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The innovation – technology – performance triad in the streaming service industry. An exploratory study.

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Abstract

The term streaming defines the relatively ICT-based service of distributing data – as audio or video files – in a continuous stream via a wired or wireless connection from a transmitting source to receiving devices, carried out in a continuous flow. This innovative service is based on sets of technologies that allow the files (which are desired to be run) to be opened and run at the same time as they are loaded. As an exploratory study, this paper focus is to investigate the conceptual model of multidimensional innovation – technology – performance triad (in that sense of a triad of possible triads) in the disruptive industry of streaming services, an industry that has been little studied to date due to its recent emergence and development. Several characteristics related to the innovation – technology – performance triad are selected, and a comparative analysis is conducted across three leading companies in this industry – Netflix, Amazon and Disney. As result, a guiding set of best practices related to the three pillars of the triad innovation – technology – performance is suggested to the main stakeholders. Finally, the contributions and conclusions, the limitations of the study and the future research are highlighted.

Keywords:

Innovation-technology-performance triad, streaming service industry, streaming industry best practice, Information and Communication Technologies (ICT), innovation, technology, performance

INTRODUCTION

The streaming services industry refers to the transmission of media or entertainment content to Internet-connected electronic devices such as screens, TVs, computers, phones, or tablets, with the transmitted content running concurrently with its transmission. Online streaming does not require prior downloading and saving of the content, and compatible formats include audio and video, podcasts and webcasts, music videos, movies and TV series or shows [1] and with the expansion of demand for this form of entertainment, streaming services have become a dominant form of internet consumption [2].

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Online streaming is different from the classic ways of transmitting video or audio content, the transmission being carried out in a dynamic manner [3]. Through streaming technologies, audio files, video files, podcasts, webcasts, or music videos are prepared in advance and distributed sequentially in data packets so that they can be opened and viewed instantly. And besides the fact that the waiting time is non-existent, the files can be played in real time, another advantage being the saving of memory.

In the last years the online streaming market has seen significant growth [4], in 2020 the number of users exceeding the threshold of 1 billion [5] and according to a report by Research and Markets [6], the market growth projection is 18.3% annually until 2026 and reaching a value of approximately $150 billion by that time.

THE MULTIDIMENSIONAL TRIADIC MODEL INNOVATION – TECHNOLOGY – PERFORMANCE

Multimedia streaming is the transmission and delivery of entertainment content over the network in real time to the receiver. Recipients of entertainment content receive media materials constantly, simultaneously with their transmission and without delays [7]. By using streaming technology, a multimedia file is divided into very small divisions. Each division consists of a fraction of the original file and can be streamed individually. The online streaming entertainment content provider continuously transmits these small divisions one after the other to the recipient. Thus, users can watch the entertainment materials at the same time as they receive the data stream, not requiring an extensive data storage space, the playback of the content being processed in real time [8]. The video streaming service industry is a revolutionary and disruptive industry for the traditional model of transmission and consumption of entertainment content, an industry that has been little studied up to now due to its recent emergence and development, but has a high development potential, also conducive to studies from scientific and academic research.

Triadic models are conceptual constructs based on a set of three interrelated elements. Far from being defined as a simple set of three elements, triad-type conceptual models must be systemic and synthesizing, thus being an integrated part of the same system and highlighting the essential part of each of the elements, together with the relevant links between them. Such a model is also characterized by synergy, offering more possibilities and a much higher value than the potential of individual elements or in dual pairs, becoming a valuable research tool for theorists and an important decision support for managers, entrepreneurs and legislators [9].

According to Scarlat & Iliescu [10], the term triad represents a complex concept widespread in various fields of scientific research or general knowledge. Among them are listed: the triadic color scheme, the tricolor flag, the political triumvirate (appearing for the first time in ancient republican Rome, exemplified here by Caesar, Pompei and Crassus), the triadic literary form that appears in medieval literature from the area of Wales and Ireland or the triads in chemistry that record the oldest system of classifying elements by atomic weight (Döbereiner's Law of Triads). Other examples are represented by the "triple helix" model presented by Etzkowitz [11] [12], a triad launched since 1993 that includes the university area - the industrial area - and the government area, by the triad represented by the geographic areas North America – Western Europe – East Asia defined by Ohmae [13] as the triad of world economic geography and by the triad of America formed by North America, Central America and South America.

The current research paper employs an exploratory approach to investigate the multidimensional innovation-technology-performance triad in the streaming service industry, focusing on Netflix, Amazon, and Disney as representative cases. Besides primary data from company documents and financial reports, secondary data is gathered from academic sources. This study aims to shed light on the interplay between innovation, technology, and performance metrics, as well as their potential impact on industry success by using descriptive, comparative, and correlational analysis. Data collection and analysis are conducted in accordance with ethical considerations. Research such as this contributes to a better understanding of the triadic dynamics in the streaming sector, as well as the possibility of future studies examining broader industry trends and technological developments. Starting from examples of triads from the business world that can be observed in economics, project management, entrepreneurship and marketing, the present paper focuses on the Technology – Innovation – Performance triad having a practical organizational perspective, highlighting the analysis of the potential of this triadic model. The study will have a triple S (Synthetic, Systematic and Synergistic) holistic approach – as defined by Scarlat [14].

Based on the triad innovation – technology – performance [10], [15], the present work proposes the multidimensional triad innovation – technology – performance, a complex, multidimensional model, which puts at its center the triad innovation – technology – performance, each of its elements being in turn formed by a triad (Fig. 1). Thus, the technology component is made up of the triad hardware – software – knowledge, the innovation component is made up of the triad capital – organizational culture – patents, and the performance element is made up of the triad number of users – turnover – profitability.

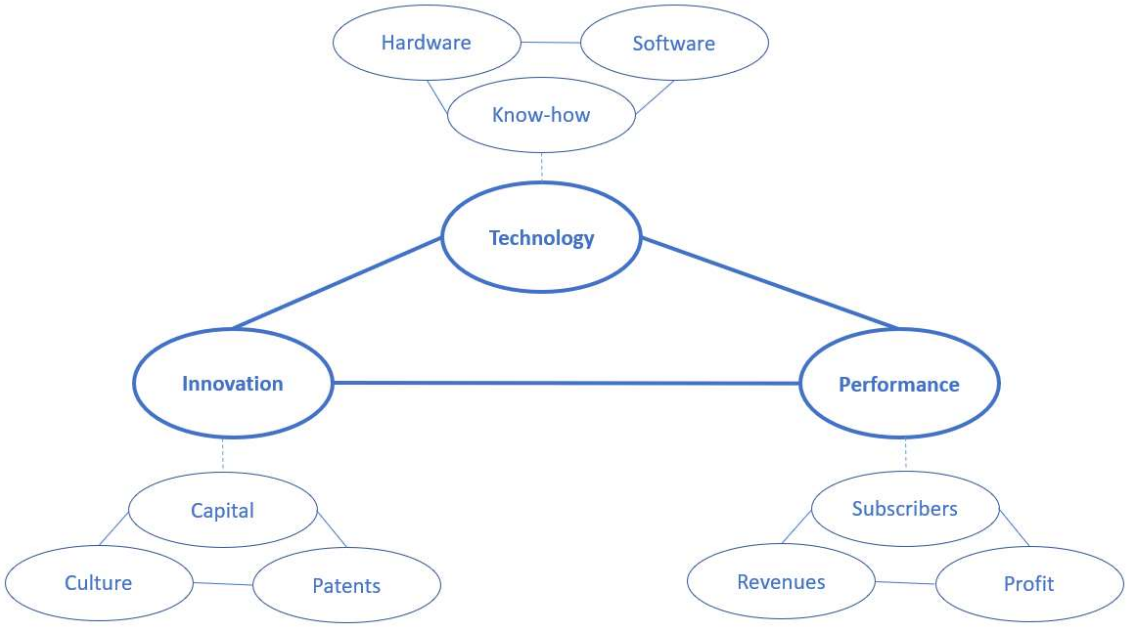

Fig. 1: The multidimensional triadic model innovation – technology – performance

To assess the technology state of art, the following KPIs will be used: for technology there will be VMAF, the number of devices which can transmit simultaneously the streaming content and the customers satisfaction while for the innovation element of the triad, the number of titles which are available through the streaming technology, the number of patents and the R&D investments will be taken into account. Regarding the performance element of the triad, the results will be measured through the number of subscribers, the market share, the revenues, and the profitability obtained.

RESULTS

VMAF (Video Multimethod Assessment Fusion) is a comprehensive video quality measurement and reference tool used in the research area and in the streaming technology industry, which incorporates several existing quality measurement tools along with other features, and which based on artificial intelligence algorithms frequently used in technological predictions returns a value score between 0 and 100 per video sequence, the maximum value of 100 determining a quality identical to that of the reference video material.

The number of devices to which online streaming entertainment content can be simultaneously streamed may vary and the compatible devices are different and have varied features, meeting individual and customized requirements, such as playback devices with advanced technical features such as 4K, hands-free devices, dedicated devices games, devices with or without remote control or affordable devices.

The quality of experience or customer satisfaction obtained from the consumption of streaming entertainment aims to quantify the customer experiences and their degree of delight, and a rating system can be used in this regard. The values are in the range 1-5 where value 1 represents the lowest level and value 5 represents the highest level of customer satisfaction.

Netflix, Amazon, and Disney are enterprises that comprehend the present market demands and consistently track both current and future customer needs. They develop and deploy novel technologies to secure dominance in terms of user numbers and financial outcomes above the market mean. This correlation underscores the intertwining of technology with corporate performance, underpinning their success in implementing new technologies and fostering transformation.

As it can be observed in Table 1, Netflix is the pioneer in the area of technology, succeeding to achieve the highest VMAF value of 93, being able to transmit video content to its subscribers on up to four devices simultaneously, obtaining the highest customer score of 4,3 and benefiting from a stable high audio quality [16]. Next is Amazon, which provides video content to its customers with a VMAF video quality index of 87 on up to three devices. The customer rating offered to Amazon is 4 and the audio quality bitrate ranges between 192 and 640 kbps [17]. The next one in line, Disney, can offer video quality with VMAF 83 and same as Amazon, can stream on up to three devices simultaneously. The customer rating succeeded by Disney is 3,6 and the appliable audio quality bitrate varies between 128 and 768 [18].

Table 1: Technology KPIs for the streaming services industry
Adaptation from: Netflix (2022), Amazon (2022), Disney (2022)

	Netflix	**Amazon**	**Disney**
VMAF	93	87	83
Nr. of devices	4	3	3
Customer rating	4.3	4.0	3.6
Audio quality bitrate (kbps)	256 - 640	192 - 640	128-768

An important result of the research and development activity is represented by obtaining new technologies and their commercialization, an exclusive right held by the authors of the discoveries. Obtaining patents and trademarks is a result of innovation that contributes to increasing productivity, protecting resources, stimulating publicity and reducing the risks of the decision-making process. For technology companies, they represent an innovation success, a competitive advantage, a way to create value, a piece of intellectual property and an important asset [19].

Consumers have the possibility to choose between various possibilities to spend their free time, but Netflix, Amazon and Disney aim to be their first choice for their entertainment time. In order to reach this target, improving the entertainment transmission service offered is a priority for companies, both at the technology level and at the content level, innovation being perceived as a determining factor of the company's success.

As it can be noticed in Table 2, the highest number of titles offered via the streaming technology belongs to Amazon which can offer to its subscribers a wide variety of video content with over 25.000 movies, TV series and shows. Netflix follows closely with 17.500 entertainment materials while Disney is the last one in the top with 2.700 movies and video content, all the companies aiming to release new entertaining video content at least one a week.

Capital is the most important element of technological innovation, which together with an organizational culture strongly focused on research and development activities, will result in profitable innovations, studies in the field demonstrating the link between capital and innovation performance. Capital input and R&D investments shape innovative activities and can also participate in decreasing the time to market for commercializing products. Amazon has the highest R&D investments with a percentage of 11-12% from revenues, followed by Netflix with 7-

8% and Disney with 7,3-7,5%. From the patents and trademarks perspective, the focus on innovation has rewarded Amazon with around 21.000 patents. The patents and trademarks raking is continued by Netflix with 912 patents and by Disney with 528.

Table 2: Innovation KPIs for the streaming services industry
Adaptation from: Netflix (2022), Amazon (2022), Disney (2022)

	Netflix	**Amazon**	**Disney**
Highest number of titles offered via streaming	17.500	26.000	2.700
R&D investments (% from revenues)	7-8%	11-12%	7.3-7.5%
Number of patents	912	21.137	528
New releases frequency (weeks)	1	1	1

Developing new businesses or products and launching into new markets or niche segments can come with high performance through innovation [20]. Within Netflix, Amazon and Disney, a major emphasis is placed on the trend of permanent and constant development and progress, which must be incorporated at all hierarchical levels, thinking focused on the novelty factor not being a granted privilege only to management members and superior market and financial performance highlights the direct link between these and innovation in the three companies.

To measure performance within the companies activating in the video entertainment industry, a multi-perspective approach will be taken into consideration, based on financial and non-financial evaluations (Table 3). From the financial perspective Amazon has generated an income of 35,3 billion USD, followed by Netflix with 31,7 billion USD derived from streaming activities and Disney with 19,7 billion USD. In terms of profitability, Netflix has obtained a profit margin of 21% from the income, followed by Disney with 15,7% and Amazon with 7%.

From the perspective of the marketing KPIs, Netflix is the global leader with a market share of over 30% of the paid subscriptions, followed by Amazon with a market share of 22% and Disney with 16,5%. Thus, Netflix counts over 221 millions subscribers, while Amazon has 200 millions paying users and Disney completes the list with around 180 millions subscribers.

Table 3: Performance KPIs for the streaming services industry
Adaptation from: Netflix (2022), Amazon (2022), Disney (2022)

	Netflix	**Amazon**	**Disney**
Income (billion USD)	31,7	35,3	19,7
Profit margin (% from income)	21%	7%	15,7%
Market share	> 30%	22%	16,5%
Subscribers (millions)	221	200	179

A high turnover and profitability, brand reputation, goodwill and the value of intangible assets are closely related to Innovation, technology and performance. The innovation produced by the companies and the usage of the most performant modern technologies represent key factors in driving companies to a superior performance.

The study investigates the intricate relationship between innovation, technology, and performance in the streaming service industry, focusing on key players like Netflix, Amazon, and Disney. A harmonious fusion of innovative technologies, extensive R&D investments, and diverse content offerings leads to elevated performance metrics for these companies. Their success is driven primarily by metrics such as VMAF scores, device compatibility, customer satisfaction, patent portfolios, and R&D spending.

In addition to providing actionable insights for enhancing innovation, technology deployment, and overall performance, the obtained results have substantial practical value for stakeholders in the streaming service industry. The identified best practices can be used by companies to refine their strategies related to technological infrastructure, content development, customer experience enhancement, and R&D investment. Industry participants can improve their resource allocation, foster sustainable growth, and increase market share, customer satisfaction, and profitability by understanding the intricate interplay between innovation, technology, and performance.

BEST PRACTICES DISCUSSION

The current best practice guide is built upon the consolidation of the detailed study of the specialized literature in the field of technology, innovation and performance, the analysis of the practices of the leading companies active in the area of online streaming entertainment content, as well as the confirmation of the multidimensional triadic model innovation – technology – performance.

To improve VMAF values and reach the minimum recommended threshold of 93, several activities are required such as: focusing on this parameter through continuous measurement and monitoring; performing intensive testing and regression testing for new developments or system changes; optimizing streaming quality adapted to users' devices and their internet connection; the use of professional equipment and high-performance computer systems both in the production stage of entertainment materials and in the post-production stage; development of a reliable and scalable infrastructure and a performing network, which can cope with a loaded network or a difficult Internet traffic.

In order to improve the number of devices on which entertainment materials can be transmitted simultaneously through streaming technology, it is recommended to pay attention to the following aspects: choosing suitable performance equipment, which includes developed networks and powerful computer systems; configuring the streaming platform by setting the appropriate settings and ensuring a strong network and stable internet transmission; constantly testing the transmission of entertainment materials on as many devices as possible and with varied features to ensure their compatibility; solving technical problems and providing assistance to customers when they encounter technical difficulties.

To ensure the quality of the customer experience and improve the score given by them, the following measures are necessary: periodically asking for detailed feedback from customers and analyzing it to determine the points that need improvement; avoiding technical problems and solving them in the shortest possible time when they occur; improving and stabilizing audio quality, ensuring fast playback of content without long waiting time; limiting interruptions to users' viewing of entertainment by ensuring a steady stream and fast transmission.

In order to retain customers and keep their interest high, it is necessary to constantly add series, movies, TV shows or other entertainment material, on a weekly basis. This way, customers will continue to purchase subscriptions to watch new material, instead of finishing the playlist and canceling subscription payments. To develop the content, improve the list of titles and increase the number of entertainment materials the following solutions must be put into practice: continuous development and addition of engaging entertainment material to continuously attract users and keep their attention; adapting content to the audience and using preference algorithms so that users can quickly and easily access informative and relevant materials; planning and producing content in advance so that the addition of titles is constant and seasonality is avoided; solicit feedback from users and include it in future planning; creating visuals that are pleasing to the eye and easy to view by including graphics, visual effects or animations; short-term release of materials relevant to the current situation, locally or globally.

A high number of patents will represent an important competitive advantage and a portfolio of over 1.000 patents will help streaming companies to occupy a top position. To improve innovation performance and increase the number of patents and registered trademarks, stimulating activities should implemented such as: establishing a simple and easily accessible innovation process for all company employees; encouraging, collecting development plans and ideas and rewarding them; organizing dedicated brainstorming sessions where each team member can contribute; organization of internal or external competitions to find the most convenient ideas and solutions, simultaneously with joining open innovation; incorporating customer feedback into new developments or innovations; increasing the budget allocated to research and development; establishing partnerships with other companies in the field and related fields or joining innovation clusters.

In order to achieve high profitability, companies in the streaming service industry must constantly allocate high funding to research and development. Thus, to achieve a strong competitional advantage and a superior performance, it is recommended that a company allocates a percentage between 8% and 12% of its turnover, these reinvestments ensuring the profitability of future activity. In order to increase the amounts invested in this direction, the following measures are necessary: creating an organizational culture that recognizes the importance of innovation and promotes it intensively; automating processes so that human resources can be intensively used for research and development; long-term planning and ensuring adequate funding for research and development; continuous monitoring and evaluation to ensure adherence to planning and avoidance of budget deviations; the gradual increase of the percentage ceiling to facilitate the implementation of the new development coordinates.

In order to obtain a large number of users and to have a market share exceeding the minimum threshold of 30%, the following are necessary: providing customers with the newest and fastest technologies; ensuring video quality with a VMAF indicator located in the range of 92-93; giving users the ability to play entertainment content on at least four devices simultaneously; avoiding running delays and outages, achieving a high customer score of at least 4.3/5.

The application of the triad innovation – technology – performance will conduct to a superior income and a higher profitability so the following steps should be taken into account: the constant introduction of new entertainment material, series, movies or television shows to maintain the interest of users; creation of new business models or product diversification such as pay-per-view, premium content, introduction of games or other innovations; registration of patents and trademarks that confer a superior quality to entertainment materials and the way they are viewed; automating processes by using the newest and best performing technologies; allocation of a budget of 8-12% of the turnover for research and development; implementation of an intensive innovation process resulting in the expansion of the product offer and the patent portfolio.

Innovation, technology, and performance are the three factors that underpin Netflix's, Amazon's, and Disney's success on the streaming service scene. The study also highlights how innovation, exemplified by a diverse portfolio of content and strategic R&D investments, facilitates competitive differentiation and sustained market leadership. Besides validating the theoretical framework of the innovation-technology-performance triad, this research offers a practical roadmap for companies seeking to navigate the rapidly evolving landscape of online streaming.

CONCLUSIONS

The present article sought to analyze the triad innovation - technology - performance in the industry of video streaming services, obtaining a systemic link between the elements of the triad. Thus, organizational innovation attracts high competitivity and superior performance, both from the perspective of high returns offered to the parties involved, as well as a general development of business performance, and the incorporation of technology into processes and products brings an accelerated improvement of results.

The triad technology – innovation – performance is a good base for analysis of the companies with the largest number of users and the highest profitability in the video streaming services industry, an industry that has captured the entertainment market with a very rapid development in recent years, that has surpassed traditional methods and has prospects real growth rates, considering the vacant market.

The current study has its own limitations implying the novelty of the domain, the rapidly changing landscape of technology and consumer preferences. Additionally, streaming services and platforms are constantly evolving, with new players entering the market, existing ones expanding their offerings, and consumer behaviors shifting. But the

industry benefits from excellent growth and development perspectives and represents a good base for future research in areas like the impact of emerging innovative technologies, such as virtual and augmented reality, on the streaming landscape. Researchers could investigate how these technologies are being integrated into streaming platforms, their effects on user experiences and corporate performance, and their potential to disrupt traditional streaming models.

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