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From Archaeological Museum Showcase to Gamedev—The Missing Links of Creative Collaboration. A Case Study of the Game Numiares—A Dark Tale

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Abstract

This study examines collaboration between museums and video game developers through value co-creation processes, identifying factors that support and limit cross-sector partnerships. Using a mixed-method approach combining literature review with case study analysis of the game "Numiares—A Dark Tale," the research reveals significant tensions between museums' authenticity priorities and developers' entertainment focus. The study finds that museums possess vast untapped potential, with archaeological collections offering cultural artifacts that could enhance game credibility and historical accuracy. Key barriers include institutional isolationism, digital immaturity, and intellectual property concerns. The research develops an open innovation model for creative partnerships, demonstrating how museums can commercialize knowledge while maintaining educational integrity. With gaming reaching 41% of the global population, this collaboration represents a critical pathway for cultural institutions to engage digital audiences and strengthen institutional sustainability. The findings provide practical recommendations for building museum-developer partnerships and contribute to understanding digital transformation in cultural heritage management.

Keywords: digitization, museum, archaeological collections, video game development, value co-creation, video games

1. Introduction

Until the 20th century, museums performed two basic functions: conservation and interpretation (Hatton 2012). The social role of museums has become multilayered, and the way museums interpret cultural heritage and engage their audiences has also changed. Museums in the "post-digital era," alongside static exhibitions, increasingly use digital solutions to create interactive and immersive experiences (Pastore, 2020; Mihura-López et al., 2023). As part of the digital turn initiated by the Internet era, video games have emerged from the margins and been recognized as a form of cultural practice, a sophisticated medium that has permanently entered the fabric of everyday life, also affecting cultural heritage resources and education (Connor, 2024).

Video games, like works of contemporary cinematography, are complex works. Unlike other cultural content carriers, besides the audiovisual layer, they offer users a certain degree of interactivity with the work, using a range of intermedial means of expression, which intensifies their culture-creating function (Zawada 2018). Following the criterion of utility, the authors adopted a broad definition of classically understood games focused on entertainment: "A video game or computer game is an electronic game that involves interaction with a user interface or input device (such as a joystick, controller, keyboard, or motion sensing device) to generate visual feedback from a display device, most commonly shown in a video format on a television set, computer monitor, flat-panel display or touchscreen on handheld devices, or a virtual reality headset." (Wikipedia, 2025; cf. Jensen et al., 2016).

Video games, like museums' cultural offerings, reflect the current condition of society and culture, needs and expectations, shape cultural frameworks, and push technological boundaries (Connor ,2024). Although games gained the status of cultural artifacts in the 1990s, entering the collection of the Game Museum in Berlin (1997, Connor, 2024), their pejorative perception still persists in public discourse, including within museum walls. The interaction between museums and video games is certainly intensifying. Two main evolution paths can be identified for games in the museum context—as collectible objects worthy of preservation (MoMA's first purchase of a game collection in 2012) and as part of exhibitions, installed as interactive elements supporting collection interpretation and enriching visitor experiences (Bakun, 2017). An emerging path is deeper integration of collaboration, transitioning from museums that exhibit and collect games to museums that actively co-create games as a medium for building engaging experiences, education, and knowledge dissemination. Game co-creation most often takes the form of designing games for museums, with limited museum engagement of their knowledge and digital resources in supporting commercial game projects.

It should be emphasized that cultural heritage entities, including museums, like the game industry, according to the classification presented in Regulation 2024/1689 for the Creative Europe program, are classified as belonging to the culture and creative sector (CCI). This proximity results from the nature of work outcomes (goods and services), based on talent, knowledge, and creativity of individuals. Additionally fueled by a clear preference for participation in

non-institutional culture in Poland (NCK, 2024) and changing patterns of audience perception, the development of new forms of participation in digital culture. Deep digital transformation of society additionally strengthens the convergence of CCI activity areas, competing in the leisure time market, the experience market. Pressure related to digitization in recent decades has significantly contributed to bringing both sectors closer through knowledge diffusion and integration of technology and art. From video games—like museum exhibitions—sophisticated artistic content and technologically advanced forms of perception and interaction with the audience are expected (Baeza-Gonzales 2021; Belyaeva et al., 2022; cited in Klimas et al., 2025). The need for cooperation and integration of museums with the game industry is clear, supported at many levels of cultural policy formation: global—UNESCO (2022), ICOM (2024), European—European Commission (2022, 2024; OECD-ICOM 2019) and national (CRPK).

The public value perspective helps explain challenges related to cooperation at the intersection of industries and sectors (Ćwiklicki 2017). Public value in a broad sense "is what society values" at a given time (Blaug et al., 2006, cited in Ćwiklicki, 2023). As Ćwiklicki emphasizes, "public goods are limited to products and services, while public value is not only the result of an organization's activity, but also the impact, effect that enjoys society's recognition (Alford and O'Flynn, 2008, cited in Ćwiklicki, 2023)". For cultural heritage to be utilized for society's benefit, it requires interpretation and creativity from employees (Hausner 2013) and content delivery forms adequate to expectations. A condition for achieving the desired social resonance is identifying different needs and expectations of a diverse group of stakeholders. Determining factors forming values is important for understanding the sources of their creation and the possibilities of their realization by museums (Ćwiklicki, 2023).

The article focuses on understanding cooperation between video game creators and museums through identifying the process of co-creating value based on innovation, whose result is a video game (value carrier). The aim of the considerations is to identify factors supporting and limiting cooperation, areas of tension and contradictions in the area of values and goals. Special emphasis was placed on value co-creation, a term that means a joint, iterative process of conceptualization, design, and development (Klimas, Czakon, 2022a; 2022b). Co-creation assumes deeper cooperation in which partners combine resources, achieving a synergy effect. The value co-creation relationship takes the form of creative partnership (CP). Bringing a game from concept to market always takes the form of a project (Klimas et al., 2025; Klimas, Czakon, 2022a; Klimas, 2019a).

According to Ilczuk et al. (2011), the purpose of CP is "producing innovative content and transferring creative capabilities from culture to other areas of economy and social life." The subject of the research insight is therefore this kind of cultural activity by museums, which expresses itself through the public value provided by cultural resources—capital and intellectual property—using the output of cultural activities as input for the creation of video games. The prerequisite for collaboration is openness and the availability of resources, held by the partners.

The game is a carrier of created value. As Klimas and Czakon note, "video game design leads to innovation resulting from creative processes, such as insight or inspiration, or from a form of creativity that combines different concepts in a novel way through their adaptation, addition, combination" (2022a). The conducted reflection fits into the emerging cognitive trend in management sciences devoted to different types of innovation ecosystems (Klimas, Czakon, 2022b). This approach also justifies the challenges accentuated in the pages of professional journals in terms of integrating immersive technologies for the benefit of cultural heritage, such as participatory innovations in cultural heritage and efforts to increase museum openness and promote cooperation with the outside world (Wang, 2025; Chaitas, 2024). Creative partnerships play an important role in the video game innovation ecosystem (VGIE)—knowledge-based and highly creative, due to the potential for generating knowledge spillovers that result from access to museum collections and employee knowledge (more in Klimas, 2019b; Klimas, Czakon, 2022a).

The basis for value co-creation by CP is innovation in an open model (following Klimas, Czakon, 2022a; more in Molter, 2023). According to the theory, open innovation expresses the strategy of organizations that deliberately use flows of knowledge, competencies and resources, cooperating in an open innovation environment (Chesbrought, 2003; Li, Ghirardi, 2019; Klimas, 2019b; 2025). Key importance lies in CP cooperation aimed at co-creating innovation, delivered to the market in the form of a game with diverse value and socio-cultural impact (Wronka-Pośpiech 2015; Klimas, Czakon, 2022a; Klimas et al., 2025). Innovations generated from cultural content take the form of a process in which roles, forms and stages engaging partners' resources and activities can be distinguished. Following the above criteria and the approach of H. Bakhshi and D. Throsby (2010), special attention was focused on the supporting and expert role of museum employees (knowledge brokers), new possibilities for using museum knowledge (innovations) and ways of commercializing it. Museum engagement may involve co-creating symbolic content, aesthetics or narratives based on sources of knowledge and cultural artifacts (Li, Ghirardi, 2019). In this sense, innovations are characterized by communicative value (transmission of knowledge about cultural heritage), aesthetic value (Alcaide-Marzal, Tortajada-Esparza, 2007), and content value (Handke, 2004). This leads to the key issue of cooperation and co-creation between museums and video game creators.

CCI cooperation assumes partners' activities toward a common goal (Sopińska, Dziurski, 2018). A relationship based on co-creating innovation does not have to be symmetrical in terms of achieving partners' overriding goal, that is—the value proposition offered and delivered to players—emotionally and cognitively engaging game experience (game creators) and generating long-term impact through delivering knowledge about cultural heritage, deepening its understanding through contextualization of content and giving meaning (museums). The contribution of museologists may include reconstruction of socio-cultural contexts through co-creating intermedial transmission of symbolic content (plot, narrative) and interactive elements, such as digital representa-

tions of cultural artifacts or intangible manifestations of cultural practices (rituals and ceremonies). Museums ensure the authenticity and credibility of games' cultural message. Transferring knowledge about cultural heritage to games can also be a form of protection and dissemination. Cooperation with the video game industry is not only an opportunity for institutional development, but may be necessary for survival in a leisure market increasingly dominated by digital audiences (Dalle Nogare, Murzyn-Kupisz, 2021; Klimas et al., 2025; Klimas, Czakon, 2022a).

A review of existing literature and the authors' experience suggests that cooperation is a common phenomenon in the museum sector (NIM statistics; Nogare, Murzyn-Kupisz 2021). Museums show noticeable polarization, with intensive cooperation within the museum and educational sector (Sawczuk 2019) and limited cooperation with the technology and services sector (Li, Ghirardi, 2019). According to the authors' knowledge, the area of cooperation between museums and video game creators remains partially studied in the literature. It is also difficult to establish a complete picture of this cooperation in the context of the Polish Game Innovation Ecosystem, as quantitative data on cooperation with CCI presented by NIM in the Museum Statistics project does not directly refer to game creators (NIM 2024; Dalle Nogare, Murzyn-Kupisz 2021).

Additionally, the lack of case studies marks a clear empirical gap (Klimas et al., 2025). Examples of cooperation between museums and game creators, also in the Polish context, document museum workers' engagement mainly in the context of serious games, educational applications and digital experiences using game elements in exhibition or virtual space to build engaging visitor experiences (Charr, 2025). This does not exhaust the possible forms of cooperation. Value co-creation in the open innovation model can have different levels of openness and degrees of cooperation intensity (de Pourbaix, Warzybok, 2018). The authors' intention is to point out the missing links in value co-creation, where the game is the carrier. According to the suggestion of Klimas et al. (2025), an integrative approach was applied in the research process, combining literature review with qualitative research using the case study method. Empirical data allowed for the identification of factors supporting and disrupting cooperation from the perspective of people involved in designing the game "Numiares—a Dark Tale". In accordance with theoretical findings, these factors were sought in three areas of exploration: motives; practices, resources and experiences; and sources of knowledge (Klimas et al., 2025; Sopińska, Mierzejewska, 2016).

In the analyzed case, the authors' many years of experience in cross-industry cooperation and participant observation allowed for the identification of knowledge commercialization paths (databases, licenses, external financial resources). The developed model of value co-creation based on CP can serve as a kind of map supporting the video game creation process. The article concludes with reflection on ways to mitigate identified inhibitors of cooperation.

2. Literature Review

In the literature, the mainstream consideration of video games in the context of museums is mainly conducted in three contexts. The first refers to the game as a cultural artifact placed in the museum exhibition space—a collectible object (physical medium—carrier, along with design documentation), the second—games as an element of installation accompanying the exhibition, enriching/expanding the experience during a museum visit (Connor, 2024). The last is related to the use of games as an element of museum education. A negligible part of publications in scientific discourse, especially those developed in the field of digital humanities, game studies or strategic management, addresses the issue of the co-creation relationship of games at the intersection of the museum sector/industry and games (more in Klimas, 2019b; Klimas et al., 2025).

Given that game design is an interdisciplinary area of exploration, to narrow the cognitive perspective and clarity of argument, an ecosystem approach within strategic management was adopted as the reference theory. The *differentia specifica* approach of museums additionally required support with the concept of creating public value (Ćwiklicki 2023). The basis for determining the current state of research was the desk research method (Babbie 2004).

This article focuses on recognizing the value co-creation relationship in the video game innovation ecosystem (VGIE), as the basic unit of analysis of the culture and creative sector (CCI). Focusing the lens on this particular type of innovation ecosystem results from several premises: (1) insufficiency of theory and empirical research, in this sense implementing research postulates emphasized by Polish researchers P. Klimas (2019b; 2025 et al., 2025) and W. Czakon (2019; 2022a); (2) task proximity as a result of deep digital transformation of society and economy (change in preferred forms of perception based on sound and image at the expense of textuality of message); (3) potential for co-creating creative content in cultural circulation (innovations); (4) result of work based on knowledge, creativity and talent (cultural goods and services); (5) importance of innovation for organizational development and success; (6) necessity of crossing sectoral boundaries; (7) specialization in managing projects based on creators' intellectual capital.

As a starting point, cognitive assumptions were adopted according to categories identified by Klimas and Czakon (2022a), serving to analyze the process of co-creating innovation, such as role and stages of engagement in the value co-creation process. According to the authors' findings, partners can play four characteristic roles: direct value creation, supporting value creation, encouraging entrepreneurship, and leadership. Five common stages can be distinguished in the co-creation process: discovering, developing, implementing, delivering, and disseminating. Due to the complexity and interdisciplinarity of game projects, partner engagement has different scope and intensity depending on the process stage. In the studied context, focus was placed on concept creation and idea generation as well as gathering intellectual, cognitive, and physical resource support (Klimas, Czakon, 2022a). Answers were sought to research questions: what skills and knowledge does a museum possess that can be used in a game

project? How can archaeological resources strengthen the attractiveness and cultural message of a game? What public value does a game deliver, both for creators and players?

Answering the first question allowed for identification of motives underlying the establishment of creative partnerships (de Pourbaix, Warzybok, 2018). According to Sopińska and Dziurski (2018), these motives can be divided into internal, such as: better use of own potential, acquiring new knowledge and technology, possibility of acquiring new audiences and improving competitiveness, and external—financial motives. Museums can be characterized as knowledge-rich organizations (Krzyworzeka, 2010), that is, those whose core consists of "professional services" in the field of intangible goods (Alvesson, 2004). A key role is played by specialists, characterized by diverse, often broad and difficult to describe spectrum of competencies, especially tacit knowledge directly related to the collection. Museum workers are perceived as a source of expert knowledge. Museums also play the role of "aesthetic gatekeepers." For game creators, museums can be places of exhibition, dissemination or production, as well as sources of creative content and suppliers of inspiration for such content (Dalle Nogare, Murzyn-Kupisz, 2021).

The current state of knowledge and participant observation by the authors allows us to state that game co-creation relationships are rather rare, involving a one-on-one relationship between a central entity and its partner (museum—commissioner, creator—exploring the relationship), emerging bottom-up, often ad hoc informally based on social relationships (Klimas, Czakon, 2022a). The lack of strong connections between museums and game creators noticed by researchers should be interpreted from dichotomous perspectives. The first, socio-cultural perspective indicates the disjoint specificity of cultural activity of museums vs game creators, which is based on goals and methods of their implementation (transmission of symbolic content) (Strycharz, 2013; Kasprzak, 2013). The second—economic-political, focuses on creating public value, i.e., the implementation of cultural goods and services in the strict administrative-legal regime, regulated through financial intervention of decision-makers vs the flexibility of the free market. Industry discourse confirms the belief about mutual incommensurability of culture vs business, from fear of pauperization of museum functions (attraction for visitors), threat of appropriation of cultural value and its improper use (Eid, 2016).

The degree of openness of museums to cooperation with game creators is also largely a consequence of the pejorative perception of games, and moreover, of relational short-sightedness. Game creators are not perceived as potential partners and/or competitors, even though a significant part of cultural participation takes place in non-institutional spaces, and games can be considered such a form alongside film or books, in which they compete in the leisure time market. For game creators, cooperation with museums is marked by a series of difficulties in accessing resources and expert knowledge. The main reasons can be considered institutional isolationism, digital immaturity, and asymmetric positioning of power in the curator-layperson relationship. This hermetization

of the museum environment toward game creators may result from the tradition-grounded institutional isolation and the imperative of realizing intangible goals (Eid, 2016).

Research conducted in the field of game studies clearly indicates that digital representations of cultural artifacts are not used in games, which often rely on stereotypes and topoi of mass culture (Sołtysiak, 2015, 2017; Yap et al., 2024; Muñoz et al., 2025). Game creators prioritize gameplay attractiveness at the expense of message credibility. Considering that one of the main functions of contemporary museums is educational activity, this constitutes the main source of tensions (Haczewska, 2002; Skowron, 2002; Radecki, 2015; Pater, 2016; Cabała, 2019). Museum archaeological collections become inspiration for a wide educational offer (cf. Czopek 2016; Ligoda 2023). The potential of museum institutions in popularizing archaeology still remains not fully recognized, overshadowed by exhibitions, lectures, workshops or festivals. Popularization activities constitute only the surface of advanced research and scientific work, sources of knowledge. Digital representations of archaeological artifacts become a valuable, though insufficiently utilized resource for the dynamically developing video game sector. In this sense, museums constitute valuable repositories of material and spiritual heritage of prehistoric and medieval communities (in the discussed case, Slavs). Archaeological collections offer game creators authenticity and historical credibility. The image of past epochs reconstructed based on archaeological sources relies on factual and symbolic knowledge, which generates potential for creative content. It provides inspiration for designing the game universe (props, locations, cultural worldview), character appearance and gameplay mechanics. It allows enriching the narrative and plot of games while enhancing their educational value.

Deconstruction of the status quo also required theoretical identification of contradictions arising from the separateness of material vs. immaterial goals, operating models and professional culture. Public museums function in a very complex space created by: "ethics—politics—law—economics" (Zeidler, 2011). Each area determines conflicting goals, whose realization requires balancing priorities and competing values that guide the museum (Davies et al., 2013). The specific system of goals and values, orientation toward realizing intangible goals creates a broad context of challenges for museums, such as: securing public interest (mission); institutional development; image protection; adopting consumer orientation; managing relationships with internal and external stakeholders (competency potential); digital transformation of the institution. In this light, the need for developing entrepreneurial orientation of museums is evident, in three dimensions: proactivity, innovation, acceptance of risk accompanying experimentation, exploitation and commercialization of knowledge (Wójcik-Karpacz, 2016).

In summary, over two decades of digitization of museum collections have certainly contributed to the evolution of museums toward "hybrid spaces," in which digital cultural data coexist alongside physical artifacts, thereby increasing the accessibility of cultural content (Türkmen, Savasta, 2024). The traditional museum model, which is based on isolationism and focus on the

collection without considering multidirectional relationships engaging various stakeholders, remains a dysfunctional anachronism (Eid, 2016).

3. Methodology

The adopted cognitive strategy consisted of several stages. The first stage was exploratory in nature. In terms of achieving cognitive goals, the method of critical analysis of literature and existing sources was used. The literature review was subordinated to achieving the adopted goal. Based on it, the current state of knowledge and research was established. Identified cognitive gaps allowed for determining specific exploratory-explanatory goals maintained in a mixed deductive-inductive approach. Research conclusions took the form of abduction (Glinka, Czakon, 2021).

To obtain greater detail and accuracy of conclusions, the case of creating a video game prototype titled "Numiares—A Dark Tale" was analyzed, which is an example of cooperation between actors from outside the gaming circle. To provide some context, the characteristics of the game are outlined. “Numiares—A Dark Tale” is a narrative type of 3D game driven by horror, with a story conceptualized as a visual novel, told by means of environmental storytelling. The story of the game is deeply rooted in a brutal and unforgiving fantasy world inspired by a grim and dark early medieval middle Europe fairytales and folklore with its gritty and bloody reality. Players take on the role of a holy warrior and witch doctor, going against a blood-chilling menagerie of creatures of various origins, tasked with negotiating treaties with the supernatural. The player acts as a judge, jury and an executioner of Nature laws, permeating the fabric of reality. Every stage of a game is a decision between stealth and combat, solvable by both. Players learn the secrets of the World by seeing it through the eyes of nature. The choice of game was purposeful, as the authors were directly involved in its implementation. The game allowed insight into a different type of games than serious games which are designed with clear educational, interpretive or social goals that go beyond entertainment, and games co-created to interpret museum collections and increase visitor engagement (Djaouti et al., 2011).

In accordance with the national programme for the support of video games creators (PWGW) organised by CRPK, under which the prototype was realised, the game was to combine elements and inspirations related to Polish culture with cultural codes potentially understandable and attractive to a global audience. The game draws inspiration from many different European cultures, including Slavic. It is an action adventure game with puzzle-solving elements, with high-quality, stylized 3D graphics. The team structure by specialization criterion with role division used in gamedev presents: 1. Design—story & narrative design; cultural research; gameplay design; combat design; 2. Graphics and animation—art direction; concept artist; 2D graphics artist; environmental

3D modelling artist; character 3D modelling artist; mo-cap and 3D animator; 3. Programming—gameplay/generalist programmer; 4. Production—producer; 5. Sound—sound design; 6. Quality assurance—game tester. The implementation time was about five months for designing the concept and iterative implementation, which resulted in creating a playable prototype with strong focus on the visual aspects.

For an in-depth analysis of the game co-creation relationship, conceptual frameworks and conclusions from participant observation by the authors were used. Focus was placed on elements that were considered important from a theoretical point of view (Strumińska-Kutra, 2012). The game allowed for a better understanding of mutual relationships of value co-creation based on video games (Dondajewska 2016; Yin 2015; Ćwiklicki, Pilch, 2018). The cooperation was established at the game's conceptual stage and was based on the findings of a museologist/researcher of magical cultures, in terms of reconstructing the worldview and structure of magical thinking appropriate to early forms of culture and the symbolism of individual linguistic, behavioral and material artifacts used in the game (totem, ritual, clan).

To understand the scope and form of engagement in game co-creation, game layers and its elements were first distinguished. They also allowed further identification of areas of tension and contradictions in mutual relationships. For analysis purposes, K. Gonciarz's division was adopted (201, cited in Zmuda, 2018), which distinguishes game planes: (1) content—all substantive and audiovisual content of the work, i.e., all text elements, images, sound recordings, three-dimensional models. In the case of video games, content is all artistic design, as well as the game's plot (if present) and all narrative structures related to it; (2) gameplay—the set of solutions and elements that constitute the mutual interaction between player and game. Gameplay consists of infinitely many manifestations of possible interactions between them, enabled by programmed game mechanics; (3) technology—the factor ensuring the game's operation as a computer program. Consequently, through this combination, the viewer is able to read the other two factors as the interface and the creators' designed audiovisual representation of the virtual world.

It should be emphasised that “all three planes are inextricably linked, and the quality of this bond determines a game's artistic and commercial success” (Zmuda, 2018). For game developers, the overarching layer remains the mechanics of gameplay, which is the essence of the phenomenon of the medium (Zmuda, 2018). For museum professionals, on the other hand, the key layer consists of story and narrative, artistic and aesthetic content. The two sides of the relationship are thus divided by the interest guiding cognition (Habermas, 1971)—authenticity vs utilitarianism. The case study was analysed in this dimension. Answers were also sought to the questions: what potential for games does an archaeological collection have? What types of artefacts can be placed in the game as assets? What digital barriers can be identified from digitisation

to the use of digital assets, further the commercialisation of knowledge about the collection. The answers made it possible to identify the competence potential of the partners.

4. Results

Cooperation between game creators and museologists poses a series of challenges in the context of understanding mutual needs and expectations. Museologists are specialists characterized by a diverse, often broad and difficult to describe spectrum of competencies and abilities (Ingram, 2016). The area of professional activity of museologists often remains within the boundaries of substantive specialization, which deepens through accumulating knowledge and experience and numerous relationships with the professional environment. Knowledge about museum collections often has the character of tacit, personalized and highly contextual knowledge, which makes it difficult to imitate on one hand, and difficult to commercialize on the other. Importantly, cooperation requires maintaining a balance between audience expectations (attractiveness of message) and the social role played by museums (guardian, researcher, educator, mediator).

The game “Numiares—A Dark Tale”, whose action is set in the early medieval period, like others, raises the most tensions in the area of priorities of gameplay attractiveness vs. credibility of message. The Middle Ages is perceived not only as (another) historical period—for many reasons closer to contemporary audiences than ancient times (e.g., Stone or Bronze Age), but also as a kind of cultural myth that defines an area of certain convention for game creators (cf. Sołtysiak 2017, 219). Games are carriers of cultural messages, often also sources of knowledge. A challenge for 21st-century archaeology—as Sołtysiak (2017) emphasizes "is the lack of interest in its achievements and a peculiar petrification of the popular state of knowledge, in which many concepts long since refuted still function," as well as cultural topoi that infantilize the image of the archaeologist.

The studied case revealed the enormous potential of museums, which are depositories of often huge series of artifacts. The chronologically and typologically diverse collection of archaeological materials of the Regional Museum in Rzeszów (MOR) as of April 30, 2025, amounted to 2,979 inventory items, which when converted to artifacts gives us over half a million (!) cultural artifacts. The vast majority of them are so-called mass material, but nevertheless a significant group consists of exhibits that can serve as models for replicas and historical reconstructions. The source potential in the context of the analyzed game and the usefulness or attractiveness of artifacts for game creators from the early medieval period is defined by militaria. MOR has an interesting collection of this group of artifacts, which include iron, double-edged swords and axes. Properly digitized, these objects could serve as models for the armament of the hero, virtual warrior—protagonist or other characters appearing in the game. Besides militaria, archaeological reconstructions of locations have great potential, presenting the layout of residential settlements, defensive strongholds, or lifestyle and work, such as craft activities (pottery, blacksmithing, weaving,

etc.). Tangible traces of this information are sources of material culture discovered during archaeological research, in the form of a series of ceramics, tools and everyday objects, as well as ornaments in the form of glass bracelets and beads or silver temple rings and rings.

The goal of archaeologists is to convey reliable, evidence-based knowledge about cultural heritage. Archaeology is a science that uses the achievements of other disciplines and is constantly developing. At the same time, the state of knowledge about human life in prehistory is currently so extensive that existing factual material allows for precise reconstruction of almost any time period, providing inspiring information for game creators. This can concern economic, social, as well as spiritual or symbolic issues, allowing for the reconstruction of interactive elements and representations in the game world. The ease and preference for choosing stereotypical forms of message additionally supports the discrepancy in the area of partner cooperation. The dissonance is deepened by the fact that a huge resource of authentic archaeological artifacts lies in museum warehouses, and its potential is not used for the benefit of the gaming community.

Ultimately, expert support from museologists allows building the added value of the game through the credibility of elements of the presented world. It also allows for the realization of museums' social role, revision of stereotypical simplifications and erroneous, repeatedly reproduced beliefs that in mass culture circulation become carriers of information, creating historical realities in the eyes of recipients. Games constitute a cultural medium (Crogan, 2018). A game as a carrier of value for players can and should shape the proper imagination of past worlds, alongside fictionalization measures affecting the immersiveness of the game itself, which can be achieved at another level of emotional immersion (Jacko F.M, Jacko M., 2020). The tension identified in priorities is therefore apparent. Co-creation based on the cooperative relationship between museums and game creators enables the creation of high-quality products and delivery of a more comprehensive range of cultural experiences. The studied case confirms the significance of a series of barriers indicated in the literature. Among the more important ones are issues of intellectual property protection and the lack of frameworks regulating digital artifact licensing, allowing for the necessity of maintaining balance between public access and commercial interests of the game industry (Klimas et al., 2025; Wang, 2025). Emphasis should also be placed on the dissemination of museum knowledge through game projects, which are aimed at different audiences. In the discussed case, the problem of "reasonable popularization" of knowledge was revealed. The necessity of maintaining a "delicate balance between information and entertainment" (Bahn, 1997, cited in Czopek, 2000) also allows for better understanding of digital creators' motives and identification of common interests. Basing a game on historical sources is a major challenge for game creators. It requires both easy access to comprehensive expert support and significant time commitment from partners for consultations, which can additionally limit the free creative process (example of the mobile game "Zaginiona partytura Moniuszki" [The Lost Score Of Moniuszko]). Additionally, it is difficult to measure the extent to which content and elements based on evidence affect the game's attractiveness (i.e. number of downloads). M. Bauchmann and O. Gawlik (2025), referring to the results

of a study conducted by PIN in 2022, note that the Internet and computer games can be considered the most important or one of the most important sources of historical knowledge, especially among high school youth. The inclination of game content is the result of the project, type of game and adopted goals, including educational ones. It was assumed that through cooperation it is possible to maintain the authenticity and accuracy of cultural messages, enrich its interpretation with plot threads, without violating the integrity of cur rent knowledge.

Team collaboration was marked by certain difficulties: barriers related to the use of game-specific jargon; focusing more attention on gameplay, i.e., the game itself and implemented mechanics in the game than the factual layer; seeking inspiration in popular science sources while resigning from relying on expert knowledge (Slavic Mythology Museum) and the achievements of archaeologists (MOR). Conclusions from participant observation are confirmed by the literature (Zmuda, 2018; du Vall, Majorek, 2014; Jacko J.F, Jacko M., 2020)—game creators, focusing on player needs, mostly focus on: gameplay (interaction with the game) at the expense of its artistic values; consistency of gameplay elements—to maintain player engagement, achieve deep immersion of the player in the virtual world (immersion) and maintain adopted conventions, at the expense of novelty and exploitation of expert knowledge in the creative process; use of intermedial means, such as sound, image, text, iconography to build mood—immersion, hedonistic experience at the expense of cognitive engagement, cognitive aspects of participation in the game; game rules that build player engagement, evoke strong emotions, affect the sense of effectiveness, success, ultimately the realization of individual needs; reproducing cultural motifs and tropes ingrained in popular culture at the expense of interpreting reliable facts into game language.

These elements define areas of tension and contradictions in the game co-creation process. Museums are characterized by focus on the object vs. audience (cognitive and participatory dimension of experience). Game creators focus on experience, its fetishization (hedonistic dimension) (Sangamuang et al., 2025), sensory immersion (sense of world reality) vs. emotional (stimulation, absorption, flow) (Jacko F.M, Jacko M., 2020). The parties to the relationship differ in interpretive strategy (facts vs. fiction) and communication with the audience (hierarchical vs. direct). Often the inspiration for game creators are historical events, archaeological discoveries, reinterpreted and enriched with fantastic elements, blurring the boundaries between fact and fiction. For specialists in a given field, such "caricatural representations of reality" are highly harmful to the recipient, for whom the game may be the main source of knowledge on a given topic. Sołtysiak (2017) identifies stereotypes, simplifications, misrepresentations, medievalisms and neomedievalisms reproduced in games, which reflect mass imaginations from which the state of historical knowledge of contemporary society is built. It should be agreed with M. Wawrzak-Chodaczek (2012) that games can serve to transmit knowledge from many fields. Archaeological knowledge is particularly affected by stereotypes and misrepresentations. The studied case is also not free from mass borrowings, which was pointed out by female archaeologists, also emphasizing the need to revise the game to maintain the authenticity of the message.

The identified difficulties are confirmed by literature and conclusions from the GameHearts project, of which the authors were participants (03.2025). In a systematic literature review (177 publications), Wang et al. (2025) emphasizes the inherent difficulties in combining different professional languages, methodologies and expectations. Effective co-creation depends on successful communication and cooperation between different groups: museum professionals (curators, researchers, educators, conservators), game creators (designers, programmers, artists), scientists (from humanities, social sciences and computer science), and often also community members engaged in game development.

Cooperation between the sectors was exploratory in nature. The game developers sought inspiration in museum ethnographic and archaeological sources. The scope and nature of activities related to the development of the game, which were supported financially by the CRPK, severely limited the possibilities for co-creation that would go beyond the stage of consultation and identification of common areas of cooperation. Ultimately, inspiring material was identified in archaeology. The cooperation established was an early stage in the process of co-creating the game. It mainly concerned the identification of source material in the form of artefacts collected in the museum and curatorial interpretation, as well as other research materials. This stage was not without tensions and contradictions related to differences in knowledge and perspectives (so-called information diversity), a lack of mutual understanding of expectations and needs, which resulted from both hermetic language, different work logic and professional orientation (profit vs. social mission). This stage can be described as the 'Innoversity Paradox' (Justesen, 2001). Despite the information diversity related to the role and purpose—the overriding value—diversity supported the creative energy of the team from the very beginning, leading to inspiring motifs and ideas to be used in the game.

The success of the collaboration lay in attracting game developers who recognised the potential of museum collections. The case of the game Numiares—A Dark Tale demonstrates the potential for co-creation between two sectors that have largely operated separately until now. It also reveals the structure of dynamic relationships and forms of partner engagement, opening up new opportunities for the museum to popularise knowledge. This partnership is an excellent example of how collaboration can use pop culture to promote historical and archaeological literacy among the public, help build the image of museums as brokers of knowledge, and in turn contribute to the development of institutions.

The analysis of the case study allowed us to identify key areas of cooperation and the scope of partner involvement. The ideation and conceptualisation stage of the game project and its joint development, based on the exploration of mutual relations (support, expert advice, feedback), were considered particularly important. The authors' findings emphasise the importance of the various roles that museums can play in their cooperation with game developers: expert advice, a repository of knowledge and resources, and a channel for promotion and communication with the audience. Cooperation with the gaming industry

also allows museums to increase their influence on other fields, expanding the role of the museum as a guardian of cultural heritage and an active participant in social transformation (Chaitas et al., 2024). Based on a non-systematic literature review, the roles and scope of partner involvement in the game co-creation process were identified (Chaitas et al., 2024; Kosti et al., 2025; Klimas et al., 2025): (1) co-creation of the game from concept to dissemination. Co-authorship may include the game's narrative, character design, development of visual and audio resources, and even the basic game mechanics that shape player interaction (e.g., Mini Melbourne, Carmen Funes); (2) design methodologies focused on building an immersive cognitive experience; (3) joint research and development in the field of inclusive game design, democratisation of access to innovative tools, and deeper links between technology and heritage (EU i-Game project, as cited in Kosti et al., 2025).

These diverse forms of engagement are rarely mutually exclusive. The prerequisite is cooperation based on flexibility and mutual trust between partners (Klimas et al., 2025). Transdisciplinary competences, broad knowledge and the ability to navigate the complexity of game projects, both interpersonal and digital, are of key importance.

5. Discussion

The article contributes cognitively and empirically to understanding the process of value co-creation by CCI, whose carrier is a video game. The basis for research conclusions is the perspective of people engaged in the process of value co-creation based on video games, that is, game creators and museologists. The case study served for detailed analysis, which took into account the characteristics of entities (who?), roles played in the context of mutual benefits (what?), diverse engagement of partners (how?) at different stages of the process (when?) (Klimas, Czakon, 2022b). The research insight allowed for identification of areas of tension and contradictions and factors mitigating them, indicating mutual benefits. It should be emphasized that the studied case confirmed literature findings identifying factors supporting and limiting CCI cooperation. It also allowed for determining common interests and factors allowing for reaching compromise in the area of priorities. Also future directions for development of joint initiatives based on CP, mainly related to knowledge diffusion and cooperation based on the open innovation model, through which partners combine complementary resources and achieve their own goals. The case study helped fill the empirical gap emphasized by researchers. Research conclusions served to develop an open innovation model based on CP (Fig 1). The proposed value co-creation model captures in a theoretical framework, identifying factors supporting cooperation between museums and game creators. The assumptions at its base are supported by three related concepts: open innovation strategy, entrepreneurial orientation, and

cultural innovations (compare Eid, 2016). Each of these concepts was a separate subject of research conducted by A. Molter (2020; 2021; 2023), and was also observed in the studied case.

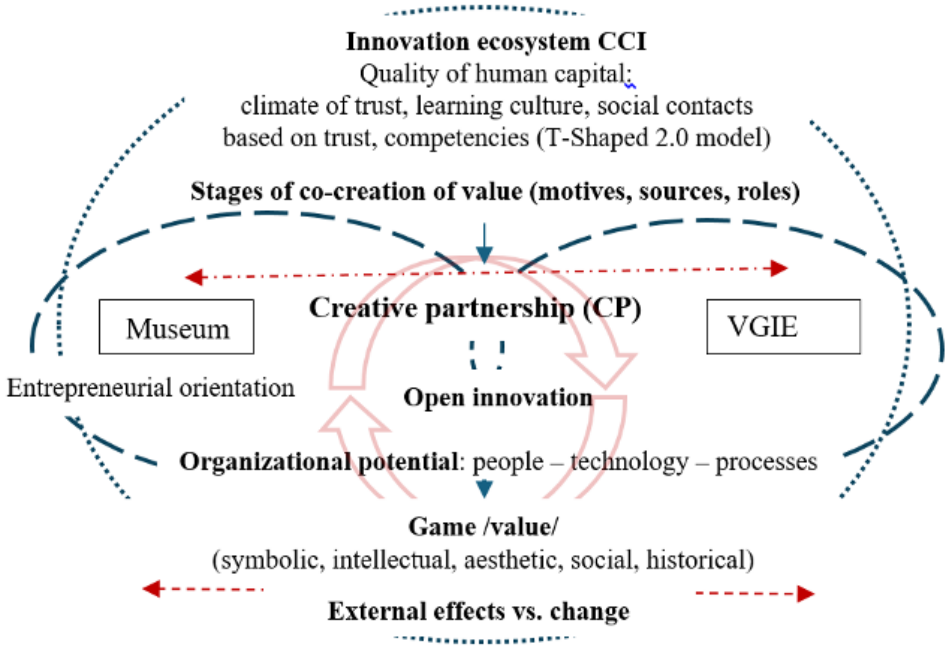

Figure 1. The Creative Partnerships open innovation model. Source: own contribution (Kasprzak 2013; Klimas et al., 2025, 2019; Juchnowicz 2018)

The developed model has utilitarian purpose and can serve as a kind of map for CP whose cooperation focuses on co-creating video games. Additionally, it allows building financial resilience of museums through identifying paths of knowledge commercialization (databases, licenses, external financial resources). Given that museums are largely characterized by low innovation and organizational flexibility, and more broadly low entrepreneurial orientation—despite high proactivity of employees (Molter, 2020; 2021; 2023)—which is a consequence of limitations tied by tight administrative-legal corset. This engagement of museologists is important in the pre-production phase: developing concepts and working on the prototype, expert support in the development phase and embedding cultural content. In this sense, game creators can derive a series of benefits from the direct and supportive contribution of museologists in designing concepts and developing games (consulting, creating aesthetic and artistic impressions, supporting narrative elements with reliable sources of knowledge, providing 3D models of objects and locations in appropriate format,

with the possibility of further processing (high-poly models). Mutual benefits resulting from commercialization of knowledge and use and processing of digital representations of cultural artifacts by game creators are clear. Despite examples of good practices related to digitization, there are still a number of barriers related to the openness of cultural data. This results from two critical limitations, hedging resulting from the perceived threat to intellectual property by museologists, the problematic "reciprocity between commercialization and institutional ethics" (Lorenc, 2024). Also concerns about the possibility of improper use of objects and lack of implementation of unified digitization standards for access to cultural data, especially on open license terms. Museums' digital lag, manifested by a gap in digital competencies, lack of adequate ICT infrastructure and abandonment of technology due to high operating costs, constitutes an additional inhibitor of cooperation and establishing creative partnerships between museums and game creators. This translates into a series of barriers in access to cultural resources, defines a gap between creators' needs for access to digital artifacts (3D models, location maps) and the possibility of their further processing for various applications, including commercial ones (Rattanarungrot et al., 2025).

In the authors' opinion, cooperation between museums and game creators is a natural path for developing a museum's digital strategy. Despite significant involvement of European funds in building infrastructure, open platforms and methodologies dedicated to designing games devoted to cultural heritage (i-Game, Digital Heritage, Digital Games Research Association—DiGRA; ACM SIGCHI Annual Symposium on Computer-Human Interaction in Play—CHI PLAY), journals devoted to research at the intersection of technology-culture-games[1], cooperation between museums and game creators can hardly be considered mature. In the authors' opinion, it is marked by a series of barriers and contradictions that were identified in the research process.

6. Conclusions

The need for inter-organizational cooperation usually appears when organizations are unable to independently provide services, deliver certain goods or meet the needs of recipients (Czernek-Marszałek et al., 2023). Understanding the needs and expectations of game creators is important in the context of society's deep digital transformation. According to the Newzoo report (2024), at the end of 2024 the number of players was estimated at 3.422 billion, which is about 41.73% of the world's population. According to estimates, in 2027 this value will reach 45% of players, and by 2030, 50.5% of players. As D. Gałuszka

[1] Journal on Computing and Cultural Heritage (JOCCH); Museum International issued by ICOM and Taylor & Francis (2025); Journal of Museum Management and Curatorship (2024); Digital Applications in Archaeology and Cultural Heritage (2024).

(2020) notes, games constitute one of the leading pieces of evidence of progressing ludification (Raessens, 2012), the growth in the importance of play in different domains of life. Games are becoming an alternative form of participation in culture and spending free time, which can be realized in many different ways (Gałuszka, 2020; Polacyn, 2018). The success of museums is not only the quality of presented content, but also obtaining the desired social resonance through appropriately developed interpretive and exhibition strategies supporting and enriching the experiences of digital audiences. The development of digital society requires museums to redefine institutional development strategies, increase openness and take advantage of opportunities from the environment that will allow them to tune into the needs of cultural content recipients.

Cultural data has particular value for generating spillover effects (Kasprzak 2013). For the survival, growth and development of the Polish game industry, which struggles with innovation pressure, access to cultural data can be a source of inspiration and competitive advantage (Klimas, 2019b; Klimas et al., 2025). Cooperation in an open innovation environment can be an alternative form of knowledge commercialization for museums, building image and promoting the institution. However, it requires developing recommendations and good practices that allow balancing commercialization with institutional ethics without compromising the integrity of collections (Lorenc 2024; Chaitas et al., 2024). The authors indicated possible ways to mitigate tensions and contradictions. It should be emphasized that the proactivity of museologists (Molter 2020) is a good predictor of CP development, but inflexible work environments in museums remain a serious inhibitor.

The case study method is subject to criticism of low acceptability of results due to difficulty in defining true statistical generalizations and the charge of researcher subjectivity. To limit researcher subjectivity, data and researcher triangulation was used (Glinka, Czakon, 2021). The study provides insight into a small fragment of the complex game co-creation process, identifying only a few possible paths of cooperation based on CP. It allowed for determining future research directions related to developing a competency profile of a digital curator; recommendations and support mechanisms in shaping the entrepreneurial orientation of museums.

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