS and customers to prepare their own cube Then a DDS researcher presents value archetypes Once done, we explain and learners played with the cube After each group came up with one idea, which they presented to the others
About the class	1 instructor 2 consultants 20 participants	2 instructors 1 consultant 24 participants	2 instructors 2 observing professors 18 participants	2 instructors 7 participants 3 hours	2 instructors 8 participants 3 hours

(*continued*)

Table 2

Cases descriptions	*Case 1: AutoFactoryUK*	*Case 2: B2BFactoryFR*	*Case 3: MasterLearnersFR*	*Case 4: PatronITFR*	*Case 5: PatronCustFR*
	6 hours total duration, 7 pictures (Figure A4)	4 hours 61 pictures (Figures A1, A2 and A7)	3 hours 26 pictures, 7 short videos around 10 seconds each (Figure A3)	17 pictures, 2 timelapse videos around 30	
Practitioners' feedback	*We were not able yet to get the feedback from external participant on this test*	The approach is perceived as innovative and involves more the audience than traditional class Observing professors are willing to develop the approach in their own class	The approach is perceived as very useful for learning and experimenting simply with big data while being easy to set up and cost effective	The CEO of the firm wrote "Compared to brainstorming techniques, Game of Streams decompartmentalizes and encourages transversality, favors the expression of all, and strongly stimulates the participants. It is simple to set up and generates results in less than two hours."	The approach was considered useful for understanding value archetypes and how to create value with data The fact that different department of the firms were able to work together was also perceived as an important outcome The idea generated was not considered as truly innovative

- Each team throws three times the DDS cube, two times the value archetypes cube, two times the customers' cube (Figure A3) and writes results on their idea sheet (Figure A5).
- Each learner must create two ideas with at least one DDS, for one customer proposing one value.
- Each person introduces the first idea to the team and the team selects one first team idea. Each person introduces the second idea and the team selects one second idea.
- Then each team selects its preferred idea and enriches it to present to the whole group (Figure A7).
- Each team introduces one idea in 1 min to the overall group.
- All group select the best idea from all the teams.
- Then instructors bring closure to the class providing and asking for feedback and answering questions.

By doing so, the approach allows idea generation and improvement by the means of the research and a contextualized approach with the use of their business context. In generating several ideas to converge into a smaller amount, they build on previously generated ideas, known for generating novel and potentially successful ideas (Gillier and Bayus, 2020).

4. Conclusion

4.1 Gamification bridges the gap

We observed that this approach worked to foster the engagement of learners. We foresaw that the use of this approach will impact practitioners beyond a classroom experiment. For example, in Case 2, six months after the case, students came back to explain that two of the ideas were evaluated and one of them was passing a feasibility study. We also saw that students were manipulating the cube while speaking with each other. Using this artifact supports communications and discussions about research concepts and allows learners to come up with real-life contextualization of the research. All the contents of Game of Streams can be downloaded and used for free in respect to a creative commons license following this link (See Figure A8):

https://recherche.grenoble-em.com/sites/default/files/public/kcfinder/game_of_streams_11_2020_chairedos_diffusion_final_english.pdf

4.2 Limits and future development

We developed and tested four times in 2022 an online version of the approach because of the pandemic. This was done with French members of an international manufacturer of goods (from washing machines to smartphones) for anyone to use it without having to print a document. We need to compare between cases what may be the differences. We also need a more longitudinal approach to see if the methods impact practitioners not only when practice occurs but also from a long-term perspective.

Keywords:
Boundary objects,
Gamification,
Digital Data Streams,
Value creation,
Big data,
IT-dependent strategic initiatives

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Appendix

Figure A1 Learners from Case 2 creating a customer cube

Figure A2 Learners from Case 2 working together to assemble their own cubes

Figure A3 Learners from Case 3 throwing cubes on the ground to randomly select Digital Data Streams and customers

Figure A4 Learner from Case 1 working on defining its Digital Data Streams and customers

Figure A5 The guide to idea generation and selection during prototyping

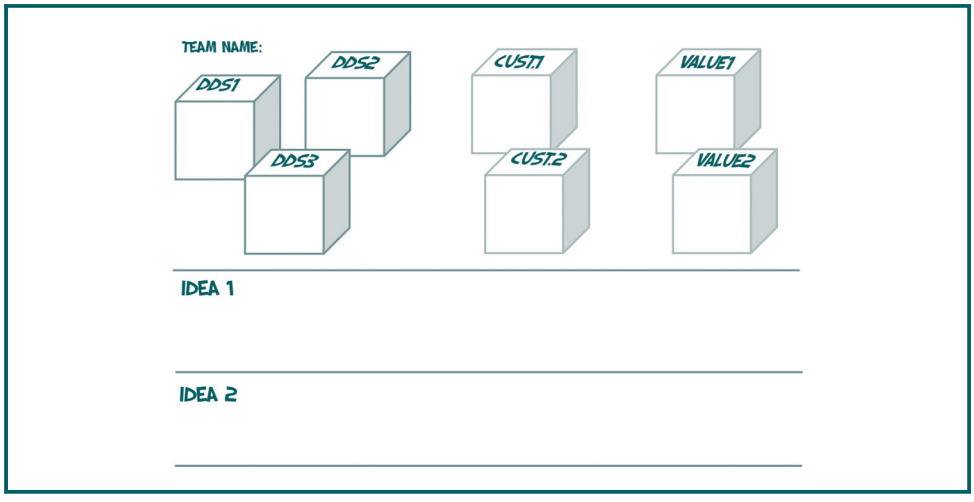

Figure A6 The net of the value archetypes cube during prototyping

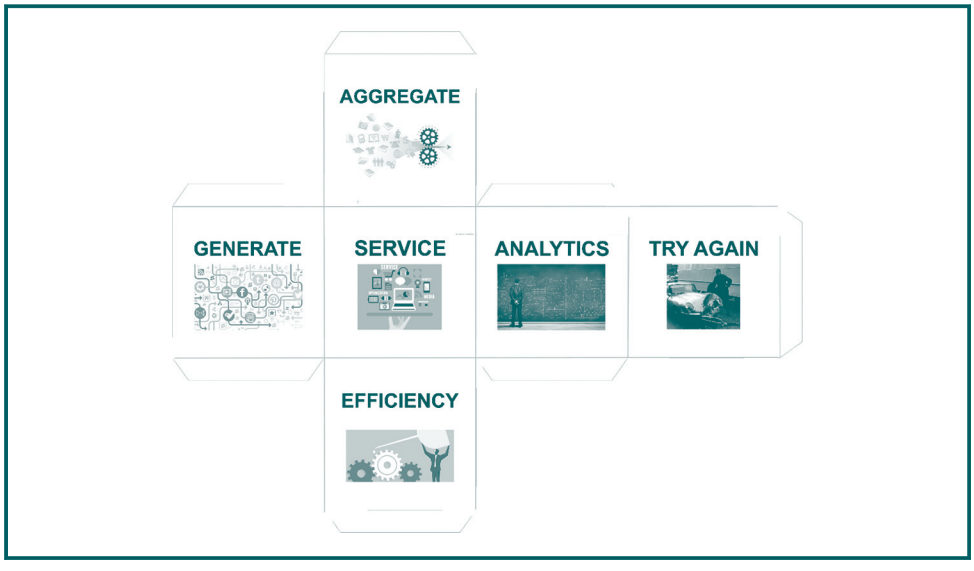

Figure A7 Learners from Case 2 improving their team idea

Figure A8 The complete methods you can use for free under the terms of the Creative Commons Attribution-Noncommercial-Share Alike License 4.0 International

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CHAIR DIGITAL ORGANIZATION & SOCIETY

Thank you!

We, at the Digital Organization & Society Chair, are convinced that our research needs to be understood and disseminated to all.

Thus, one of our missions is to develop one boundary object per year.

These boundary objects enable citizens, practitioners, and society as a whole to contextualize the results of our research, to manipulate them and, ultimately, to modify our practices, whether individual or collective.

Our first achievement is:

Game of Streams

(*continued*)

Figure A8

Our "Game of Streams" approach allows you to generate ideas with high value-creating potential, regardless of the size of your organization, from real-time data streams, also known as "big data".

The result of research published in international scientific journals, this approach aims to offer you a framework for thinking about these "big data" and the archetypes of value creation identified by research. Thus, your organization can exploit the "big data" to create value according to the five following possibilities[3]:

	A company can create value by being at the very origin of a real-time digital data streams, either voluntarily or as a by-product of another business process.
	A company can create value by focusing on collecting and aggregating digital data streams in real-time to give them a new purpose.
	A company can create value by using real-time digital data streams to create new services or improve the quality of existing services.
	A company can create value by using real-time digital data streams to optimize internal operations or to monitor the performance of an activity (examples: response time, process performance, waste volume).
	A company can create value from aggregation by adding real-time data analysis and visualization. The objective is to improve decision-making and deepen the knowledge of a subject (for example via dashboards or datamining).

3 Pigni F. (2013) Les Echos. « Big Data : où est la valeur ? » lesechos.fr, october 18th 2013, http://archives.lesechos.fr/archives/cercle/2013/10/18/cercle_82135.htm

(*continued*)

Figure A8

You will find in this file all the elements allowing you to use "Game of Streams" in this order:

- a sheet to use the approach, within your context.
- a sheet to note the ideas produced.
- a cube pattern to select your customers.
- a cube pattern to select your real-time digital data streams.
- a cube pattern with the archetypes of value creation.

You are free to use this kit in your organization, following the terms of the Creative Commons Attribution-Noncommercial-Share Alike License 4.0 International.

Do not hesitate to contact directly Delphine, our development manager, if you want to know more about this boundary object and our customized support possibilities at Grenoble Ecole de Management.

Please note that the logos and visuals of the Digital Organization & Society Chair and the Game of Streams logo remain the exclusive property of Grenoble Ecole de Management and are not made available under the aforementioned license.

You can also buy a tangible kit with re-useable cubes, re-positionable stickers, pens and the user's guide with the re-useable idea sheet on the Plush & Nuggets website with whom we worked to design the materials: https://shop.plushnuggets.com/fr/collections/frontpage/products/erasable-dices-game-of-streams-edition

To your scissors and glue!

(*continued*)

Figure A8

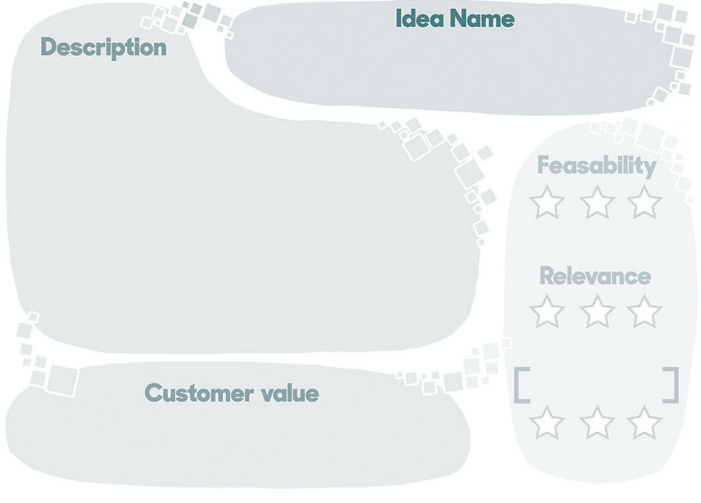

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Figure A8

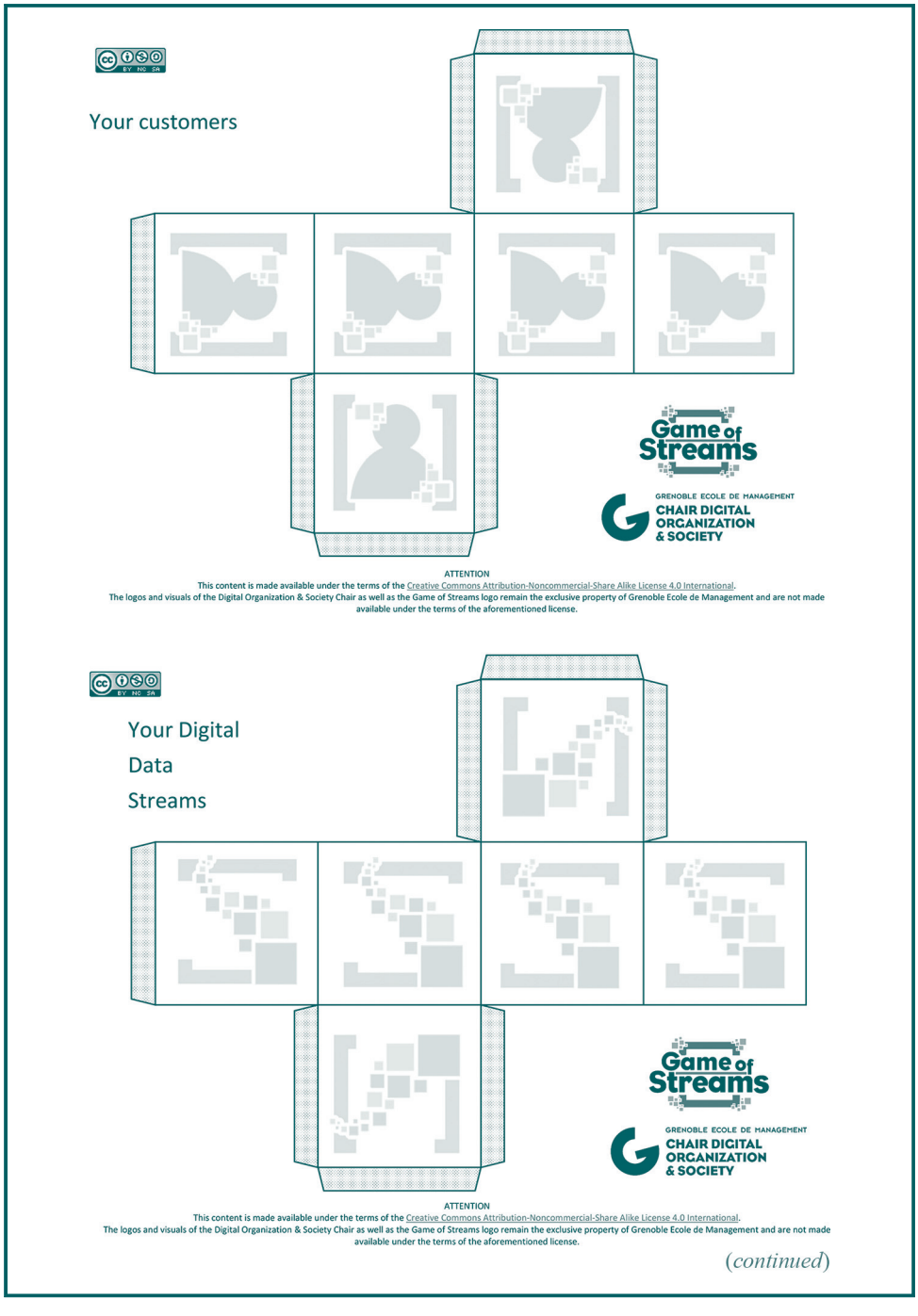

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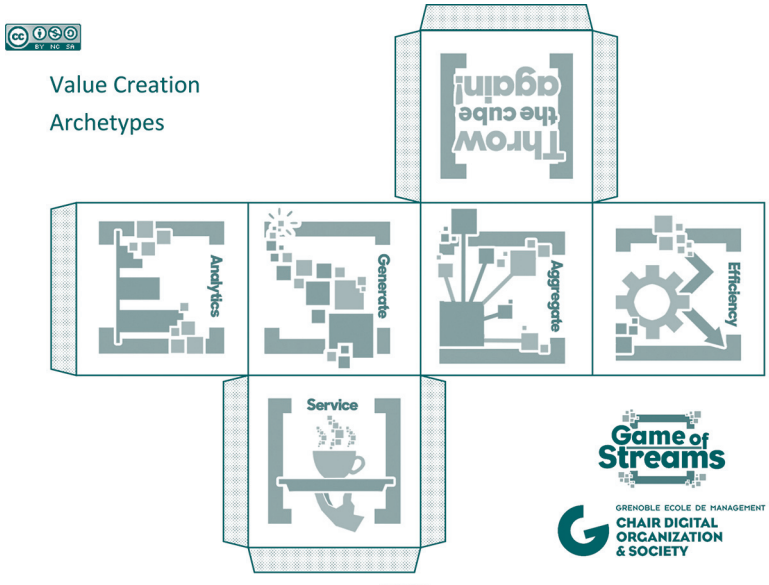
Figure A8



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