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# Cultural and creative industries in the fourth industrial revolution: heterodox economic perspectives on the EU'S triple transition

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This paper examines the transformative impact of the Fourth Industrial Revolution (4IR) on Cultural and Creative Industries (CCIs) and their role in advancing the European Union's triple transition—green, digital, and social. It explores how technological disruption interacts with structural inequalities, institutional frameworks, and human capabilities, drawing on heterodox economic perspectives to provide a comprehensive analysis. The study adopts a qualitative and exploratory approach, combining theoretical synthesis with sectoral evidence from European CCIs. The findings indicate that while 4IR technologies offer unprecedented opportunities for creative expression, global reach, and new forms of collaboration, they also reinforce digital dependency, structural heterogeneity, and capability trade-offs. Concentrated platform power, algorithmic gatekeeping, and data extraction reproduce historical centre–periphery dynamics, while productivity gaps between high-tech and traditional creative sectors deepen social inequalities. At the same time, digital tools expand access to resources and audiences, opening new avenues for participation and innovation. The analysis suggests that technological progress alone cannot secure inclusive development; instead, institutional reform, capability enhancement, and alternative economic models are essential to align CCIs with Europe's wider social and environmental objectives. By synthesising insights from structuralist economics, dependency theory, capability approaches, and institutional analysis, the paper develops an integrated model for understanding CCIs as both vulnerable and as drivers of transformative change. The results provide policy guidance on promoting creative autonomy, technological sovereignty, and cultural diversity within the EU's triple transition.

KEYWORDS

**cultural and creative industries, fourth industrial revolution, digital dependency, structural heterogeneity, creative capabilities, institutional innovation, European Union, triple transition**

## 1 Introduction

The Fourth Industrial Revolution (4IR) represents a fundamental change in production, consumption, and social organisation, characterised by the merging of physical, digital, and biological technologies (Schwab, 2016). This technological revolution encompasses artificial intelligence, machine learning, robotics, the Internet of Things, biotechnology, quantum computing, and other emerging technologies that blur the boundaries between physical, digital, and biological realms. For the Cultural and Creative Industries (CCIs), this revolution

presents both remarkable opportunities and existential challenges that necessitate thorough theoretical analysis.

The European Union's triple transition framework—encompassing green, digital, and social transformations—offers a comprehensive perspective on how CCIs can contribute to sustainable development. This framework, adopted as part of the European Green Deal and Digital Decade initiatives, acknowledges the interconnected nature of environmental sustainability, digital transformation, and social inclusion. However, traditional economic frameworks often overlook the complex dynamics of creativity, technology, and inclusive growth that characterise CCIs in the 4IR era.

The importance of CCIs in this context cannot be overstated. Recent estimates show that CCIs contribute about 4.4% of EU GDP and employ over 8.7 million people, making them a crucial economic sector (European Commission, 2021). Additionally, their impact goes beyond economic measures, influencing cultural identities, social cohesion, and innovation across European societies. As these industries experience rapid technological change, understanding their development paths is crucial for policy making and strategic planning.

This paper addresses significant gaps in the existing literature by applying heterodox economic perspectives, especially from the Global South, to understand how CCIs navigate the tensions between technological disruption and fair development. While mainstream economic analyses often focus on the efficiency improvements and market growth opportunities offered by 4IR technologies, they frequently overlook the structural inequalities, power imbalances, and capability limitations that shape actual development outcomes.

Building on the theoretical foundations established in contemporary development economics, we investigate how the paradox of growth without development—characterised by extreme wealth coexisting with ongoing poverty—appears in the digital creative economy. This issue becomes especially urgent as digital divides threaten to worsen existing inequalities while also providing opportunities for alternative development paths. The COVID-19 pandemic has accelerated digital transformation in CCIs, making this examination both timely and vital for understanding post-pandemic recovery strategies.

Three primary research questions guide our investigation: First, how do 4IR technologies create new forms of dependency and structural heterogeneity within European CCIs? Second, what are the implications of these transformations for human capabilities and creative freedoms? Third, how can institutional innovations support CCIs in contributing to the triple transition whilst avoiding the pitfalls of technological determinism?

To move beyond a generic statement of the challenges and opportunities facing the CCIs within the context of the Fourth Industrial Revolution, it is essential to clarify the methodological foundations of this research. Before discussing the theoretical frameworks used, this section outlines the qualitative and exploratory approach employed in the analysis, along with the empirical sources that support it.

## 2 Materials and methods

This research adopts a qualitative and exploratory approach, suitable for examining the complex and dynamic transformations affecting CCIs within the context of the 4IR. The primary aim is not to measure change solely through standardised indicators, but to explore how technological, institutional, and social dynamics interact to create new forms of dependency, inequality, and capability development. Special focus is given to the European Union's triple transition—green, digital, and social—as the framework within which CCIs are expected to foster inclusive and sustainable development.

The analytical approach unfolds in four stages. The first stage is conceptual mapping, which identifies how central theoretical traditions—such as structuralist economics, dependency theory, capability approaches, institutional economics, and structural heterogeneity—can be translated into operational categories relevant to the creative economy. This ensures that abstract concepts, like centre–periphery relations, unfreedoms, institutional path dependency, or dual productivity structures, can be meaningfully applied to empirical cases.

The second stage involves cross-theoretical synthesis. Recognising that no single framework can fully capture the multifaceted transformations of CCIs in the 4IR, this step aims to identify complementarities and overlaps between different perspectives. This synthesis enables a more nuanced understanding of how technological progress interacts with inequality, governance, and creative autonomy, while also highlighting the potential for CCIs to support the EU's triple transition.

The third stage is empirical application, where the integrated framework is used to analyse specific cases from the European creative sectors. These include music streaming, digital gaming, virtual museums, and online creative platforms. The cases cover both digitally intensive and more traditional cultural forms, demonstrating the range of opportunities and constraints within the triple transition. Special focus is given to technologies such as artificial intelligence, blockchain, and immersive media, as well as the role of platform economies in shaping value flows and creative autonomy.

Finally, the fourth stage involves a critical evaluation where empirical findings are interpreted within the theoretical framework. This includes assessing whether 4IR technologies decrease or increase dependency, whether they expand or restrict creative abilities, and how institutional arrangements either reinforce or challenge existing inequalities. Importantly, this evaluation also considers the environmental, digital, and social implications of these dynamics, aligning with the EU's integrated policy agenda. The primary objective is to generate insights that are not only academically valuable but also practically useful for policymakers, guiding the practical application of institutional innovation, creative autonomy, and capacity building to strengthen technological sovereignty, cultural diversity, and social inclusion.

The study draws on a diverse range of data sources. These include European Commission reports on CCIs and digital transformation, UNESCO statistics on cultural trade and creative economy indicators, and industry-level data from organisations such as CISAC, IFPI, and the European Games Developer Federation. Academic literature on platform economies, digital labour, and creative industries provides an additional interpretative perspective.

Several limitations must be recognised. Informal and emerging creative practices are often underrepresented in official statistics, while the rapid pace of technological change outstrips the capacity of institutional data collection. This creates gaps that restrict the comprehensiveness of the empirical base. Furthermore, although the multi-theoretical framework offers conceptual depth, its application

mainly relies on secondary sources. The findings should therefore be regarded as exploratory, emphasising key dynamics and tensions rather than providing definitive causal explanations.

While the methodological design outlines the analytical framework and empirical scope of the study, its explanatory power depends on the theoretical foundations that guide the interpretation of the data. The following section elaborates on these foundations, drawing on heterodox economic perspectives. Collectively, these traditions provide the conceptual tools necessary to analyse how technological disruption, creative autonomy, and institutional dynamics intersect within the European creative economy in the era of the Fourth Industrial Revolution.

## 3 Theoretical framework and heterodox perspectives

The analysis of CCIs within the context of the 4IR requires moving beyond traditional economic paradigms, as mainstream approaches often overlook the structural inequalities, institutional dynamics, and capability limitations characterising these sectors. To address this gap, this study adopts a heterodox perspective that incorporates insights from structuralist economics, dependency theory, the capability approach, institutional economics, and the theory of structural heterogeneity. By situating CCIs within these diverse yet complementary frameworks, it becomes possible to understand not only the economic mechanisms driving digital creative markets but also the broader social, cultural, and institutional factors that shape development outcomes. This multi-theoretical approach lays the conceptual groundwork for critically examining how 4IR technologies reshape creative economies and their potential to support the European Union's triple transition.

### 3.1 Structural dependency: platforms, power, and digital colonialism

The primary focus in structuralist and dependency analysis is understanding and overcoming the structural relations of dependence, which persist and reappear in new forms despite technological advancements and the emergence of new economic sectors, such as the digital creative economy. Furtado (1978a) argued that genuine development requires freeing a population's creative potential and shifting the focus of the accumulation process away from simply copying external models or the instrumental rationale that ties creativity to commercial or power-driven goals.

A re-examination of the centre–periphery model, initially established by Prebisch (1950) and further developed by Furtado (1974), highlights the concentration of technological progress and capital accumulation within the "centre" of the capitalist system. At the same time, the "periphery" mainly participates through exporting primary commodities or cheap labour, as well as importing manufactured goods and technology, thus maintaining systemic inequality. In today's global capitalism, transnational corporations hold a dominant position, controlling technological innovation and structuring international transactions as internal activities within their conglomerates. When applied to the digital creative economy, this framework shows that, even in sectors where the main "product" is cultural or digital, similar patterns of power, technological control, and value concentration are replicated. The "centre" retains dominance over "noble technologies" and the platforms that support creativity, while the "periphery"—comprising content creators—primarily acts as a source of low-cost creative labour.

This perspective highlights how digital platforms continue unequal exchanges and extract value from content created outside main hubs. Furtado (1974, 1978b) noted that transnational corporations maintained control over technological flows by consolidating research and development activities within the core, while shifting amortised technologies and local capital to peripheral regions. In the digital sphere, this dynamic appears through the centralisation of data, algorithms, and infrastructure within core economies. In contrast, content created by producers in other regions—including Europe—is mainly monetised to benefit corporate headquarters. Similar to the export of cheap labour embedded in manufactured goods, the added value created by creative work is appropriated chiefly externally. Additionally, the process of mimetic modernisation—where peripheral economies imitate the consumption patterns and technological platforms of core economies—serves to deepen this dependency and further consolidate the concentration of income and power.

Furtado's (1978a, 1978b) distinction between authentic development and mimetic modernisation is key to understanding the course of digital cultural practices. Modernisation, in his view, involves adopting sophisticated consumption patterns copied from central economies without proportional advances in local capital growth or productive methods. Culturally, this process leads to a form of "cultural colonisation" or "deculturalisation," where local communities lose the ability to define their own goals. In the digital creative industries, mimetic modernisation is evident through the uncritical copying of aesthetic forms, narrative structures, and monetisation models dictated by global platforms. Conversely, authentic development requires a process of social re-creation supported by endogenous growth. It involves enabling a society's creative forces to set and pursue their own objectives, using technology to produce and share cultural expressions that mirror local diversity and values, rather than conforming to formats imposed by dominant platforms.

In other words, authentic development does not refer to a romantic idea of cultural purity or an intuitive sense of "localness." Instead, following Furtado, authenticity signifies a state of agency over the direction and purpose of development. Development becomes authentic when creative actors—individuals, collectives, and institutions—are able to decide how technology is utilised, what forms of creativity are valued, and how value circulates within the ecosystem. Authenticity is not found in the output (cultural products), but in the process and governance of cultural production.

Authentic development thus relies on the existence of institutions that safeguard decision-making authority from external influence. In digital creative ecosystems, this includes: (a) mechanisms that ensure autonomy over circulation infrastructures (e.g., transparent algorithms, access to data, fair contracts), (b) rules that keep value within creative communities rather than extracting it through platforms, and (c) policies that broaden creators' substantive freedoms—such as time, income stability, training, and conditions for experimentation. In this perspective, authenticity is not merely an aesthetic trait but an institutional outcome: creative ecosystems are

"authentic" when they possess the capacity to choose, rather than when they resemble pre-digital or traditional cultural forms.

At the core of Furtado's framework is the notion that creativity drives development, not merely serves as a market asset. In digital CCIs, this manifests as a tension between endogenous creativity and externally imposed models of production and monetisation. For Furtado, authentic development emerges when societies set their own cultural and technological goals, rather than reproducing patterns dictated by external actors. Development, in this context, is not solely about economic gains but also about creating new value syntheses that transcend instrumental logic.

Ultimately, the challenge for societies—and, by extension, for cultural and creative creators—is how to go beyond the technological and cultural reliance imposed by global corporate logics. This demands reorienting creativity and accumulation towards genuine development, emphasising social goals and the full expression of human freedom, rather than replicating external patterns that reinforce value concentration and dependence.

## 3.2 Capabilities and creative freedoms in the 4IR

Following the structuralist focus on dependency and asymmetry, Amartya Sen's capability approach adds an extra emphasis on the freedoms and opportunities available to individuals within the framework of the Fourth Industrial Revolution (4IR). For Sen (1999, 2004), development should be understood not just as a growth in national income or technological progress. Still, as the removal of "unfreedoms" that prevent people from leading lives they have reason to value. When applied to the cultural and creative industries, this perspective promotes an assessment of how digital technologies both expand and limit creative freedoms, cultural participation, and artistic expression.

4IR technologies expand capabilities by lowering production costs and enabling global reach, but they also introduce new unfreedoms. Platform algorithms determine visibility; data extraction concentrates value outside creative ecosystems; and precarious platform-based labour restricts long-term autonomy. Thus, digitalisation does not inherently expand freedoms—it redistributes them unevenly.

Sen's framework also provides tools to assess the impact of 4IR on cultural participation, artistic expression, and diversity. Digital technologies can empower marginalised voices, aid cultural affirmation and increase recognition of artistic contributions. However, the dominance of platform logics risks homogenising cultural output, favouring content that conforms to global standards and thus discouraging genuine diversity. In this context, the issue of "mimetic modernisation," as described by Furtado, is reflected in the digital sphere: societies risk copying external consumption models without developing their own cultural capacities. Consequently, while the potential for empowerment remains strong, it is tempered by risks of superficial cultural engagement and the erosion of local knowledge.

When considered within the framework of capability expansion, the 4IR offers significant benefits but also presents certain limitations. These benefits include global outreach to audiences, democratised creative tools, and new expressive channels in areas such as generative art and immersive media. Such developments expand the range of accessible functions and enhance creative agency. However, issues such as the ongoing digital divide, the insecure nature of creative work, and reduced autonomy due to algorithmic governance limit these opportunities. These limitations result in capability deprivations that prevent individuals from fully realising their creative potential, even in technologically advanced environments.

Therefore, innovation policies should be evaluated based on their ability to enhance capabilities rather than solely relying on economic metrics. The main goal should be to expand individuals' substantive freedoms, ensuring that technological progress benefits the many rather than a privileged minority. This includes investing in education and digital literacy, guaranteeing equitable access to infrastructure and tools, and establishing protections for creative professionals within platform economies. Additionally, support for diverse cultural ecosystems and the promotion of open discussions about the adoption and governance of technologies are essential. Ultimately, the measure of 4IR innovation in the creative industries should not be its contribution to GDP or technological novelty, but rather its capacity to nurture creativity, encourage participation, and maintain cultural diversity.

## 3.3 Institutions, governance, and path dependency

Building on the perspectives of structuralism and capabilities, an institutional perspective explains how the creative economy is organised and why it often reproduces patterns of dependency. Institutions, understood as formal and informal rules that shape human interaction, are key to the production and distribution of creative work. Copyright frameworks, licensing systems, data governance mechanisms, and labour protections set incentives, lower or raise transaction costs, and influence how value is captured (North, 1990). Likewise, norms of collaboration, trust, and self-regulation within creative communities shape how creators cooperate and oversee each other's contributions (Ostrom, 1990/2015). Collectively, these structures define the possibilities for creative production and distribution in the digital age.

Institutional arrangements, however, are not always effective in fostering creativity. Rules that lag behind technological advancement can create rigidities that favour intermediaries while disadvantaging creators. Copyright law, for example, often struggles to address the challenges posed by generative artificial intelligence or blockchain applications, leaving gaps that diminish the bargaining power of artists. Data governance remains inadequate, enabling platforms to extract and monetise vast amounts of user information without transparent or fair mechanisms for redistribution. In the labour sphere, the rise of freelance and gig-based creative work has outpaced protections, leaving workers without security or collective negotiation rights. These shortcomings highlight institutional inefficiencies and governance failures that hinder sustainable creative development (Ostrom, 1990/2015).

Once established, institutional arrangements tend to persist through mechanisms of path dependency (North, 1990). Dominant platforms consolidate their power by expanding user bases, controlling algorithms, and setting standards for monetisation, which makes it costly for creators to exit or seek alternatives. The gradual nature of institutional change reinforces these dynamics, while entrenched interests maintain rules and practices that reproduce dependency

(North, 1990). In this context, creators often find themselves locked into systems that limit autonomy and concentrate value, even when these systems restrict cultural diversity and innovation.

Despite these obstacles, institutional change remains achievable. Local creator communities have demonstrated the ability to establish and enforce their own rules for managing shared resources, while policy initiatives and cooperative ventures suggest alternative paths. Emerging models include platform cooperatives owned and managed by their users (Ostrom, 1990/2015), new licensing systems adapted to technologies like AI and NFTs, and municipal strategies that build local infrastructures for digital culture (Ostrom, 1990/2015). These developments represent gradual but meaningful steps towards institutional diversification, where creativity is supported by governance models that better align with cultural autonomy, fairness, and sustainability.

Analysing the creative economy through an institutional perspective highlights both the persistent nature of dependency and the potential for change. Institutions shape incentives and transaction costs (North, 1990), restrict or facilitate cooperation (Ostrom, 1990/2015), and influence the flow of value within creative markets. At the same time, they lay the groundwork for the development of alternative arrangements. Understanding these dynamics is crucial for rethinking governance in the digital creative economy and for developing policies and practices that foster cultural diversity and the autonomy of creators.

### 3.4 Structural heterogeneity: dual economies within CCIs

Building on earlier discussions of structural dependency and institutional dynamics, Pinto's (1970) perspective on structural heterogeneity offers a valuable framework for understanding how the digital creative economy is organised across markedly different levels of productivity. Within this system, advanced sectors—such as those related to artificial intelligence, blockchain, and virtual reality—coexist with traditional and artisanal sectors, including the performing arts, crafts, and independent professionals, which operate with low capital intensity and utilise inherited techniques. Pinto would also recognise intermediate segments between these poles, but the key characteristic remains unequal interdependence: the modern sector dominates while the lagging groups remain marginalised.

This coexistence results in measurable inequalities. The "productivity gap" between advanced and traditional activities is significant and tends to persist over time. While high-productivity digital sectors generate higher revenues per worker, most of the creative workforce remains involved in low-return traditional activities. Furthermore, the weak link between sectors hinders the spread of innovation and limits spill-over effects. Instead of fostering dynamism, the advanced sectors stay closely connected to external technological and financial centres, contributing little to the development of local creative ecosystems.

The persistence of this structural heterogeneity can be attributed to several factors. Skill mismatches mean that many workers from traditional sectors lack the training needed to participate in digital industries. Restrictions on access to capital make it difficult for small and medium-sized creative enterprises to invest in new technologies. Market segmentation reinforces inequalities, as dominant firms concentrate demand within affluent niches, leaving most producers excluded. Institutional inertia, often rooted in regulatory frameworks or colonial legacies, restricts transformative change. Finally, cultural resistance, expressed through mimetic modernisation, leads to the uncritical adoption of consumption and production patterns from advanced economies rather than the development of authentic creative models.

These dynamics risk creating a divided creative economy. On one side are digital elites thriving in high-productivity, globally connected sectors; on the other, a vulnerable majority struggling with low incomes, weak protections, and limited access to technology. Such polarisation worsens social inequalities, increases marginalisation, and threatens social cohesion. It also strains democratic participation, as growing disparities can fuel discontent and justify technocratic or authoritarian responses. Internationally, reliance on transnational corporations for technologies and platforms sustains external dependence, reinforcing the vulnerability of local creative ecosystems. Pinto's analysis indicates that without targeted structural reforms and policies focused on equity and inclusion, the growth of high-productivity digital creative sectors is likely to deepen economic and social divisions. The benefits of technological innovation will mainly accrue to a small elite, while most creative workers remain vulnerable, thus weakening both cultural diversity and democratic stability and resilience.

Taken together, these four perspectives provide a comprehensive framework for analysing creative development in the 4IR. Furtado and Pinto discuss the structural conditions of external dependence and internal dualism, Sen emphasises how these conditions influence human freedoms and capabilities, and North and Ostrom demonstrate how institutions can either strengthen existing hierarchies or encourage collective innovation. The synthesis shown in Table 1 makes clear that creative development in the 4IR is neither neutral nor automatic: it is shaped by power relations, structural inequalities, and institutional dynamics. Only by addressing these dimensions simultaneously can creativity truly drive development, expand freedoms, promote diversity, and support a more equitable integration of CCIs into Europe's triple transition.

This cross-theoretical synthesis provides the conceptual framework for analysing how CCI experiences technological disruption in practice. The following section, therefore, examines empirical analysis, focusing on specific examples of digital dependency, structural heterogeneity, changes in capability, and institutional adaptation across European creative industries.

## 4 Results and empirical analysis

This section examines how the theoretical dynamics outlined earlier manifest concretely within European CCIs. Drawing on sectoral reports and market data, it explores four interrelated dimensions of the digital transformation. First, it analyses the forms of digital dependency that arise from platform concentration, data colonialism, and the extraction of creative value. Second, it considers the structural heterogeneity that characterises European CCIs, highlighting the coexistence of high-productivity digital subsectors and labour-intensive traditional activities. Third, it examines how these dynamics expand or restrict the fundamental freedoms and creative capacities of individuals, before turning to the final section,

TABLE 1 Cross-theoretical contributions to the analysis of CCIs in the 4IR.

| Theoretical lens | Key focus | Core contribution to CCI analysis |
|---|---|---|
| Structuralism and dependency | External dependence; centre–periphery dynamics | Shows how global platforms replicate unequal exchange by controlling technology, algorithms, and value extraction. |
| Structural heterogeneity | Internal dualism between high-productivity and traditional sectors | Explains the coexistence of digital creative elites and precarious majorities, with limited linkages across sectors. |
| Capability approach | Expansion or restriction of real freedoms (creative, cultural, political) | Highlights how dependency and heterogeneity shape human capabilities, participation, and cultural diversity. |
| Institutional economics | Formal and informal institutions; path dependency; self-organisation | Identifies how existing institutions reinforce dependency, but also how cooperative and municipal innovations may emerge. |

Source: Authors.

which explores institutional arrangements that mediate these processes. Together, these results offer a comprehensive empirical foundation for understanding the opportunities and risks faced by CCIs in contributing to the EU's green, digital, and social transitions.

## 4.1 Digital dependency in the creative economy

The rapid digitalisation of European CCIs has increased their reliance on a few dominant global platforms. In the music industry, streaming accounted for 67% of recorded music revenues in Europe in 2023, with just four companies—Spotify, YouTube, Apple Music, and Amazon—dominating nearly the entire market (IFPI, 2024). This level of concentration changes bargaining power: labels, publishers, and artists operate within distribution systems where access to audiences depends on adhering to obscure platform rules. In gaming, over 80% of PC game downloads in Europe are handled through only two channels, Steam and Epic Games Store (ISFE—Interactive Software Federation of Europe, 2023). In audiovisual markets, subscription video-on-demand (SVOD) services earned €15.8 billion in 2023, with Netflix and Disney+ as the primary beneficiaries (IFPI, 2024).

This concentration produces asymmetries analogous to those described by Furtado, where transnational corporations hold the "noble resources" of accumulation—technology, capital, and access to consumers—while dependent economies provide content and labour but retain little control. The reliance of European AI start-ups on U. S. cloud infrastructures and machine learning libraries illustrates this point: innovation is domestically vibrant, yet dependent on external technological foundations (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). From a structuralist lens, Europe risks reproducing the very dependency dynamics it once associated with the Global South: it generates creative talent and cultural diversity. Still, it lacks sovereignty over the infrastructures that mediate cultural exchange.

The asymmetries extend beyond economics, also transforming cultural priorities. As platforms grow more influential in determining which works reach consumers, European policymakers find themselves with less scope to implement quotas, subsidies, or other cultural policy measures. This decline in institutional independence reflects the "loss of agency" outlined in dependency theory, where decision-making shifts to the centre while the periphery adapts. For Europe, the strategic concern is that digital transition proceeds without establishing cultural sovereignty, leaving the region technologically modern but structurally subordinate.

Beyond concentration, the more insidious aspect of dependency resides in value extraction. CISAC's Global Collections Report 2024 states that European creators earned €10.4 billion in royalties in 2023, nearly half of global collections (CISAC—International Confederation of Societies of Authors and Composers, 2024). However, digital revenues are growing fastest in segments dominated by platforms, and the share returned to authors and performers remains disproportionately low. This "value gap" highlights a structural imbalance: infrastructure operators take more value than the cultural producers, even though the latter generate the substance of demand.

Algorithmic gatekeeping exacerbates this imbalance. SVOD platforms, for instance, now serve as cultural editors. Algorithms determine which works are recommended, and their optimisation for engagement metrics systematically favour globally appealing, commercially driven content (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). For European works, particularly those in minority languages or experimental formats, this leads to reduced visibility and limited monetisation opportunities. The power of algorithms thus turns cultural diversity into an externality rather than a fundamental value, echoing Furtado's warning about "cultural colonisation" and Pinto's observation that technological modernisation often widens, rather than diminishes, structural divides.

Data colonialism explains how platforms harvest user and creator data as a form of raw resource. Every stream, download, or click creates behavioural information that is monetised through targeted advertising, predictive analytics, and AI training. However, creators have almost no claim to the value derived from this data. In this way, cultural activity in Europe generates "digital rents" that mainly flow to non-European centres of technological dominance. The asymmetry is structural: the surplus created by European creativity is increasingly captured outside its borders, similar to the historical transfer of value through unequal exchange in commodity markets.

The social consequences of this imbalance are profound. Precarity among creators is not only an economic issue but also a constraint on their capabilities. As Sen argued, development must be assessed in terms of the expansion of fundamental freedoms. When creators are forced to produce "algorithm-friendly" content or cannot sustain a dignified livelihood despite contributing to global markets, their freedoms shrink. Thus, digital dependency is not merely a structural issue but a direct limitation on Europe's cultural and social transition.

The concept of "digital raw materials" reflects a new form of unequal exchange shaping European CCIs. Similar to how classical dependency theory described primary commodities as undervalued

exports that drove industrial growth elsewhere, today, cultural content and user data are treated as inputs captured at low cost in Europe and monetised by global platforms. UNESCO's Global Report warns that AI-enabled value chains risk shifting creation, distribution, and marketing to technological centres, displacing human labour and diminishing national agency (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022).

This reflects Pinto's idea of structural heterogeneity. High-productivity digital subsectors—AI-driven creative studios, immersive technologies, blockchain-based cultural assets—are growing quickly across Europe. However, traditional cultural sectors, such as the performing arts, crafts, and independent creators, remain labour-intensive and underfunded. According to Eurostat data cited in UNESCO's report, more than 60% of employment in the European cultural sector is still concentrated in these traditional areas, despite their lower productivity (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). The weak link between high-tech and traditional sectors reinforces a dual system: elites in digital industries succeed, while most others remain precarious.

In this light, data and content function as the equivalent of exported labour: they embody creativity and effort but are priced as low-value inputs. Platforms at the centre transform these inputs into highly profitable services, capturing the rents of technological innovation. For Europe, the strategic danger lies in being positioned as both centre and periphery simultaneously: globally competitive in cultural production yet dependent on foreign platforms for distribution and monetisation. This paradox reflects a deeper structural trap—technological advancement without full sovereignty.

Unless deliberate institutional measures address these asymmetries, Europe risks locking itself into a pattern of digital dependency. The triple transition—digital, green, and social—requires more than technological adoption. It demands institutional innovations that ensure creative autonomy, redistribute value fairly, and incorporate progress into local ecosystems. Without such measures, Europe's creative economy may replicate centre–periphery logics that restrict both its economic potential and its cultural freedoms.

## 4.2 Structural heterogeneity in creative sectors

Europe's creative economy demonstrates a striking dualism between its digitally intensive and its traditional sectors. On the one hand, advanced subsectors such as immersive media, blockchain applications, and AI-assisted production attract significant investment, scale rapidly, and integrate into global markets (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). On the other hand, artisanal and heritage sectors—live performing arts, museums, crafts, and small independent publishing—remain fragmented, labour-intensive, and reliant on public funding or patronage. The contrast is not merely technological but structural: high-productivity subsectors concentrate capital and skilled labour, while traditional sectors concentrate employment but generate lower returns.

This dualism reflects Pinto's (1970) concept of structural heterogeneity, where a modern sector of technologically advanced activities coexists with large segments of low-productivity work. In Europe, the creative "modern sector" is highly globalised and data-driven, while the "traditional sector" remains rooted in local ecosystems. Weak links between these sectors mean that digital expansion does not automatically lead to improved conditions for the broader cultural workforce.

Sectoral data emphasise the extent of these disparities. In music, live performance revenues in Europe increased by 67.8% in 2022, reaching €2.7 billion; however, they remained 7.9% below pre-pandemic levels (CISAC—International Confederation of Societies of Authors and Composers, 2024). Conversely, digital collections grew by 33% the same year, surpassing €4 billion for the first time, with growth mainly in streaming platforms and publishers connected to them (CISAC—International Confederation of Societies of Authors and Composers, 2024). This uneven recovery highlights the gap between capital-heavy digital sectors and labour-intensive live sectors.

In the European book market, revenues reached €23.6 billion in 2022, yet digital formats accounted for less than 12% of sales, with print remaining the dominant format (IFPI, 2024). Productivity gains are therefore focused on a small part of the sector, while employment stays linked to traditional distribution models. A similar duality is evident in video games: the European market was valued at €23.3 billion in 2022, with digital downloads and in-game purchases accounting for over 90% of revenues, while physical sales continued to decline (ISFE—Interactive Software Federation of Europe, 2023). This enhances how digitally scaled segments harness productivity, while jobs in retail, events, and local production decline.

Inter-sectoral linkages also remain limited. UNESCO—United Nations Educational, Scientific and Cultural Organization (2022) reports that over 60% of cultural employment in Europe remains focused on traditional activities, including heritage, crafts, and the performing arts. However, these sectors benefit little from spillovers created by high-productivity digital industries, which tend to connect more strongly with global technological ecosystems than with local creative communities. This confirms Pinto's diagnosis that modern sectors often expand externally rather than strengthening domestic structures.

Technological diffusion has not eradicated inequalities across European CCIs. CISAC—International Confederation of Societies of Authors and Composers (2024) observes that despite record global collections, revenue distribution remains unequal: the top 10% of creators earn most royalties, while small and mid-level artists find it difficult to secure significant earnings. In film and audiovisual, GMR (2025) indicates that although digital video revenues in Europe grew by 12.6% year-on-year, traditional cinema box office recovery has been slow, with admissions still 26% below 2019 levels. The labour-intensive sector remains structurally weaker even as digital revenues increase.

Employment patterns reinforce this dualism. UNESCO—United Nations Educational, Scientific and Cultural Organization (2022) observes that cultural workers in Europe face higher rates of precarious contracts and self-employment than the average workforce, with particularly acute vulnerabilities in performing arts and heritage sectors. The gap is widened by limited access to capital and skills, as smaller firms and individual creators find it difficult to adapt to algorithm-driven markets. In Pinto's terms, structural heterogeneity persists because progress in the modern pole does not diffuse effectively to the broader economy. Instead, technological change risks entrenching a dual creative economy: a small elite embedded in high-productivity digital industries and a majority employed in low-productivity, precarious segments.

The evidence presented above suggests that technological diffusion within European CCIs has not eliminated structural inequalities, but rather reinforced them in new forms. High-productivity digital sectors grow quickly, yet they remain loosely connected to the artisanal and traditional sectors where most employment is found. This dualism confirms Pinto's diagnosis of structural heterogeneity: progress in one sector does not automatically create spillovers for the rest of the economy. However, structural imbalances are not just economic; they directly affect the freedoms, opportunities, and creative capacities available to individuals. To understand how digital dependency and heterogeneity influence the lived experiences of creators and cultural workers, it is essential to draw on Amartya Sen's capability approach, which emphasises the expansion or restriction of fundamental freedoms as the accurate measure of development.

## 4.3 Capability transformations

The digital transformation of European CCIs has led to unprecedented growth in creative capacities. Streaming and digital distribution platforms have significantly broadened the international reach of European content. For example, European repertoire accounted for 26% of global recorded music consumption in 2023, with streaming as the primary driver of international circulation (IFPI, 2024). Similar patterns are evident in video games: the European market, valued at €23.3 billion in 2022, now exports culturally distinctive titles worldwide, facilitated by online distribution (ISFE—Interactive Software Federation of Europe, 2023). These changes enhance creators' ability to reach distant audiences and monetise their works beyond traditional territorial limits.

Technological tools have also reduced barriers to creation. The wide availability of AI-assisted music composition, affordable production software, and cloud-based collaborative platforms has democratised access to high-quality production processes (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). In the museum sector, digital transformation technologies such as augmented reality, interactive installations, and virtual exhibitions have expanded opportunities for cultural participation and education (Wang et al., 2024). These tools allow smaller institutions and independent creators to experiment with formats that were previously restricted to large organisations with substantial capital.

Collaboration has also undergone a significant transformation. Cloud infrastructures and online platforms have enabled pan-European and international projects. GMR (2025) highlights the increase in cross-border audiovisual co-productions, supported by digital platforms that lower transaction costs. These forms of collaboration create new spaces for cultural dialogue, diversify creative practices, and enhance the ability of European creators to participate in global cultural conversations. In Sen's terms, these are meaningful expansions of the "capabilities to aspire" and to act as autonomous cultural agents.

At the same time, digitalisation has imposed significant restrictions on capabilities. The digital divide remains a persistent barrier: UNESCO—United Nations Educational, Scientific and Cultural Organization (2022) reports that uneven access to high-speed broadband and digital skills across European regions limits participation in digital cultural markets. Small-scale creators, especially those in rural areas or those lacking advanced digital literacy, are unable to fully benefit from the opportunities offered by new technologies. This perpetuates inequalities within Europe, as those with access and skills expand their creative freedoms, while others face exclusion.

Precarity is another significant constraint. CISAC—International Confederation of Societies of Authors and Composers (2024) indicates that, although global collections reached record highs, income distribution remains highly uneven: most creators earn only minimal returns, while the top tier secures the majority of revenues. GMR (2025) confirms this pattern in audiovisual and cinema, where freelance and project-based contracts prevail, leaving creators vulnerable to fluctuations in income. The growth of platform-based gig work further intensifies this precarity, restricting not only economic security but also the ability to plan and pursue long-term creative projects. In Sen's terms, this represents a limitation of substantive freedoms: creators may technically participate but under conditions that restrict their autonomy.

Finally, creative autonomy itself is increasingly eroded. Algorithmic gatekeeping compels creators to adjust their output to align with the logic of platform profitability. UNESCO—United Nations Educational, Scientific and Cultural Organization (2022) warns that recommendation systems often prioritise mainstream or Anglophone content, marginalising local and experimental works. This dynamic weakens cultural diversity and pressures artists to conform to homogenised formats. For many creators, the freedom to experiment and innovate is limited by the need to remain visible in algorithm-driven markets.

The coexistence of expansions and restrictions highlights the complexity of capability transformations in the digital era. A capability trade-off matrix serves as a helpful diagnostic tool to visualise these dynamics. Table 2 summarises the main expansions and constraints observed across European CCIs, using evidence from multiple sectors.

The analysis of capability transformations shows that the digital transition of European CCIs is not a straightforward process of empowerment, but a complex negotiation of freedoms gained, and freedoms lost. While global reach, new tools, and collaborative infrastructures expand opportunities for many creators, digital divides, precarity, and algorithmic homogenisation limit the fundamental freedoms of others. These mixed outcomes highlight that the path of CCIs in the Fourth Industrial Revolution cannot be understood solely in terms of technology or markets. Instead, it heavily relies on institutional frameworks—formal regulations, governance mechanisms, and collective arrangements—that influence incentives and access to opportunities. To address the disparities mentioned earlier, it is essential to consider the institutional economics perspective, which explores how rules, historical paths, and governance innovations shape the environment in which capabilities can truly develop.

## 4.4 Institutional adaptations and gaps

European CCIs are under intense pressure in the digital environment. Intellectual property regimes, historically designed around analogue forms of authorship and distribution, are increasingly misaligned with digital practices. CISAC—International Confederation of Societies of Authors and Composers (2024) notes

TABLE 2 Capability trade-off matrix in European CCIs.

| Capability dimension | Expansions | Restrictions | Net effect |
|---|---|---|---|
| Market access | Global reach of European repertoire: 26% of global music consumption via streaming (IFPI, 2024). Growth of digital exports in gaming: €23.3bn market with global reach (ISFE—Interactive Software Federation of Europe, 2023). | Persistent digital divide across regions and skill levels (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). | Conditional expansion: wider reach, but unequal participation. |
| Creative tools | Affordable AI and cloud-based production tools democratise creation (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). Museums adopt AR/VR for new experiences | Resource constraints prevent smaller actors from adopting advanced tools at scale. | Stratified expansion: benefits concentrated among those with access to capital and skills. |
| Collaboration | Cross-border audiovisual co-productions supported by digital platforms (IFPI, 2024). | Dependence on global infrastructures outside EU weakens sovereignty. | Uneven expansion: greater collaboration, but structurally dependent. |
| Economic security | Growing digital revenues (CISAC—International Confederation of Societies of Authors and Composers, 2024; IFPI, 2024). | Precarity of freelance work; income skewed to top creators (CISAC—International Confederation of Societies of Authors and Composers, 2024). | Ambiguous: increased revenues but persistent vulnerability. |
| Creative autonomy and diversity | Expanded distribution channels give more voices global exposure (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). | Algorithms prioritise mainstream content, marginalising diversity (UNESCO—United Nations Educational, Scientific and Cultural Organization, 2022). | Contested terrain: broader reach, but homogenisation risks. |

Source: Authors.

that while global royalty collections reached €12.1 billion in 2023, much of the growth was captured by digital platforms rather than by creators themselves, with streaming alone generating €4 billion. This imbalance highlights how current copyright rules enable platforms to retain disproportionate value, leaving creators in weaker bargaining positions. From North's perspective, these institutional "rules of the game" create incentives that benefit large intermediaries while disincentivising sustainable creative labour.

Data governance faces parallel challenges. UNESCO—United Nations Educational, Scientific and Cultural Organization (2022) emphasises that data has become the "new raw material" of the creative economy, yet governance mechanisms for cultural data remain underdeveloped. Algorithms used by streaming and audiovisual platforms determine visibility and monetisation, but their functioning is opaque. The "value gap" debate, raised by European policymakers and echoed in CISAC—International Confederation of Societies of Authors and Composers (2024), highlights the institutional vacuum: while the consumption of cultural content grows, the revenue returned to creators falls behind. Without transparent rules on data use, algorithmic accountability, and equitable revenue sharing, creative workers face systematic disadvantages.

Labour protections also lag behind the digital transformation. GMR (2025) indicates that a significant portion of Europe's audiovisual sector relies on freelance or project-based contracts, exposing workers to income volatility and a lack of social protections. UNESCO—United Nations Educational, Scientific and Cultural Organization (2022) similarly documents that high levels of self-employment and precarious contracts characterise cultural employment in Europe. These institutional gaps reflect what North would call "inefficient paths" that persist due to vested interests: labour regulations continue to favour standard employment models while failing to adapt to the realities of platform-based creative work.

The dominance of global platforms within Europe's creative sectors exemplifies North's concept of path dependency. Once established, these institutions gain from increasing returns, making it challenging to enact change. IFPI (2024) highlights that 67% of music consumption in Europe now originates from streaming, with a few platforms controlling access to audiences. Likewise, in gaming, over 90% of revenues in 2022 derived from digital formats distributed via a small number of global platforms (ISFE—Interactive Software Federation of Europe, 2023). Such concentration illustrates how early technological leadership and network effects reinforce dominance.

North's framework suggests that path dependency traps creators and consumers within existing systems, as high switching costs, entrenched user bases, and sunk investments hinder the emergence of meaningful alternatives. Ostrom supplements this analysis by demonstrating that without the ability for collective action, creators cannot reshape rules or challenge dominant players. The longevity of these institutional arrangements reflects not natural efficiency but historically ingrained asymmetries in bargaining power.

Despite these difficulties, there are signs of institutional innovation within European CCIs. Ostrom's emphasis on self-organisation and gradual change offers a helpful perspective for understanding these developments. UNESCO—United Nations Educational, Scientific and Cultural Organization (2022) documents experiments in cooperative platforms and commons-based initiatives, where creators collectively define governance rules and share revenues more fairly. Such models reflect Ostrom's principles of polycentric governance, allowing creators to manage digital resources as common-pool goods.

Creative Commons licences are also being adapted to new technological realities. CISAC—International Confederation of Societies of Authors and Composers (2024) notes that AI-generated content and blockchain-based transactions are prompting debates over how open licences can evolve to safeguard attribution,

remuneration, and collective ownership in the digital age. These adaptations demonstrate how organisations can gradually adapt to emerging challenges without relying solely on top-down regulation.

At the municipal level, digital strategies are emerging as experiments in alternative governance. GMR (2025) highlights city-led initiatives in cultural policy that support local creative hubs, promote digital sovereignty, and invest in inclusive digital infrastructure. These strategies illustrate how public authorities can serve as facilitators of institutional innovation, thereby creating conditions for more equitable participation in the digital creative economy.

Taken together, these developments suggest the potential for moving beyond institutional inertia. While path dependency reinforces the dominance of platforms, innovations in cooperative governance, adaptive licensing, and municipal strategies illustrate Ostrom's insight that actors can craft new rules from below. The challenge for Europe is to scale these initiatives while embedding them within broader frameworks that ensure transparency, fairness, and cultural diversity.

The institutional challenges and innovations outlined above are crucial in determining whether European CCIs can make meaningful contributions to the EU's triple transition. Without reform, intellectual property regimes, weak data governance, and precarious labour structures risk undermining the digital and social aspects of the transition, entrenching dependency and inequality. However, the emergence of cooperative platforms, adaptive licensing frameworks, and municipal digital strategies shows that institutional change is possible. By fostering transparency, empowering creators, and integrating cultural data governance with broader sustainability goals, Europe can align its creative economy with the green, digital, and social pillars of transformation. The extent to which CCIs can act as catalysts for inclusive and sustainable development will therefore depend not only on technological innovation but also on institutional creativity to design rules that expand freedoms, redistribute value, and safeguard cultural diversity.

## 5 Discussion

The evidence from European CCIs highlights the importance of heterodox perspectives in understanding the transformations of the Fourth Industrial Revolution. Celso Furtado's distinction between authentic development and mimetic modernisation remains remarkably relevant. In sectors like music, gaming, film, and publishing, digital adoption often manifests as mimetic modernisation: platforms and monetisation models developed in Silicon Valley or Shenzhen are quickly adopted in Europe, but with limited growth in independent creative capacities. NFT experiments, algorithmic streaming, and novelty-driven production demonstrate how dependency continues even in technologically advanced industries. Authentic development, by contrast, would steer digital technologies towards locally defined cultural goals, emphasising diversity, autonomy, and creative freedom.

Raúl Prebisch's centre–periphery framework continues to be relevant in the algorithmic and data-driven economy. The dominance of non-European platforms in streaming, gaming, and audiovisual markets reflects previous trade asymmetries, now manifesting as algorithmic control and data colonialism. European creators supply "digital raw materials"—content and user data—while value is captured in global hubs outside Europe. This illustrates an unequal exchange in modern form, where visibility, bargaining power, and decision-making remain concentrated at the centre.

The empirical evidence from European CCIs underscores the ongoing importance of heterodox perspectives in analysing the transformations of the Fourth Industrial Revolution. Celso Furtado's distinction between genuine development and mimetic modernisation stands out as especially significant. Across music, gaming, film, and publishing, the adoption of digital tools often manifests as what Furtado would call mimetic modernisation: the swift integration of platform logics and monetisation models developed in Silicon Valley or Shenzhen, without a corresponding growth in independent creative capacities. NFT experiments, algorithm-driven streaming, and the focus on novelty over cultural depth demonstrate how digital practices risk perpetuating dependency rather than fostering genuine development. Conversely, authentic development would entail reorienting digital technologies towards locally defined cultural aims, emphasising diversity, autonomy, and the liberation of creative potential.

Raúl Prebisch's centre–periphery framework remains highly relevant when adapted to the algorithmic and data-driven aspects of the digital economy. The dominance of non-European platforms in streaming, gaming, and audiovisual markets reflects the structural asymmetries of earlier trade relations, now expressed as algorithmic gatekeeping and data colonialism. European creators serve as providers of "digital raw materials"—content and user data—while value is extracted and accumulated in global hubs outside Europe. These dynamics extend Prebisch's diagnosis of unequal exchange, demonstrating how control over data flows, algorithmic visibility, and platform infrastructures increasingly shape the terms of trade in the cultural economy.

Amartya Sen's capability approach provides a crucial lens for understanding the trade-offs inherent in these transformations. On one side, digital platforms extend the reach of European creators, reduce barriers to production, and foster new collaborative opportunities. On the other side, they also reinforce divisions, as precarious contracts, algorithmic bias, and uneven digital literacy limit the fundamental freedoms available to many cultural workers. The evidence suggests that the 4IR generates complex capability matrices, where expansion occurs alongside restrictions, leading to unequal distributions of substantive freedoms across creative sectors. Sen's framework helps evaluate these contradictions not merely in terms of abstract efficiency but through the lived capacity to participate in cultural life and shape one's own creative path.

The analysis emphasises the role of institutional lock-in and the limitations of incremental change. North's concept of path dependency explains why entrenched platforms continue to dominate despite widespread awareness of their extractive practices. Network effects, sunk costs, and vested interests create substantial barriers to structural change, leaving creators dependent on systems that systematically disempower them. Ostrom's insights into the potential for self-organisation suggest incremental institutional innovations—such as platform cooperatives, Creative Commons adaptations, and municipal digital strategies—but these remain fragmented, and marginal compared to the scale of platform dominance.

The insights drawn from the heterodox authors converge in an integrated framework that clarifies how digital dependency, structural heterogeneity, capability trade-offs, and institutional dynamics

TABLE 3 Integrated model of CCIs in the 4IR and the EU triple transition.

| Theoretical lens | Key concepts | Manifestation in European CCIs | Implications for triple transition |
|---|---|---|---|
| Furtado (creativity-centred development) | Authentic development vs. mimetic modernisation | Adoption of global platform models and NFTs as mimetic strategies; limited investment in autonomous creative technologies | Need for policies that redirect digital tools towards *authentic* cultural development, aligned with social and environmental goals |
| Prebisch (centre–Periphery) | Unequal exchange, technological dependency | Non-European platforms capture majority of streaming, gaming, and audiovisual revenues; EU creators supply "digital raw materials" | Digital sovereignty in infrastructure, data, and algorithms is essential for the *digital transition* |
| Pinto (structural heterogeneity) | Dualism between high- and low-productivity sectors | Digital gaming and streaming expand rapidly while crafts, performing arts, and live music lag behind in productivity and revenue | Risk of deepening inequality unless linkages between sectors are built into *social transition* strategies |
| Sen (capability approach) | Expansion of real freedoms vs. unfreedoms | Global reach, new tools, and collaborative opportunities coexist with precarity, algorithmic bias, and exclusion | Innovation should be assessed by its impact on *capability expansion*, not only GDP or efficiency |
| North (institutions and path dependency) | Rules of the game, path dependency, institutional lock-in | Existing copyright regimes, opaque algorithms, and labour law gaps reinforce platform dominance | Institutional innovation needed to overcome lock-in and enable fairer distribution of value |
| Ostrom (collective governance) | Polycentric governance, self-organisation | Platform cooperatives, Creative Commons adaptations, and municipal digital strategies | Demonstrates pathways to institutional creativity supporting *social and digital transitions* |

Source: Authors.

interact within European CCIs. Rather than treating each perspective in isolation, the synthesis demonstrates their complementarity in explaining both the persistence of inequalities and the potential pathways for transformative change. Table 3 summarises this integrated model, mapping the key concepts of each theoretical lens to their manifestations in European creative sectors and their implications for the EU's triple transition.

Together, these perspectives highlight that the dynamics of CCIs in the 4IR cannot be reduced to technological change alone but must be understood in relation to broader developmental goals. They provide the foundation for examining their role in Europe's green, digital, and social transitions. The green dimension of the EU's triple transition is both advanced and constrained by developments in the cultural and creative economy. Digital distribution models have reduced the need for physical production and circulation of cultural goods, offering clear dematerialisation benefits. Streaming services are replacing CDs and DVDs, virtual exhibitions are lessening the need for physical travel, and digital archives are preserving works without material degradation. However, these gains are offset by the hidden environmental costs of digital infrastructures. Data centres supporting music streaming, video-on-demand, and gaming consume vast amounts of energy, while blockchain-based creative practices generate significant carbon footprints. Hardware obsolescence and the rapid turnover of consumer devices further exacerbate the depletion of resources. Therefore, the green transition in CCIs exposes a contradiction: digitalisation decreases material intensity per unit but can lead to rebound effects, where heightened consumption offsets efficiency gains. The challenge lies in developing cultural digitalisation strategies that actively integrate sustainability criteria rather than assuming environmental neutrality.

The digital landscape exposes Europe's vulnerability to technological dependence. Despite its strong creative output, the continent remains reliant on non-European platforms, cloud infrastructures, and algorithmic systems. As seen in music, where more than two-thirds of consumption occurs via global streaming platforms, or in gaming, where digital revenues predominantly pass through a limited number of international distributors, Europe's creative industries are structurally subordinate to decisions made outside its borders. This raises urgent questions of digital sovereignty: who controls the infrastructures that determine access to audiences, who owns the cultural data generated by European users, and whose algorithms determine the visibility of European works? Without robust European alternatives in platforms, data governance, and recommendation systems, the continent risks perpetuating mimetic modernisation—importing technological models rather than shaping them to reflect local values and cultural diversity. Achieving real digital transition thus requires more than digitisation; it necessitates the reassertion of sovereignty in infrastructure, data, and algorithmic design.

The social aspect of the triple transition is most evident in everyday cultural work conditions. While digitalisation broadens opportunities for global reach and creative collaboration, it also increases precarity. Freelance contracts, the gig economy in creative labour, and the dominance of platforms in value extraction leave many creators unable to secure stable livelihoods. Additionally, digital divides in connectivity, skills, and resources continue to exclude large parts of the population from full participation in the creative economy. These structural vulnerabilities stand in contrast to the potential for digital justice. If governed inclusively, digital platforms could amplify the voices of underrepresented individuals, enable participatory governance of cultural data, and distribute revenues more equitably. A justice-oriented framework—ensuring access, recognition, procedural fairness, distributive equity, and restorative measures—could align CCIs with the EU's broader social goals. However, this potential remains unrealised due to entrenched inequalities and institutional inertia.

## 6 Policy implications and recommendations

European CCIs can play a pivotal role in driving the EU's triple transition, but this potential will only be realised through intentional

institutional and policy reforms. The focus should extend beyond technological adoption; it must also overhaul the frameworks governing the creative economy. This involves developing public digital infrastructures, integrating cultural values into algorithms and data governance, enhancing labour protections, and encouraging alternative economic models. Policies must ensure that creativity impacts not only growth but also sustainability, inclusion, and cultural diversity. Table 4 synthesises how each proposed institutional intervention supports the green, digital, and social pillars of the EU's triple transition.

The analysis of digital dependency, structural heterogeneity, capability transformations, and institutional dynamics shows that European CCIs can play a crucial role in driving the EU's triple transition. However, this potential requires intentional policy measures that go beyond technological adoption to reshape the institutional and economic structures of the creative economy. The following proposals suggest ways to align CCIs with the green, digital, and social pillars of the transition.

A top priority is the development of public digital infrastructure specifically designed to serve the needs of the cultural and creative sectors. This could take the form of a European public cloud for creative industries, providing affordable and sustainable storage and processing capacity. Open algorithms and interoperable recommendation systems should be established as digital public goods to counteract the dominance of profit-driven platform logics. Federated platforms, allowing creators to maintain autonomy while benefiting from shared networks, would decrease reliance on global intermediaries. Cultural data trusts, managed collectively by creators, institutions, and public authorities, could ensure that data generated in Europe is handled transparently and utilised to support cultural ecosystems rather than being exploited by external actors.

Policy evaluation must go beyond GDP growth or narrow efficiency metrics. In line with Sen's capability approach, innovation strategies should be judged by their effects on freedoms, capabilities, and cultural diversity. This may involve required capability impact assessments for new technologies in CCIs, evaluating whether they enhance or restrict creative autonomy, participation, and cultural pluralism. Funding programmes should favour projects that show inclusive access and capacity-building, while indicators of cultural sustainability—such as diversity of repertoires, resilience of creative workforces, and democratic governance of cultural data—should complement economic indicators in policy assessment.

Institutional reforms are crucial to tackling power imbalances in the digital creative economy. Platforms must adhere to transparency requirements regarding algorithms, data use, and revenue sharing, ensuring accountability to both creators and users. Labour protections should be extended to gig and platform-based creative work, providing social security, collective bargaining rights, and mechanisms to reduce income volatility. Cultural data governance ought to be formalised through EU-level frameworks that ensure fairness, respect for privacy, and mechanisms for fair value distribution. These reforms would address what North described as "inefficient paths" by recalibrating institutional rules, while promoting participatory governance as emphasised by Ostrom.

Beyond reforming existing institutions, alternative economic models should be actively encouraged and promoted. Platform cooperatives, collectively owned by creators and users, offer democratic governance and fairer value distribution. Meanwhile, municipal creative hubs can localise digital sovereignty by investing in infrastructure, training, and community-based production. Commons-based peer production models, including open-source creative tools and collaborative licensing, can strengthen cultural ecosystems outside purely commercial frameworks. Incorporating circular economy principles into creative industries—such as sustainable device design, digital carbon accounting, and low-energy cultural infrastructures—would align CCIs with the green transition while reinforcing their social legitimacy.

Finally, international coordination is essential. Creative trade agreements should include cultural exception clauses to protect policy space for domestic cultural industries, ensuring that trade liberalisation does not diminish cultural diversity. Regulatory frameworks on platforms, taxation, and labour should be harmonised across EU member states to prevent regulatory arbitrage. Europe should also learn from digital sovereignty initiatives emerging in the Global South, where alternative approaches to infrastructure, licensing, and platform governance are being developed. By engaging in South–South and

TABLE 4 Policy domains for CCIs and their contribution to the triple transition.

| Policy domain | Key measures | Green transition | Digital transition | Social transition |
|---|---|---|---|---|
| Digital creative commons infrastructure | Public creative cloud, open algorithms, federated platforms, cultural data trusts | Indirect: more sustainable digital infrastructures | Strengthens sovereignty over platforms, data, and algorithms | Expands equitable access and collective governance |
| Capability-based innovation assessment | Capability impact assessments, diversity indicators, inclusive innovation criteria | Promotes sustainable cultural practices | Ensures innovation aligns with human development, not just efficiency | Expands freedoms, cultural participation, and diversity |
| New institutional frameworks | Transparency obligations for platforms, protection of platform workers, cultural data governance | Indirect: fairer resource use through accountable systems | Reduces dependency on dominant platforms | Improves labour conditions, rights, and income stability |
| Alternative economic models | Platform cooperatives, municipal creative hubs, commons-based production, circular economy integration | Direct: embeds circular principles in creative industries | Builds localised and democratic digital ecosystems | Fosters solidarity, autonomy, and community-based resilience |
| International cooperation | Cultural exception clauses, harmonised regulation, South–South cooperation, standards leadership | Supports global sustainability standards | Promotes European leadership in global digital governance | |

Source: Authors.

North–South dialogues, the EU can build coalitions for fairer global digital governance while promoting its own sovereignty objectives.

It suggests that CCIs are not passive recipients of technological disruption, but rather potential drivers of systemic change. By embedding cultural values into digital infrastructures, aligning innovation with human development, reforming institutional frameworks, experimenting with alternative models, and building international coalitions, Europe can position its creative economy as a catalyst for the green, digital, and social transformations of the coming decades.

Taken together, these proposals emphasise that the transformative role of CCIs in the EU's triple transition cannot be achieved through technological diffusion alone. It requires deliberate institutional innovation, sustained investment in capabilities, and the cultivation of alternative economic models that privilege cultural diversity, creative autonomy, and social equity. By embedding creativity at the centre of digital infrastructures, aligning innovation with human development, reforming governance frameworks, and building global coalitions, Europe could redefine the trajectory of its cultural economy. Whether CCIs become drivers of inclusive and sustainable development or remain subordinated to extractive platform logics will depend on the political will to implement these changes and the collective imagination to envision alternative futures.

## 7 Limitations and future research

The analysis in this paper confirms that the transformative potential of the Fourth Industrial Revolution for European CCIs is closely linked to the structural conditions shaping their development. While new technologies open opportunities for global reach, innovative tools, and collaborative practices, they also reproduce longstanding dependencies, deepen structural heterogeneity, and lead to complex capability trade-offs. By incorporating Furtado's distinction between authentic development and mimetic modernisation, Prebisch's centre–periphery framework, Sen's capability approach, and North and Ostrom's insights on institutions, this study demonstrates that technological progress alone cannot ensure equitable outcomes. Instead, the future of CCIs supporting the EU's green, digital, and social transitions depends on deliberate institutional innovation, capability enhancement, and the development of alternative economic models. Ultimately, the challenge is not merely to digitise Europe's cultural economy but to reimagine it as a driver of inclusive growth, cultural diversity, and sustainability. In this context, CCIs serve as a test case for whether Europe can transcend dependency and inequality to realise a model of creative development rooted in the principles of the triple transition.

While this study offers a comprehensive theoretical and empirical analysis of European CCIs in the context of the Fourth Industrial Revolution and the EU's triple transition, several limitations must be recognised. First, the reliance on secondary data from international organisations, industry reports, and policy documents means that the findings are influenced by the categories and metrics used in those sources. As many reports lag behind technological developments, emergent practices—such as generative AI applications, new forms of cultural data monetisation, or decentralised distribution models—may not be fully captured.

Second, the study aims to balance breadth across multiple creative sectors—music, audiovisual, gaming, publishing, and digital arts—but this scope limits the depth of analysis in any one area. The diversity within sectors, such as the distinction between major rights holders and independent creators in music, or between AAA and indie developers in gaming, warrants a more detailed investigation. Likewise, the uneven digitalisation of sub-sectors, such as crafts, the performing arts, or local heritage institutions, requires further empirical research to chart their distinct paths.

Third, applying heterodox economic theories to CCIs provides valuable analytical insights, but it also requires empirical validation. Concepts such as digital dependency, structural heterogeneity, and capability transformations are operationalised here through available indicators, yet these need refinement into robust methodological tools. Future research could develop specific indices—for example, a "digital dependency index" that measures revenue concentration, data asymmetries, and algorithmic visibility, or a "capability expansion score" for creative workers.

Finally, the study primarily focuses on Europe, while acknowledging that global dynamics, particularly those involving platforms based outside the continent, impact the conditions under which European CCIs operate. Comparative research with other regions, particularly those in the Global South, would broaden our understanding of alternative digital sovereignty strategies and institutional innovations. Such comparative perspectives could reveal pathways for Europe to learn from and contribute to broader efforts to democratise the global digital creative economy.

In summary, future research should focus on three key areas: (1) empirical testing of the proposed theoretical frameworks through primary data collection and case studies; (2) sector-specific and cross-sectoral comparisons to understand internal diversity; and (3) global comparative analysis to place European trajectories within broader patterns of digital dependency, institutional adaptation, and capability development. Addressing these gaps will be crucial for advancing both academic debates and policy formulation in the rapidly evolving field of creative economy studies.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

LV: Writing – original draft, Writing – review & editing. GM: Writing – original draft, Writing – review & editing.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Generative AI statement

The authors declare that Gen AI was used in the creation of this manuscript. Generative AI (ChatGPT from OpenAI) was used for language refinement during manuscript preparation.

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## Publisher's note



## References

CISAC—International Confederation of Societies of Authors and Composers (2024). Global collections report 2024 (for 2023 data). Neuilly-sur-Seine: CISAC.

European Commission (2021). Cultural and creative industries in Europe: key facts and figures. Luxembourg: Publications Office of the European Union.

Furtado, C. (1974). O mito do desenvolvimento econômico. 4th Edn: Paz e Terra.

Furtado, C. (1978a). Criatividade e dependência na civilização industrial. São Paulo: Paz e Terra.

Furtado, C. (1978b). A economia latino-americana: Formação histórica e problemas contemporâneos. 2nd Edn. Philadelphia: Companhia Editora Nacional.

IFPI. (2024). Global Music Report 2025: State of the Industry. London: International Federation of the Phonographic Industry (IFPI). Available online at: https://www.ifpi.org/wp-content/uploads/2024/03/GMR2025_SOTI.pdf

ISFE—Interactive Software Federation of Europe (2023). Key facts: the European video games industry. London: ISFE.

North, D. C. (1990). Institutions, institutional change and economic performance. Cambridge: Cambridge University Press.

Ostrom, E. (1990/2015). Governing the commons: the evolution of institutions for collective action. Cambridge: Cambridge University Press.

Pinto, A. (1970). Naturaleza e implicaciones de la heterogeneidad estructural de la América Latina. *El Trimestre Econ.* 37, 83–100.

Prebisch, R. (1950). The economic development of Latin America and its principal problems. Santiago: United Nations, Economic Commission for Latin America.

PwC, Zenith, and WARC (2025). Global media report 2025: State of the industry. London: PwC.

Schwab, K. (2016). The fourth industrial revolution. Cologny: World Economic Forum.

Sen, A. (1999). Development as freedom. Oxford: Oxford University Press.

Sen, A. (2004). "How does culture matter?" in Culture and public action. eds. V. Rao and M. Walton (Redwood City: Stanford University Press).

UNESCO—United Nations Educational, Scientific and Cultural Organization (2022). Re|Shaping policies for creativity: addressing culture as a global public good (Global report). Paris: UNESCO.

Wang, C., Zhang, Y., and Chen, J. (2024). A systematic review of digital transformation technologies in museum exhibition. *Comput. Human Behav.* 150:108407. doi: 10.1016/j.chb.2024.108407