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Project deliverable 2.3 (D2.3)

Report on the (anti-rival) business model design toolkit and education

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1. Introduction

Digitalization has altered the way we communicate, work, and connect. While digital communities, resources and goods fundamentally differ from their real-world counterpoints, they are often subjected to the same tools and concepts for organization and coordination. ATARCA has highlighted this as a failure of the modern economy, emphasizing that the anti-rival nature of digital goods requires new ways of conceptualizing and accounting. Grasping these new ways of understanding digital goods has been challenging even for members of the ATARCA consortium at times, highlighting the need for education on anti-rivalry and how it can be applied.

To meet this need, ATARCA has designed the anti-rival business model design toolkit, featuring eight canvases to aid individuals and organizations who are interested in applying anti-rival elements in their businesses. In addition, three free, open-access online courses (MOOCs), approaching anti-rivalry in slightly different ways, were launched. To further promote education on anti-rivalry, we have created materials to be used by educators in their own classrooms. To verify the applicability of our educational deliverables, variations of our design toolkits, MOOCs and teaching materials have been tested in 36 classroom settings.

This deliverable presents the contents of the toolkit and the educational materials, as well as the processes of creating them and how they were disseminated.

2. Anti-rival business model design toolkit

The design toolkit translates the research conducted in the ATARCA project into a tangible, easy-to-use resource that can be used by interested individuals to explore the potential for anti-rival value generation and anti-rival business models. The toolkit aims to foster a more sustainable, efficient, and inclusive economy based on the sharing and collaborative use of anti-rival goods.

The canvases presented in the toolkit help the toolkit users to better understand the full ecosystem that may surround the organization and related use cases. In particular, this helps the designers identify the characteristics of the various stakeholders in the designed system, relationships between the stakeholders, and importantly, the potential for anti-rival value generation activities.

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As the toolkit is released under the CC BY-SA 4.0 license, the goal is to 1) maximize the usability and shareability of the toolkit with any interested party, 2) allow other researchers and users to adapt and modify the toolkit according to their respective needs, and also 3) allow for the tools to be utilized for commercial purposes by individuals and organizations alike. In addition, the tools and canvases provided in the toolkit are supported with easy-to-follow instructions, meaning that anyone should be able to make use of this toolkit without any additional support required.

2.1 Contents

The Anti-Rival Ecosystem Design Toolkit consists of eight canvas tools, each designed to address a specific aspect of designing and implementing anti-rival business models. The ATARCA team adapted and customized canvases 1-3 and 5 from the parts of team's previous work to suit the unique requirements of anti-rival business models, while canvases 4, 6, 7, and 8 were developed during the ATARCA pilot case development process.

1. Ecosystem Member Mapping. The Ecosystem Member Mapping canvas has a mission-centric focus. This approach intentionally avoids centralized and firm-centric structures, which may not be conducive to the collaborative nature and value-sharing potential of anti-rival business models. This focus helps to foster a more collaborative environment, where ecosystem members work together to achieve shared objectives and create value for all participants.

2. Ecosystem Member Analysis*.* By focusing on what each member can provide to the ecosystem, the Ecosystem Member Analysis canvas enables designers to identify and leverage the unique capability potential and resources of individual stakeholders. This approach ensures that all participants have a clear understanding of their roles and can effectively contribute to the mission's success.

3. Motivation Matrix. The primary goal of the Motivation Matrix is to help ecosystem designers to understand the various motivations, interests, and potential synergies between different stakeholders in the context of anti-rival goods. By doing so, strategies can be designed that effectively facilitate these value-creating interactions.

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4. Ecosystem Activities and Interactions Map. Using this canvas, designers can determine the activity hierarchy in the ecosystem, which helps identify the key activities that need to be promoted to maximize anti-rival value creation and collaboration among stakeholders.

5. Ecosystem Governance. This canvas is designed to ensure that the ecosystem design is compliant with the tenets of Ostrom's (1990; 2005) polycentric governance. Polycentric governance is a framework characterized by multiple, overlapping, and autonomous decision-making centers, promoting cooperation, adaptation, and flexibility in complex and dynamic environments. This approach is particularly relevant for ecosystems centered around anti-rival goods, as such ecosystem need intense collaboration and resource sharing among stakeholders.

6. Core Interaction Analysis. This tool is designed to model the key interactions within the ecosystem, based on the insights gathered from the Motivation Matrix and Ecosystem Activities and Interactions Map. By using an approach inspired by game theoretic modeling, the purpose of the Core Interaction Analysis canvas is to align the interests of different interacting members, ensuring that there is maximal incentive for collaboration and minimal incentive of defecting in member-to-member interactions.

7. Sustainability Drivers. The canvas based on Mindel et al. (2018)'s thinking on the sustainability of polycentric information commons. The authors' framework has been tailored to the anti-rival ecosystem context, which often involves the formation of a commons for organizing anti-rival resources. In the context of anti-rival ecosystems, sustainability drivers are crucial factors that contribute to the long-term viability, resilience, and effectiveness of the ecosystem. These drivers help ensure that the ecosystem can adapt and respond to changing circumstances while maximizing the potential of anti-rival goods for mutual benefit and value creation.

8. Business Model Patterns (for Anti-Rivalry). This tool is the result of our systematic work on analyzing business model patterns in anti-rival contexts, as reported in ATARCA deliverable D2.2 (Report on anti-rival business model archetypes). Using a closely similar approach as the famous 55 business model pattern card deck by Gassman et al. (2014), our pattern "cards" showcase patterns that are compatible with or enable anti-rival value creation, providing stakeholders with a comprehensive set of potential strategies and approaches to consider when designing and implementing anti-rival ecosystems from a business perspective. Each pattern card presents a specific business model pattern that has been identified as relevant and effective in the context of anti-rival goods.

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2.2 Use of the toolkit in ATARCA

The pilot cases were designed in parallel, allowing each case to follow its own timeline and progress at its own pace. This approach facilitated the allocation of resources and attention to each case individually, ensuring that the unique challenges and opportunities presented by each case were adequately addressed.

In all pilots, the design processes began with a series of workshops, first among ATARCA researchers and later with pilot case users and other stakeholders. These workshops utilized canvases 1-3 (Ecosystem Member Mapping, Ecosystem Member Analysis, and Motivation Matrix). The iterative process, which lasted approximately three months, ensured that the pilot cases' foundations were well-suited to address the context-dependent challenges and opportunities presented by anti-rival goods in each pilot.

Later in the pilot case development process, the project team used canvases 6 (Core Interaction Analysis) and 7 (Sustainability Drivers) to ensure proper alignment of incentives between ecosystem members and the long-term sustainability of the cases. The results from the use of canvases 6 and 7 were documented as a part of ATARCA deliverable D2.1 (Report on crypto-economic mechanisms for anti-rival goods)..

The parallel design of the pilot cases enabled valuable cross-learning opportunities among the cases. As the project team worked on each case individually, they shared insights, lessons learned, and best practices with other cases in real-time. Design workshops were also disseminated within the consortium as video- and audio-recordings. This collaborative learning environment not only facilitated the continuous improvement and refinement of the Anti-Rival Business Design Toolkit but also ensured that each pilot case could benefit from the experiences and knowledge gained in other cases.

3. Educational Activities

To build a wider pool of students, academics, policymakers, and developers able to contribute to discussions on anti-rivalry, a series of educational activities were designed and carried out over the course of the project. This included standalone MOOCs, teacher-guided online courses, and lectures and workshops in different academic settings. These activities are outlined below in detail. Information on how many people have taken part in each of the courses can be found in Chapter 4, Dissemination of educational materials and toolkit.

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3.1 Introduction to anti-rivalry MOOC

An Introduction to Anti-Rivalry MOOC was designed as the main educational output for ATARCA and the majority of the other educational materials either contributed to or stemmed from the production of the MOOC. The course is available for free on the ATARCA website, requiring only registration with a name and email address. The course is made up of five chapters, beginning with a broad overview of rivalry to introduce anti-rivalry, and concluding with examples of how anti-rivalry has been used in the ATARCA use cases.

The course is designed to take two to three hours, with most students completing the entire course over a day and a half[1]. It includes readings and interactive exercises. When students complete all the readings and exercises, they will receive a downloadable certificate of accomplishment and the opportunity to earn an anti-rival token. This certificate can be downloaded from the ATARCA course webpage until the site closes.

3.1.1 Learning objectives

The course was designed around three main learning objectives:

- Students will be able to understand what anti-rivalry means and how it differs from Students will be able understanding and rival and nonrival goods
- SWBAT identify how anti-rivalry applies to digital goods
- Students will be able identify the challenges of anti-rival systems and the potential tools to mitigate these challenges

3.1.2 Design process

The Introduction to Anti-rivalry MOOC was designed from the beginning to be a stand-alone course that did not require a facilitator or educator. It was intended that students should be able to complete the course entirely on their own, using only the materials within the course.

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[1] This does not mean students are on the website for a day and a half, but instead that start and finish the course over a day and a half.

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The original concept of the MOOC included both an introduction of the concept of anti-rivalry and a guide on how to use the anti-rival business model design toolkit. However, it was determined the scope of such a course would be too large and require more time and effort than most students would be willing and able to put in. Instead, the course was restructured to be an easily digestible course that would provide students with an understanding of the key concepts in only a few hours.

Course design began in June 2021, with interviews conducted with experts and university educators in the fields of management studies, information sciences, and the data economy. To gather materials, a literature review was conducted on relevant concepts, such as rivalry, anti-rivalry, and the data economy. Further, a scan of literature, guides, and previous successful MOOCs was conducted to determine best practices in designing the course.

An initial outline was developed and refined over the next year as the ATARCA pilot cases progressed and new understandings of anti-rivalry emerged. A major shift in the course was the move away from a focus only on the data economy, as it became evident that anti-rivalry is not restricted to the data economy, although it is particularly relevant there.

Several iterations of the MOOC were workshopped until it was launched November 2022. The course was expanded upon, including the addition of material on the anti-rival business model patterns (described in section 2.3.1) in Jan 2023.

3.1.3 Content

An Introduction to Anti-rivalry comprises five chapters: What is rivalry?, Data and data as anti-rival, Challenges to anti-rivalry, Anti-rivalry in business model design, and Anti-rival accounting in practice. Each chapter is described below, including the chapter objectives, a brief overview of the contents, and the exercises included.

Chapter 1: Welcome to the course: What is rivalry?

This chapter introduces the course itself and provides a brief introduction to the concepts of rivalry, excludability, and subtractability. At the end of the chapter, students are introduced to anti-rivalry.

The objectives of this chapter are for students to: (1) understand the purpose of the course, (2) understand and identify rival and nonrival goods, (3) identify anti-rival goods, and (4) define positive externalities in relation to anti-rivalry.

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The chapter content includes a definition of rivalry and non-rivalry, as well as the term subtractability, including an exercise where students label goods as rival or nonrival. In the next section, students are introduced to the term excludability and are asked to label goods as excludable as non-excludable. Finally, students are introduced to anti-rivalry as a good that does not fit into these previous categories. Students are given examples of anti-rivalry goods, including both excludable and non-excludable. At the end of the chapter, the relationship between anti-rivalry and positive externalities is outlined. Students conclude by identifying goods as rival, non-rival or anti-rival. Once complete, the exercise provides explanations for each answer.

Image 3.1. Questions included in the activity concluding Chapter 1.

Chapter 2: Data and data as anti-rival

The second chapter focuses on developing a shared understanding of data and how data can be anti-rival. The objectives of this chapter are for students to: (1) develop shared understanding of data, (2) understand how data sharing is anti-rival, and (3) recognize examples of anti-rivalry. In this chapter, students are also introduced to the Data Metaphor Cards, a series of cards and exercises to help users develop their own understanding of data and the value created by data. Finally, students are introduced to the idea of a "data commons" as a prime example of an anti-rival governance structure. Students review their understanding of anti-rivalry by again identifying goods as rival, nonrival, or anti-rival.

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Chapter 3: Challenges to anti-rivalry

In the third chapter, we outline the challenges to achieving anti-rivalry and some ways to mitigate those challenges. The objectives of this chapter are for students to: (1) understand and relate the tragedy of the commons to anti-rivalry and (2) recognize challenges in maintaining anti-rival ecosystems. Students are introduced to the idea of the Tragedy of the Commons and how it takes form in a digital commons. Students are then presented with Ostrom's (2005) ideas on managing the commons. Students then complete a short exercise reviewing the concepts of the commons and the tragedy of commons.

Chapter 4: Anti-rivalry in business model design

In the fourth chapter, students are introduced to the questions and challenges of anti-rival business model design. The objectives of this chapter are for students to: (1) recognize main approaches to anti-rival business design and (2) recognize the failures of current accounting systems that do not consider anti-rival goods. This chapter includes real-world business examples of the main approaches to anti-rival business model design and describes the need for anti-rival accounting methods.

Chapter 5: Anti-rival accounting in practice

In the concluding chapter, students are introduced to the three ATARCA pilot cases as examples of anti-rival accounting in real world settings. The objective of this chapter is for students to: (1) identify anti-rival elements of real examples. The background of each case is given, as well as an explanation of how the case is anti-rival. Videos explaining the cases are also included.

At the end of the course, students are encouraged to take part in the Designing Anti-Rivalry MOOC.

3.1.4 Anti-rival expert token

As the use of anti-rival tokens was central to ATARCA's three experimental cases, it was decided to create an anti-rival token to support the introductory MOOC. These tokens are shareable non-fungible tokens (sNFT), an innovative form of token created by the ATARCA consortium. Tokens are minted to those who complete the course, An Introduction to Anti-rivalry, to acknowledge their efforts to promote anti-rivalry. These tokens can be shared with others to identify them as anti-rival experts.

By encouraging the sharing of tokens, we aim to create a community of anti-rival practitioners and experts. The tokens provide a concrete example for MOOC participants of what an anti-rival token may look like and how it may be used.

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The tokens are created using the Talkoapp, a platform created as part of ATARCA and which also hosts the Streamr and Green Shops tokens. By using the Talkoapp, we also create more traffic for the platform and potentially find new ways to attract customers.

The earned token will continue to exist within the owner's crypto wallet even once ATARCA is complete. It can serve as a form of reputation, showing others that they are knowledgeable and active in learning more about the data economy, anti-rivalry, and regenerative ecosystems.

Image 3.2. Screenshot of sNFTs that have been minted as part of the course.

3.2 Designing Anti-rivalry: The Anti-rival Business Design Toolkit MOOC

To support users in applying the toolkit to their own cases, the Designing Anti-rivalry MOOC was created. It explains the purpose of toolkit canvases and how to use them, modelling each canvas using the example of the Streamr's ATARCA pilot case. These canvases were used by ATARCA resources to map out the Streamr case as part of the project; however, the canvases presented in the MOOC are simplified versions.

3.2.1 Learning objectives

The course was created with two main objectives in mind:

- Students will be able to understand the purpose of each canvas and its role in creating an anti-rival ecosystem

- Students will be able to use each canvas on their own.

These objectives were largely supported through a scaffolding approach, where the use of each canvas was modelled using an example use case.

3.2.2 Design process

This course was designed in tandem with the Introduction to anti-rivalry MOOC. Initially, the two were intended to function as one course. To simplify the Introduction MOOC, the toolkit was separated into its own course which focuses on how and why the toolkit canvases should be used.

The chapters were designed to logically follow the order of the toolkit, with some exercises to test students' learning along the way.

The Designing Anti-rivalry MOOC was launched in February 2023.

3.2.3 Content

The course was divided into three chapters, each covering a specific theme related to several of the toolkit canvases. The chapters included: Designing anti-rival ecosystems, Motivating anti-rival interactions, and Sustainable anti-rival systems.

Each chapter is outlined below, including the objectives, content, and exercises.

Chapter 1: Designing anti-rival ecosystems

The objectives of this chapter were for students to (1) understand what a business ecosystem is, using an anti-rival use case (Streamr), and (2) be able to complete their own ecosystem member mapping and member profiling canvases. In this chapter, students are introduced to the concept of a business ecosystem, using relevant literature such as Moore (1996) and Adner (2017). This sets the stage to explain the purpose of the toolkit and the ecosystem member canvas. Students are then guided through the ecosystem member canvas and the member profile canvases using the example of Streamr.

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Chapter 2: Motivating anti-rival interactions

In this chapter, we explore activities and motivations within an ecosystem, again using the Streamr case as a model. The objectives of this chapter were for students to: (1) understand the relevance of motivation and interaction in ecosystems, (2) identify activities, sub activities, and virtuous cycles in anti-rival ecosystems, and (3) be able to complete motivation matrix & ecosystem activities/interactions canvas for their own ecosystem. Students are first given an explanation of motivations and their role in ecosystems. The motivation matrix canvas is modelled again using the Streamr case. To receive the fully completed canvas, the student must complete an exercise related to the motivation matrix. Students are then introduced to the ecosystem activities and interactions map.

Chapter 3: Sustainable anti-rival systems

The final chapter focuses on sustainability challenges and possible solutions, as well as gives an overview of the final canvases. The objectives of this chapter are for students to (1) be able to identify threats to sustainability in their own ecosystem, (2) recognize potential methods to promote long term sustainability for anti-rival projects, and (3) to understand the function of the remaining canvases. The sustainability drivers and collective action threats are reviewed and modelled using the case of Streamr. To receive the completed collective action threat canvas, students must complete a short exercise identifying potential solutions. The potential of tokens for incentivization are also introduced as a way to promote participation and collaboration. At the conclusion, the remaining three canvases are explained.

3.3 Sustainable Consumption MOOC

The Sustainable Consumption MOOC was created as part of the Food Futures Use Case. Unlike the other MOOCs, this was run as part of the Open University of Helsinki, in partnership with the master's program in Global Politics and Communication at the University of Helsinki. The course was run four times on the Open University platform, and students were able to earn two university credits for completing the course.

Sustainable Consumption combined both theoretical and practical elements with an emphasis on individual contributions to collaborative efforts for sustainability. Students in the course were encouraged to use the Food Futures app, developed as part of the Food Futures use case in ATARCA. Anti-rival blockchain tokens were received for validated acts of sustainable consumption.

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3.3.1 Learning objectives

The Sustainable Consumption course has two main objectives for students. These learning objectives are stated below:

- Students have a deepened theoretical and practical understanding of sustainable consumption, emphasizing the role of sustainable meal choices.

- Students are familiar with how individual choices contribute to the tragedy of the global environmental commons and how individual and collective impact data, channeled as a user-friendly mobile application Food Futures, can guide towards informed consumption choices.

This course places a strong emphasis on the individual's ability to have an impact, requiring students to take action beyond simply reading and completing a traditional quiz or test.

3.3.2 Design process

The course was designed by Dr. S.M. Amadae and several student assistants. The curricula was developed as a University of Helsinki Open University course available to the general public. It is also published as the open-source textbook "Sustainable Consumption," in Aalto University's Science and Technology publication series. The curricula was designed to cover the theoretical and practical application of anti-rival cryptocurrency tokens to mitigate tragedy of the commons resulting from the negligibility of individual impact and negative externalities.

3.3.3 Content

The course is made up of eight modules. Each chapter is outlined below, including the objectives, content, and exercises.

Module 1: Introduction

The first module serves as an introduction to the course and concepts. The objectives of this module are for students to: (1) learn class etiquette and the basics of participating in work life and (2) learn about ATARCA and the Food Futures experiment. Students are introduced to lifestyle sustainability metrics and encouraged to apply them to themselves. Students also learn about the concepts of citizens' sovereignty and consumers' sovereignty. Information is anti-rival and is necessary for efficient market allocation.

Module 2: Data

The objectives of the second module are for students to: (1) understand concepts of data and information, both raw/unprocessed and contextualized, (2) understand role of data in ATARCA Food Futures, and (3) understand different analyses and visualizations of data relevant to sustainable consumption. In this module, students learn about data variables, how data is sourced and calculated, and different factors influencing how we understand data. Students also complete several exercises and a quiz related to data metrics.

Module 3: Aggregated Data

The objectives of the third module are for students to: (1) understand the challenges of aggregating data, (2) understand that aggregated data serves the purposes of its producer, and (3) understand the functions aggregated data can serve. In this course, students are introduced to methods of aggregating impact data; challenges of aggregating data; and the value of collective input. Students also learn about how to visualize collective impact and complete exercises related to data aggregation and individual/collective impact.

Module 4: Tragedy of the Commons

The objectives of the fourth module are for students to: (1) understand the dilemma captured by Hardin's tragedy of the commons (Hardin, 1968), (2) relate the tragedy of the commons to the challenge of achieving environmental sustainability, and (3) explain why neither market not government solutions are sufficient alone to remedy this challenge. This lecture includes information on the tragedy of the commons and the assumptions driving the theory, the connection between the tragedy of the commons and the prisoner's dilemma, and the viability of market vs. government solutions. Students complete exercises related to the "public goods games" and excludability.

Module 5: Externalities

The objectives of the fifth module are for students to: (1) understand the definition and give examples of negative externalities, (2) understand definition of and give examples of positive externalities, and (3) relate externalities to the tragedy of the commons. This module discusses positive and negative externalities, their relation to market failures, and the regulatory approach to externalities. Several other related concepts are introduced, such as Pareto Optimality/Efficiency and market equilibrium. Students complete exercises related to externalities, carbon taxes, and Food Futures as an alternative.

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Module 6: Negligibility

The objectives of the sixth module are for students to: (1) understand the philosophical problem of negligibility, (2) understand the different motives of free riding and negligibility, and (3) compare and contrast the analysis of the tragedy of the commons from the perspectives of free riding and negligibility. This module centers on negligibility and freeriding, as well as why collective action fails. In this module, students are encouraged to consider how the ATARCA Food Futures approach to collective action can promote positive externalities with respect to sustainable consumption. Students complete exercises related to freeriding and legibility and complete an individual analysis of whether "negligibility" or "tragedy of the commons" most describes individuals' experiences.

Module 7: Cryptocurrencies

The objectives of the seventh module are for students to: (1) understand the characteristics of cryptocurrencies and their relationship to traditional currencies, (2) understand the difference between rival (exchangeable) and anti-rival (shareable) cryptocurrencies, and (3) relate the conceptual structure of cryptocurrencies to ATARCA Food Future's History and Impact tokens. This module introduces the basics of blockchain cryptocurrency and the potential application of anti-rival cryptocurrencies for solving market failures and tragedy of the commons dilemmas. Students complete exercises comparing exchange with sharing, comparing token types, and addressing the stakes of solving free riding versus negligibility.

Module 8: Conclusion

The objectives of the final module are for students to: (1) understand and explain how ATARCA Food Futures App, and cryptocurrency tokens more generally, are designed to address the tragedy of the and (2) understand and explain the role of aggregated data in helping individuals as citizen consumers in solving collective action failure. This module summarizes and concludes the overall course. Students also complete exercises regarding anti-rival market design.

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3.4 Teaching materials

Five teaching modules were created to enable educators to include anti-rival concepts in their own classrooms. The materials are based on the MOOCs and on the educational presentations of ATARCA researchers. The materials are suitable for educators and students at the bachelors, masters, doctoral and executive education levels. Each of the modules is outlined below.

3.4.1 Teaching Module A

This teaching module discusses the different categories of goods based on their subtractability and excludability. The module introduces the concept of anti-rival goods, which increase in value the more they are used, with digital goods being the clearest example. The module also provides examples of anti-rival goods outside of the digital realm, such as language, movie quotes, climate change efforts, and reggae.

Submodule video title
A.1 Rival and Non-rival Goods
A.2 Excludability of Goods
A.3a The Third Category: Anti-Rival Goods
A.3b Anti-Rivalry Beyond Digital Goods
A.3c Anti-Rivalry in Action: Externalities

All videos are available in the teaching materials playlist on the ATARCA YouTube channel, accessible at: https://www.youtube.com/watch?v=QlF5fb50DzA&list=PLmNO5ufDme9p6W3RdupvptGVSeyjQWtov

3.4.2 Teaching Module B

The challenges of anti-rivalry discussed in this module include the tragedy of the commons, collective-action threats, free-riding, and fluctuating user engagement. To address these challenges and ensure the long-term sustainability of anti-rival ecosystems, it is important to incentivize participation and collaboration among community members through methods such as acknowledgement and reputation, delegating decision-making rights, facilitating curation, monitoring behavior, and enforcing fair consequences for rule-breaking.

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Submodule video title
B.1 Challenges to Anti-Rival
B.2 Long-term Sustainability of Anti-Rivalry
B.3 In detail: Managing the Tragedy of Commons

3.4.3 Teaching Module C

The module highlights how anti-rival goods present a paradox in business model design: to gain maximal benefit, one should maximize sharing, yet ultimately sharing is based on at least some rival resource usage. Here, traditional pricing models become less applicable, and businesses must find creative solutions. In the module it is described how the ATARCA project has identified different approaches to anti-rival business design: building community network effects and decentralizing rival costs, subsidizing sharing-related costs, shifting the revenue focus from rival resource usage to anti-rival results, and creating parallel offerings. Moreover, the module stresses that proper anti-rival accounting is still largely lacking in large-scale cases. The module concludes on discussing how the ATARCA project has piloted anti-rival accounting technologies.

Submodule video title
C.1 Anti-Rival Business Model Design
C.2 Four Approaches to Anti-Rival Business Model Design
C.3 Anti-Rival Businesses Need Anti-Rival Accounting

3.4.4 Teaching Module D

This module discusses the ATARCA cases in detail, as examples of real-world applications of anti-rival accounting. Each case is described, as well as the purpose of the tokens to support anti-rival value production. The module is supported by the videos created to promote the pilots.

The first case is the Food Futures case, which developed a mobile application that makes the sustainability impact values of meal choices readily available. This case supports anti-rival value generation through data sharing and positive externalities for environmental sustainability.

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The Barcelona Green Shops case promotes sustainable consumption in local shops and is built off an already existing community currency. This case incentivizes local, sustainable consumption by rewarding the actions of both shoppers *and* shop owners.

The final case, the Streamr Community, is centered on promoting community contributions within the open-source Streamr project. All three cases highlight the use of anti-rival tokens to incentivize certain outcomes.

Submodule video title
D.1 ATARCA Pilot Cases
D.2 ATARCA Pilot Case: Food Futures
D.3 ATARCA Pilot case: Barcelona Green Shops
D.4 ATARCA Pilot Case: Streamr Community

3.4.5 Teaching Module E

The final module centers on ATARCA's aggregated results and the role played by the sNFT in each of the pilots. These tokens facilitated positive community engagement through community contributions and sustainable consumption practices, effectively capturing the anti-rival value generated by these actions. The module introduces a systems model for anti-rival generation. It describes the "reinforcing loops" that increase anti-rival value generation and capture: the incentivization of contributions and recognition of contributions. The module then goes on to introduce the connecting loop (fostering collaboration) which links the two reinforcing loops.

Submodule title
E.1 Aggregated ATARCA Pilot Results

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3.5 Other educational activities

ATARCA researchers presented educational materials in 22 university courses (approximately 615 students) and 14 executive education courses (approximately 310 students) throughout the lifetime of the project. These included both guest lectures and courses led by ATARCA researchers. The materials used included presentations on anti-rival topics, an introduction and modelling of the toolkit, an introduction to the anti-rival business model patterns, and, in some cases, a student project on ATARCA topics.

In bachelor's education, ATARCA researchers gave guest lectures in three course at Aalto University to 55 students total, including content on decentralized platforms and ecosystems.

At the master's level, ATARCA researchers presented in 16 courses to approximately 535 students. While most of these presentations were given as guest lectures, ATARCA researchers served as responsible teachers or course teachers in three cases. These courses were given at Aalto University, as part of EIT and in Unite! University. Some of these courses also included bachelor and doctoral students. In two courses, students completed project work focusing on ATARCA related material.

Three guest lectures were given at the doctoral level to 25 students. There were given as part of the EIT Digital program and addressed platforms and ecosystems with decentralized governance.

Finally, lectures were given in 14 courses at the executive education level to 310 students. The majority of these were as guest lectures, however an ATARCA researcher served as the main lecturer in two of these courses. Executive education included lectures on decentralized platform and ecosystems, anti-rival business models, and the ecosystem design toolkit.

Information on the courses is summarized in Table 3.1 below, including the relevant ATARCA materials presented as part of the lectures.

Table 3.1. Information on lectures and courses including ATARCA materials during the lifetime of the project.

Education level	Settings	# of courses	# of students	Avg # of students	Topics included
Bachelors	Aalto University	3	55	18.3	Platforms and ecosystems with decentralized governance Anti-rival business models
Masters	Aalto University EIT Unite! University	16	535	33.5	Platforms and ecosystems with decentralized governance Anti-rival business models Utilizing ecosystem design toolkit Student projects on ATARCA
Doctoral	EIT Digital	3	25	8.3	Platforms and ecosystems with decentralized governance
Executive education	Hochschule Luzern Aalto Executive Education	14	310	22.1	Platforms and ecosystems with decentralized governance Anti-rival business models Utilizing ecosystem design toolkit
Total		**36**	**925**	**25.7**	

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4. Dissemination of educational materials & toolkit

4.1 Dissemination of the toolkit

The platform economy has been traditionally discussed in terms of centralized, rival platforms. However, the growing interest in decentralized platforms and cryptocurrencies highlights the importance of providing students with information and examples of more decentralized ecosystems and also alternative economic institutions, such as anti-rival ones.

Our efforts to introduce students to the anti-rival design toolkit has not been intended to completely supersede traditional approaches to platforms, but rather to provide an alternative way of understanding of how platforms may be designed to generate wider, positive impacts beyond rival logic. Moreover, the ecosystem design toolkit in particular serves as a valuable resource when considering sectors such as the creative (i.e., photography, music, and performing arts), gaming, and entertainment industries, where understanding the anti-rival interplay and relationship between different stakeholders is paramount. Furthermore, within these aforementioned industries, the need for more sustainable approaches towards ownership, governance and control are also further supported.

Furthermore, through external pressures and internal motivations, universities, and particularly management education within universities, have begun to place an increased importance on the inclusion of entrepreneurial education within their offerings, and a crucial component within those skills is creativity. Creativity is associated with the ability to create and deliver novelty, provide transformative and radical breakthroughs, and support innovative practices within the larger society and economy, and the anti-rival ecosystem design toolkit provides that. Within the context of management education, this could be linked to the ability to "draw ideas from abstract models and theories" (Gilson & Madjar, 2011, p.27), and suggesting "new and set-breaking frameworks or processes" (Gilson & Madjar, 2011, p.22). In this case, the toolkit provides a new framework and process that breaks away from existing paradigms. This, in turn, can help management education to provide educators and students with practical tools that can support this new way of thinking. This relates to imparting the ability within students to first, question the foundations of businesses and their ways of working, and the second, be able to effect change and create novel solutions and practices to drive towards a more sustainable future. The Anti-Rival Ecosystem Design Toolkit can help foster creativity and provide new frameworks to assist students and educators alike to develop novel solutions that leverage anti-rival perspectives and decentralized mechanisms.

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Following these aims, the Ecosystem Design Toolkit for Anti-Rivalry was introduced and utilized in a variety of Bachelor (2), Master (11), and Doctoral level courses (2) across different academic years. These courses were offered at institutions like Aalto University (9) and through the UNITE! (1) and EIT (EU) (1) networks. The number of enrolled students in these courses ranged from around 10 to 60, and the toolkit was taught through guest lectures, co-teaching, and as part of the main curriculum. Altogether the toolkit reached 295 students in these educational events. Based on the feedback, the inclusion of the Ecosystem Design Toolkit for Anti-Rivalry in these courses highlighted its significance in contemporary business education and its role in shaping the future of anti-rival value creation.

The Anti-Rival Ecosystem Design Toolkit and other ATARCA content were also integrated into various executive education courses (10), helping business professionals understand and apply the concepts of anti-rivalry in their organizations. These courses ranged from MBA courses to tailored programs and sessions that addressed specific needs. The courses typically had a small number of enrolled students, ranging from 10 to 40. Based on the feedback, through these educational events, participants learned about decentralizing platforms for anti-rivalry, ecosystem design for anti-rival contexts, and anti-rival business model archetypes.

The Ecosystem Design Toolkit for Anti-Rivalry has also been used in other initiatives pursued by Barcelona Green Shops and Streamr beyond their involvement in the ATARCA project. This indicates the broader applicability and usefulness of the toolkit beyond the specific cases developed within ATARCA. Additionally, the initial response from the web3 community suggests that the toolkit has also been adopted by other community-led projects, demonstrating its potential to facilitate the creation of anti-rival ecosystems across different contexts and communities.

In addition, the toolkit has been distributed through the ATARCA newsletters (reaching 215 people) and through ATARCA's social media followers (573 people; 30.3.2023). The toolkit was also presented at ATARCA's final seminar week workshops, reaching 172 people.

4.2 Dissemination of the MOOCs

The three MOOCs have been advertised and shared to a diverse audience, as each course offers a different angle to understanding anti-rivalry in practice. The courses are targeted at students in the fields of technology, business, and information sciences. They are also intended for those interested in the platform economy, the data economy, and decentralized communities. Table 4.1 shows the total number of participants in each course.

Table 4.1. Information on participants in ATARCA MOOCs[2].

Course	Students who have started the course	Completed the Course
An Introduction to Anti-rivalry	138	108[3]
Designing anti-rivalry (toolkit MOOC)	15	7
Sustainable Consumption	180	71
Total	333	186

The online courses were distributed through a number of avenues to reach a wider audience. While mainly targeted to be used by university students, the courses are designed to be accessible and understandable for anyone with a basic understanding of management.

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[2] Data as of March 29, 2023.

[3] Includes 84 users from the ATARCA website and 24 from the video format of the course, available on YouTube at
https://www.youtube.com/watch?v=QlF5fb50DzA&list=PLmNO5ufDme9p6W3RdupvptGVSeyjQWtov

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To reach students, the course "An Introduction to Anti-rivalry" was included as a pre-exercise for students in the Aalto University master's course "Business Model Design", directly reaching 60 students in Aalto University. The Sustainable Consumption MOOC was also advertised in flyers at cafeterias across the University of Helsinki. Messaging about the MOOCs was also shared by Aalto University School of Business Mikkeli Campus and in Otaniemi Campus to students by email, and on the Aalto University Lifewide Learning Platform (https://lifewidelearning.aalto.fi/). The MOOCs have also been advertised since January 2023 in any ATARCA-related lectures (information on lectures visible in Table 3.1).

The most significant dissemination of the MOOCs has been through the Unite! Network. Unite! (University of Innovation, Technology and Engineering) is a network of nine technological universities across Europe. MOOC messaging was distributed in emails to all member universities, potentially reaching 280,000 students.

To reach a broader audience outside the university setting, we created promotional materials in text, image and video format. These materials and messaging were shared with consortium partners who shared the online courses within their own networks. The MOOCs have also been advertised on selected Facebook channels, especially for service designers and those interested in Web3, reaching 2166 people.

Since their publication, the MOOCs have been regularly shared on social media and in ATARCA newsletters, and consortium partners have consistently re-shared these posts. Consortium partners have actively shared ATARCA posts as well as created their own posts about the MOOCs. To incentivize participation in the MOOC, we have created and advertised a downloadable certificate of accomplishment and the anti-rival expert token, outlined in section 3.1.4.

The initial goal outlined in the grant agreement created a target of 500 students completing the online courses by the end of the project. As the course was slated for release in November, incentivizing 500 course completions in five months was not accomplished, especially as that time also included the winter holidays in most European countries. Despite this, we have found the response to the courses to be positive so far. The completion rate of the MOOCs is high, averaging 63% for the Introduction to Anti-rivalry course. Additionally, we have reached a high audience for students who are not required to complete the course. 93 of the 153 students who have taken part in the Introduction to Anti-rivalry and Designing anti-rivalry courses are not associated with an Aalto University course, indicating that interest in the content expands beyond the classrooms of ATARCA researchers. Despite this, the current trends of course completion indicate that 500 students will have completed the course by the end of 2023.

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5. Conclusion

The materials outlined in this deliverable helped us to turn anti-rivalry from a confusing and theoretical concept into an understandable approach to real world ecosystems. To ensure the materials were relevant and easy to follow, we engaged with members of the target audience during the creation process and iterated several versions of the courses, using feedback to further develop it and remove ambiguity. We also created a video format of the course; a set of 15 short videos that are easy to digest and easy to go back to whenever there's a need to check some details or info about anti-rivalry. This material was mainly shown on social media and supports learners who may require audio learning material. In addition, the ATARCA team succeeded in directly introducing anti-rivalry to over 1200 students through educational offerings and had disseminated the toolkit and educational materials to thousands more.

These materials have all been carefully designed to be approachable, easy to use, and grounded in real world examples in order to support the development of a community who understands and is prepared to utilize anti-rival concepts in their own work. The informal feedback we have received so far has been very positive, stating that the terms are clearly explained, and the examples are easy to follow. Additionally, the quality of the MOOCs is reinforced by their acceptance to the Aalto University Lifewide Learning platform (lifewidelearning.fi). The Introduction to Anti-rivalry MOOC was also listed as an Excellent Science Innovation by the EU's InnoRadar, highlighting the relevance of the course material.

The toolkit and educational offerings will continue to remain available, as the close of ATARCA does not signify the end of anti-rival discourses, but rather a new starting point for greater inclusion of anti-rival concepts into our understanding of ecosystems, businesses, and the economy.

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Declaration of AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used OpenAI GPT3.5 model in order to improve English grammar and text flow. The authors take full responsibility for the content of the publication.

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