

Designing the Future of UK-China RD&I Collaboration in the Museums and Galleries Sector

中英两国在博物馆和画廊领域的科研、发展与创新 (RD&I) 合作的未来



EXECUTIVE SUMMARY

执行摘要

The museums and galleries sector is central to the creative industries of both the UK and China, and it has experienced substantial growth in recent years. This expansion, driven by the rapid emergence of immersive and interactive technologies, has contributed significantly to the culture, society, and economies of both countries. The UK and China are presently engaged in actively pursuing opportunities for bilateral collaboration in this area, with a particular emphasis on immersive and interactive technologies, to foster long-term international partnerships geared towards enhancing transnational cultural exchange and accelerating their global outreach and recognition. Despite strong interest, there's a need for strategic efforts to propel this exchange forward at the sector-wide level. Accordingly, this research aims to deliver a strategic framework that can facilitate the long-term RD&I collaboration between museums and galleries in the UK and China, focusing on immersive and interactive museum and gallery experiences.

The research comprised four phases. The first focused on understanding the current trends in using immersive and interactive technologies in the museums and galleries sector and explored existing RD&I collaboration between the UK and China. An extensive literature review and in-depth case studies were applied to this exploratory study. The next step involved investigating current and emerging audience trends by conducting a questionnaire survey with museum and gallery audiences and interviewing four groups of stakeholders from both the UK and China: (i) museums and galleries, (ii) creative businesses, (iii) academic research communities, and (iv) policymakers and implementers. The third phase saw the

staging of a creative workshop with key stakeholders and audiences to obtain feedback on the key findings and elicit key considerations for creating a strategic framework for long-term RD&I collaboration. Phase four established this strategic framework.

The research findings demonstrate the significant impact and benefits of employing immersive and interactive technologies in the museums and galleries sector. Both stakeholders and audiences expressed positive views towards utilising these technologies to enhance museum and gallery experiences and promote international collaboration. Nevertheless, the research pinpoints critical issues, including divergent awareness, experiences and preferences among audiences, dependence on government funding for development, and a deficiency of strategic partnerships among stakeholders.

A strategic framework has been developed to facilitate long-term RD&I collaboration between the UK and China. This framework serves as a guide for relevant stakeholders – including policymakers and implementers, museums and galleries, creative businesses, academic institutions and audiences – to better understand and execute essential elements, core qualities and key stakeholders' roles. With this framework, stakeholders are expected to have the opportunity to embrace a multifaceted strategy aimed at mitigating challenges and impediments while simultaneously amplifying factors that drive and capitalise on opportunities impacting the endurance of long-term RD&I collaboration between the UK and China.

近年来，博物馆与画廊行业增长迅速，已成为中英两国创意产业的核心支柱。这一增长主要由沉浸式和交互式技术的快速发展所推动，对两国的文化、社会 and 经济发展均产生了重大影响。目前，中英两国正积极探索该领域内的双边合作机会，特别是在沉浸式和交互式技术的应用上，借以促进面向加强国际文化交流，提升全球影响力及知名度的长期国际伙伴关系。尽管双方对此存在浓厚的合作兴趣，但仍需在行业层面上做出战略性推动，以促进这一合作向纵深发展。基于此，本研究旨在构建一个战略框架，促进中英两国在博物馆与画廊领域的长期性RD&I合作，同时关注沉浸式和交互式技术在该领域内的应用和体验。

本研究分为四个阶段。第一阶段，通过广泛的文献回顾和深入的案例分析，关注沉浸式和交互式技术在博物馆与画廊行业的应用趋势，并探讨中英之间现有的RD&I合作现状。第二阶段，通过问卷调查和访谈，从(i)博物馆与画廊观众(ii)创意企业、(iii)学术研究社群，及(iv)政策制定者与执行者等多个利益相关者角度，收集反馈，揭示当前及新兴的观众趋势。第三阶段，组织了创意研讨会，邀请关键利益相关者和观众就主要研究发现提供反馈，并提炼出构建长期RD&I合作战略框架的关键要素。第四阶段，确立了这一战略框架。

研究结果表明，沉浸式和交互式技术在博物馆与画廊行业的应用对两国产生了积极的影响和显著的效益。利益相关者和观众对这些技术持积极态度，认为其能够丰富参观体验并促进国际合作与交流。然而，研究同时指出了一些挑战，包括观众的认知、体验和偏好的差异，对政府资金的过度依赖，以及缺乏战略性合作关系。

为推动中英之间的长期RD&I合作，本研究构建了一个战略框架。该框架作为一个指南，旨在帮助相关利益相关者（包括政策制定者和执行者、博物馆和画廊、创意企业、学术机构和观众）更好地理解基本要素、核心品质，并行使好关键利益相关者的角色。通过这一框架，相关利益相关者有望采用多元化战略应对挑战，同时抓住持续影响中英长期RD&I合作的机遇。

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1 | INTRODUCTION 前言

The museums and galleries sector serves as the heart of the creative industries in both the UK and China. In recent years, this sector has experienced tremendous growth, contributing significantly to the economies, societies and cultures of both countries (NHM, 2019a; SSTM, 2020). This surge can be attributed, at least in part, to the rapid emergence of immersive and interactive technologies (Shehade & Stylianou-Lambert, 2020). These technologies have facilitated the creation of innovative and captivating experiences, both online and on-site, increasing visitor engagement (China Daily, 2019; NHM, 2019b; Rea, 2019). This trend has prompted both countries to actively promote the growth of their immersive technologies industry via national-level industrial strategies (Kwon, et al., 2023).

Importantly, the two countries are exploring collaboration opportunities in the museums and galleries sector, particularly around the use of immersive and interactive technologies. Recognising China as a crucial market for UK creative exports, the UK government has actively pursued partnerships, with some UK museums and galleries already initiating exchanges with

their Chinese counterparts (Charr, 2021; Science Museum, 2020). Similarly, China has established initiatives to facilitate networking between Chinese businesses, including those in the creative sector, and the UK. Major Chinese museums and galleries are also seeking long-term international partnerships (BRA, 2021). However, a concerted and strategic effort is essential to drive this potentially valuable exchange consistently across the UK and China at the sector-wide level, promoting this study’s key research question: *How can proactive and sustained UK-China collaboration be achieved in the museums and galleries sector?*

This project explored (i) current trends in the use of immersive and interactive technologies for museum and gallery experiences, (ii) international collaborations between the UK and China, (iii) the stakeholder landscape in the museums and galleries sector in the UK and China, and (iv) future RD&I collaboration between the two countries. The primary focus was to understand the perspectives of UK and Chinese stakeholders and audiences to identify similarities and differences between the two. The research findings highlighted the significant impact and

benefits of using immersive and interactive technologies within the museums and galleries sector, as well as the favourable perceptions of stakeholders and audiences towards using such technologies to enhance museum and gallery experiences and foster international collaboration. However, this research also illuminated critical issues demanding consideration, including (i) varied levels of awareness, experiences and preferences regarding immersive and interactive museum and gallery experiences between stakeholders and audiences, (ii) a heavy dependence on government funding for the development of immersive and interactive experiences and international collaboration, and (iii) a deficiency in strategic, multilateral and long-term partnerships between stakeholders. The findings were principally utilised to extract key considerations for developing a strategic framework aimed at facilitating long-term RD&I collaboration between the UK and China. This involved addressing the critical issues, which include enhancing key drivers while minimising barriers.

2

METHODOLOGY
方法论

This study consisted of four phases: (i) exploration, (ii) investigation, (iii) co-creation and synthesis, and (iv) development. In the first phase, the research delved into current trends in using immersive and interactive technologies for museum and gallery experiences by extensively reviewing the literature and conducting in-depth case studies. Special attention was devoted to gaining insights from current approaches and practices, with a focus on identifying similarities and differences in the utilisation of immersive and interactive technologies in museums and art galleries, especially between the UK and Chinese contexts. The analysis revealed crucial insights into the experiences of stakeholders and audiences with immersive and interactive museum and gallery experiences. The subsequent stage saw these insights employed to shape in-depth stakeholder interviews and an online questionnaire survey.

The second phase focused on eliciting stakeholders' perspectives and understanding the audience. In-depth stakeholder interviews (UK: n=19; China: n=17) were undertaken with four groups of stakeholders: museums and galleries, creative businesses, academic research communities, and policymakers and implementers. The interview questions were centred on three subjects: (i) current trends in using immersive and interactive technologies in

museums and galleries, (ii) the stakeholder landscape in the museums and galleries sector in the UK and China, and (iii) existing international collaboration practices, particularly in creative industries and between the UK and China. The interview data was utilised for sector mapping, understanding key drivers and barriers for the museums and galleries sector, and exploring the similarities and differences in specific sector-related creative work and research. This included immersive and interactive experience production and audience engagement research. An online questionnaire survey was undertaken to comprehend audience perceptions, preferences and behaviours when accessing museum and gallery experiences, both onsite and online, and to gauge audience interest in transnational cultural exchange. The survey questions were designed around the following five themes: (i) awareness of museums and galleries, (ii) museum and gallery experiences, (iii) immersive and interactive museum and gallery experiences, (iv) expectations for immersive and interactive museum and gallery experiences, and (v) interests in cultural exchange between the UK and China. A total of 142 responses were gathered from the UK (n = 70) and China (n = 72), representing six age ranges (18–24, 25–34, 35–44, 45–54, 55–65, and over 65 years).

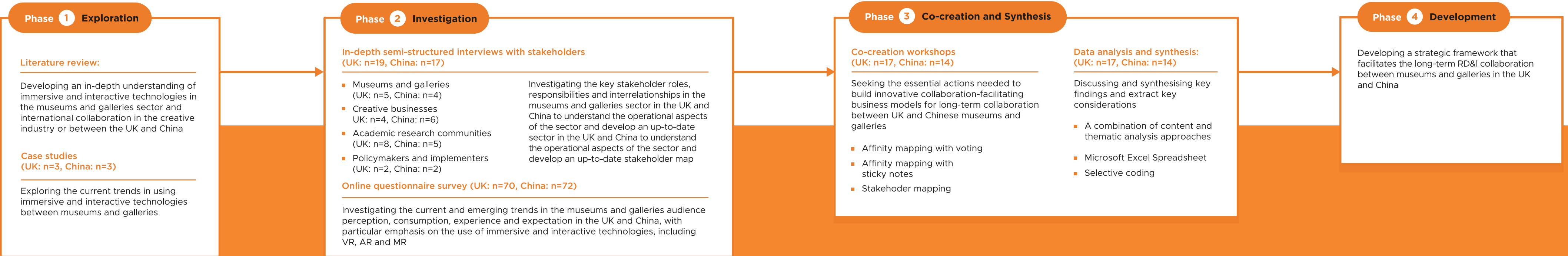


Figure 1 Overview of the research process

The key research findings from Phases 1 and 2 were integrated and incorporated into Phase 3's co-creation workshop, which gathered stakeholders and audiences from the museums and galleries sector in both the UK (n=17) and China (n=14). The phase also incorporated data analysis and synthesis. The workshop aimed to identify essential actions to be considered in developing a strategic framework for long-term RD&I collaboration between the UK and Chinese museums and galleries. Some of the workshop participants had already taken part in stakeholder interviews or the questionnaire survey. The workshop's two sessions focused on (i) immersive and interactive museum and gallery experiences and (ii) international collaboration. Each session included three activities: (i) affinity mapping with voting, (ii) affinity mapping with sticky notes, and (iii) stakeholder mapping. During the first two activities, participants shared their opinions regarding the key drivers, barriers, opportunities, and challenges associated with immersive and interactive museum and gallery experiences and international collaboration. The stakeholder mapping activity saw participants engage in discussions about roles, responsibilities and relationships between stakeholders. Following the co-creation workshop, content and thematic analyses extracted key considerations for creating a strategic framework for promoting long-term RD&I collaboration between museums and galleries in the UK and China, specifically emphasising immersive and interactive museum and gallery experiences.

The final phase concentrated on developing that strategic framework. This involved addressing two distinct aspects: structural elements, which meant determining which components should be included within the framework, and operational perspectives, which meant outlining how the framework could be implemented. Figure 1 presents an overview of the research process.

3 IMMERSIVE AND INTERACTIVE TECHNOLOGIES FOR MUSEUMS AND GALLERIES EXPERIENCES

沉浸式与互动式技术在博物馆与画廊领域的应用与体验

Immersive and interactive museum and gallery experiences employ multi-sensory systems to allow users to interact with and be immersed in the exhibits (Gao, 2022; Shehade & Stylianou-Lambert, 2020; Vi et al., 2017). These experiences are considered very important for providing audiences with social experiences, emotional engagement, embodied and spatial interaction, and learning (Allen et al., 2020), providing audiences with a real, tangible experience that allows them to step into another world (Cornacchio, 2021). Furthermore, by invoking dialogical storytelling, such approaches empower audiences to navigate their own pathways through (for example) historical content (Allen et al., 2020). Such experiences privilege communication between exhibits and viewers, making culture accessible (Carrozzino & Bergamasco, 2010). Hence, immersive and interactive museum and gallery experiences allow art and history to be investigated and understood in a much more comprehensive way (Pantile et al., 2016), supporting the development, renewal, and competitiveness of cultural organisations (Ponsignon & Derbaix, 2020).

These experiences have commonly been developed using one of several technologies: 3D screens and projections, augmented reality (AR), or virtual reality (VR). 3D screen and projection technologies produce a unique atmosphere. However, although they are inexpensive and easy to use (Yan & Ding, 2017), they offer limited viewing angles, which can be a drawback in public or crowded spaces (Hua et al., 2021). They are typically suitable for individual users and small organisations. Figures 2 and 3 exemplify art exhibitions that use 3D screens and projections. The first example (Figure 2) is a 360-degree cinematic experience of technicolour visuals accompanied by 3D audio, allowing audiences to encounter the spectacle of space science through AR. The second example (Figure 3) provides immersive experiences using 20,000-square-foot light and sound spectacular featuring two-story projections of Vincent Van Gogh's most compelling works.



Figure 2 Machine Memoirs: Space (Museums Association, 2021)

AR in the gallery context encompasses various activities that utilise individual digital devices to produce a sophisticated presentation for the user by blending the real scene observed with a virtual scene produced by the technology. Such devices augment the real scene with additional information, pictures, videos, and interactive graphics (Al-Duhaiman, 2020). However, self-guide AR implementations are expensive and require specific hardware, potentially restricting adoption. Additionally, such experiences may induce dizziness or nausea in some individuals (Onirix, 2023). Figure 4 illustrates how one can create an immersive digital experience using AR to bring the museum collections to life, showing how the National Museum of Wales created a ground-breaking new AR experience that combines area learning with AR, introducing a whole new dimension to the visitor experience. Visitors can see dinosaurs appear on their skeletal remains. Figure 4 shows how AR can be used to share works with the public and entice visitors back inside, with the National Gallery collaborating with the National Portrait Gallery, the Royal Academy of Arts and other organisations to create the Augmented Gallery, an app-accessed interactive walking trail of 20 historic and contemporary pieces visible by smartphone.



Figure 3 Van Gogh Immersive Experiences (Van Gogh, 2022)

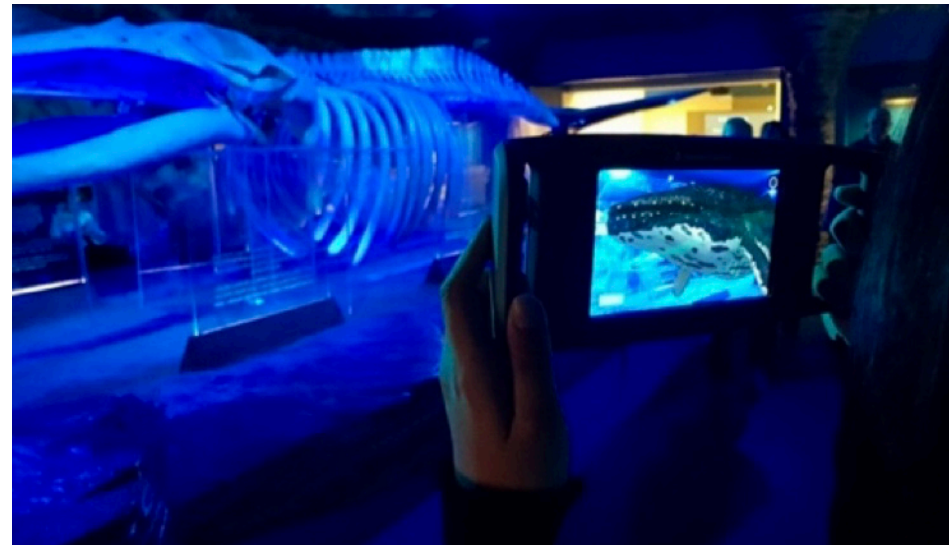


Figure 4 The Marine Gallery Experience (jam, 2023)

Finally, VR enables entirely virtual exploration of museum and gallery collections. Following the outbreak of COVID-19, museums and galleries began offering virtual tours to continue communicating with existing visitors and attract new ones (Resta et al., 2021). However, using VR may reduce social interaction, and some visitors may be reluctant to engage with the technology (Shehade & Stylianou-Lambert, 2020). Furthermore, it can be costly and require not only staff training but also additional staff to maintain the system and clean components such as headsets (Shehade & Stylianou-Lambert, 2020). Figure 6 demonstrates 'Mona Lisa: Beyond the Glass', the Louvre's first VR experience, which provides visitors an opportunity to discover details hidden from the naked eye in one of the world's most well-known works of art. Figure 6 shows a VR gallery opened in Singapore that offers visitors the opportunity to experience an exhilarating journey of touch, sight, and sound brought together using handheld controllers and headsets.



Figure 6 Mona Lisa Beyond the Glass (Louvre, 2019)

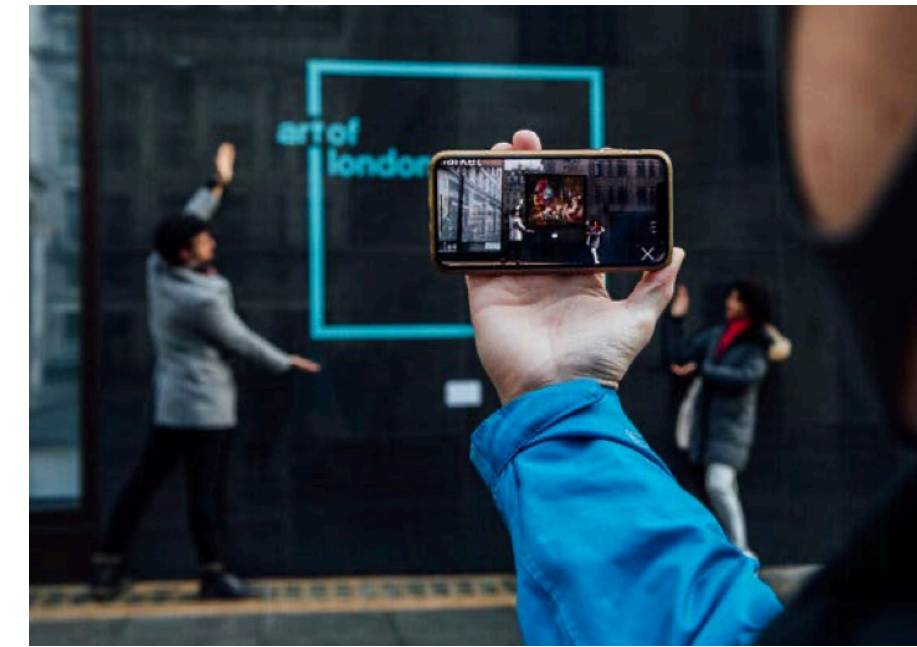


Figure 5 The Augmented Gallery (The New York Times, 2021)



**Figure 7 VR exhibition:
Hyperrealities
(Designboom, 2021)**

Beyond the differences in these technologies and the principal characteristics of each museum and gallery, immersive and interactive museum and gallery experiences exhibit both similarities and differences. The key similarities include targeting young generations (Future Museum, 2010; Ibrahim & Zainin, 2021) who are comfortable with trying new technologies (Vogels, 2019) and who may not have encountered traditional museums or galleries extensively (Dixon, 2011; Hürst et al., 2016). Additionally, the aim is typically to cultivate a culture in which individuals are open to using immersive and interactive technology (Magnelli et al., 2020).

The key differences concern the ultimate goal of museums and galleries. Museums primarily aim to preserve past cultures, often by presenting artworks or historical environments that may have been damaged or destroyed over time (Carrozzino & Bergamasco, 2010). This preservation effort is intended to safeguard these items for future generations to see and experience. Conversely, immersive and interactive gallery experience, especially those employing VR technologies, offer visitors the opportunity to immerse themselves in painting and the world created by the artist, enhancing their appreciation of art (Shehade & Stylianou-Lambert, 2020). Meanwhile, museums usually prioritise educating visitors through engaging and informative experiences that guide them on a journey. By contrast, galleries tend to focus more on providing hands-on, fun and interactive experiences that see visitors become active participants in the art. Galleries often make visitors feel that they are part of the art, playing a key role in shaping their experience (Magnelli et al., 2020).

However, Kidd and MacAvoy (2020) argued that there are more similarities than differences within the museums and galleries sector concerning the potential utilisation and benefits of employing immersive and interactive technologies to enhance the user experience. This research supports that argument, recognising that prioritising a better understanding of user expectations and requirements, along with the strategic implementation of suitable technologies, represents the foremost priority for both museums and galleries wanting to improve the user experiences in their exhibition contexts.

Drivers and barriers 驱动和障碍

Identifying key drivers and barriers proved crucial to identifying key considerations for enhancing and developing immersive and interactive technologies for museum and gallery experiences. This research examined similarities and differences between key stakeholders, with the identified drivers and barriers interconnected across varied subjects, including awareness, understanding, experiences, technologies, resources, and cooperation. For instance, the key drivers are (i) audiences' positive perceptions of immersive and interactive museum and gallery experiences (Hammady et al., 2020; Scottfleary, 2020), (ii) the creation of a comparative experience with multiple levels of interaction through new methods (Allen et al., 2020), and (iii) the development of opportunities for partnerships with artists, brands, and academic institutions (Ponsignon & Derbaix, 2020). These drivers also influence the research and development of such technologies to generate larger revenue streams for the industry (Blyth, 2020).

Meanwhile, the key barriers are (i) the cost and time-consuming nature of developing new technologies and spaces for exhibitions (Shehade & Stylianou-Lambert, 2020), (ii) the conservative perception of traditionalist audiences, which challenge the capacity of museum professionals to balance the needs of different visitors (Shehade & Stylianou-Lambert, 2020), and (iii) different levels of maturity in terms of using immersive and interactive technologies (Shehade & Stylianou-Lambert, 2020), which demands special training regarding handling and troubleshooting (Kidd & McAvoy, 2019).

Most stakeholders in the UK and China hold positive opinions regarding immersive and interactive technologies in the museum and gallery contexts. They believe these technologies can enhance exhibitions by enabling unique and interactive features. In particular, Chinese stakeholders view these technologies as valuable for boosting the educational aspect

of museum and gallery visits. Regarding requirements, stakeholders in both countries emphasised the importance of focusing on content development rather than the technology itself. UK stakeholders also highlighted two points: the use of technology for income generation in the future of museums and galleries and the importance of collaborations in technology-based initiatives. In terms of drivers, the main similarity identified is the role of immersive and interactive technologies themselves, along with people's awareness of these technologies, which facilitates enhanced museum and gallery experiences.

In terms of barriers, stakeholders in both countries encounter similar challenges related to funding issues and the differing pace of technological advancement between the technology sector and the museums and galleries sector, resulting in varying levels of understanding. However, UK stakeholders perceived audience preferences for various technologies as a barrier to the adoption of immersive and interactive technologies in museums and galleries, with Chinese stakeholders emphasising a predominant focus on developing these technologies specifically for the gaming sector rather than for cultural institutions like museums and galleries.

A positive perception of technology is considered an opportunity element in both countries, with government funding identified as a critical advantage in China. There is also a recognition of the educational impact of technology, with education departments encouraging the use of such technologies in museums and galleries. Nevertheless, there are concerns around maintaining the novelty of immersive and interactive experiences, striking a balance between commercial and curatorial aspects in the UK, and the lack of content impacting the broader adoption of these technologies in China.

Audience experiences in the UK and China

中英两国的观众体验

Evaluating immersive and interactive technologies in the museum and gallery contexts from the audience's perspective was critical to uncovering the core issues associated with enhancing user experience. Understanding both the similarities and differences in perspectives and the current experiences in both countries was valuable for identifying specific details of their main considerations, including perceptions, preferences and requirements.

Audiences in both the UK and China demonstrated high levels of awareness of the technologies and expressed a strong interest in AR and VR experiences during museum and gallery visits. However, an array of improvements are needed to meet their expectations, including providing clearer explanations of AR and VR content in different museum and gallery contexts, offering detailed instructions on using AR and VR devices, diversifying the range of experiences, and incorporating various immersive and interactive technologies into museum and gallery offerings.

UK and Chinese audiences have somewhat different experiences, particularly in terms of their perspectives on the key challenges they encountered. For example, UK audiences considered AR and VR content instructions the foremost hurdle, whereas Chinese audiences found the AR and VR devices themselves to be the primary obstacle. Furthermore, UK audiences highlighted the inconvenience of extended waiting lines, technology usage, faulty equipment, and technological obsolescence after three years. Meanwhile, Chinese audiences expressed concerns regarding hygiene, device comfort, and the redundancy of instructions as their principal issues.

4 INTERNATIONAL COLLABORATIONS BETWEEN THE UK AND CHINA

中英两国间的国际合作

The UK and China both demonstrate (i) a great recognition of the creative economy's pivotal role in overall economic development, (ii) sustained commitment to formulating policies and allocating funding to accelerate the growth of creative industries, and (iii) huge opportunities within creative industries. In the UK, notable prospects for collaboration with China can be found in cluster development and intangible investments in innovation, leveraging the country's robust creative industry landscape. Conversely, China's significant investments in cultural institutions and creative industries position it as a potentially lucrative market for the UK. However, several barriers to collaboration were identified. First, cultural differences and differences in work methodologies and approaches to relationship-building with personal connections are paramount in China, necessitating familiarity with Chinese business etiquette to establish such relationships effectively. Meanwhile, in the UK, professional relationships often prioritise efficiency and task-oriented communication. Second, there are technical challenges associated with data privacy and access restrictions – for instance, Google, along with many other websites, is inaccessible in China, with WeChat serving as the primary communication platform. Also, Chinese data privacy and cybersecurity standards often do not align with UK regulations. Finally, there are substantial financial and time costs associated with the translation and interpretation required by language barriers.

Stakeholders in both countries generally acknowledge the significance and advantages of international collaboration, particularly in terms of its impact. However, stakeholders from the UK asserted that current collaborations with China are predominantly one-way, attributing this to a perceived lack of contemporary arts and culture from China being shared in the UK. Nevertheless, stakeholders from both countries demonstrate similar perspectives on the drivers of collaboration, recognising the creative industry as a valuable avenue for international cooperation. Notably, UK museums and galleries acknowledged the importance of the Chinese market, and certain research funding initiatives actively promote and facilitate international collaborations.

Stakeholders experience challenges from different approaches to market regulations, regulatory frameworks, legal systems, intellectual property and copyright laws. They also highlight communication difficulties arising from linguistic disparities, cultural differences, and varying levels of understanding, awareness and perception around key aspects of collaborative projects. UK stakeholders particularly emphasised challenges related to capacity and funding for collaboration. While no similar opportunities were identified, UK stakeholders suggested potential future collaborations in museum and gallery education due to the UK's rich

history and well-established educational systems in this field. Furthermore, most stakeholders expressed interest in leveraging Shanghai's creative hub as a valuable resource, anticipating its ability to provide ongoing expertise on the ground, insights into China's policy and regulatory landscape, awareness of funding opportunities, and facilitation of partnerships.

Chinese stakeholders believe that digital platforms can significantly benefit international collaboration by reducing costs, travel time and other logistical complications. Although stakeholders from both countries are concerned about the difficulty of finding time to collaborate with international partners, they also report distinct challenges. Stakeholders from the UK have trouble finding new partners who possess an understanding of diverse cultures and are willing to embrace new technologies, while Chinese stakeholders express concern about slow progress in developing international collaborations, attributable to the limited number of individuals engaged in such efforts, leading to them advocating for more supportive governmental policies, recognising that the collaboration process is often influenced by systemic factors and market mechanisms.

UK and Chinese audiences both demonstrate a keen interest in the cultural exchange between the two countries, contending that immersive technologies can play a crucial role in enhancing cultural exchange in the museum and gallery sectors. Despite this enthusiasm, they voiced a need for increased opportunities to interact with various cultural exhibits from museums and galleries within their respective countries. They also emphasised the importance of working together collaboratively, such as by establishing international museums and galleries that operate on an international scale, to improve their cultural experiences. Furthermore, most UK and Chinese audiences who have experienced exhibitions featuring the other country's culture at museums and galleries feel the need for methods to explore the cultural content. This highlights a shared desire for increased accessibility and exposure to cultural diversity within museum and gallery settings. However, UK and Chinese audiences demonstrate contrasting preferences regarding the main aspect of their desired experience with the other country's content, with UK audiences preferring history-related content and Chinese audiences desiring insights into the arts and everyday life from UK-related exhibits.

5

STAKEHOLDER LANDSCAPE IN THE MUSEUMS AND GALLERIES SECTOR OF THE UK AND CHINA

中英两国博物馆和画廊领域的利益相关者格局

This research categorises the key stakeholders in the museums and galleries sector in the UK and Chinese contexts into six groups: (i) governments, (ii) policymakers and implementers, (iii) museums and galleries, (iv) creative businesses, (v) academic institutions, and (vi) audiences. These stakeholders are frequently identified as leading and supporting the development of immersive and interactive museum and gallery experiences and international collaboration between the UK and China. Each stakeholder group is responsible for diverse aspects and engages in both direct and indirect capacities. Table 1 summarises the key roles and responsibilities of each stakeholder.

Figures 8 and 9 depict the current stakeholder landscape for immersive and interactive museum and gallery experiences in the UK and China. Despite similarities in the roles and relationships between key stakeholders in the two countries, stakeholders sometimes assume slightly different roles and foster distinct relationships. For example, while the UK government encourages creative businesses to collaborate with universities, Chinese museums and galleries advocate for new technologies to the government and offer support to young artists within universities, with Chinese policymakers and implementers playing pivotal roles in providing funding to creative businesses. Additionally, UK universities prioritise showcasing the value of research for immersive and interactive experiences, with Chinese universities offering theoretical support to museums and galleries that utilise immersive and interactive technologies, forecast technology trends and audience preferences, and provide guidance leading to policy implementation.

Table 1 Current roles of key stakeholders

| | Key roles | |
|-------------------------------|---|---|
| | Immersive and interactive experience development | International collaboration |
| Governments | <ul style="list-style-type: none">Developing and implementing strategies and action plans for the growth of the creative industryAllocating budgets for developing immersive and interactive technologies and experiences | <ul style="list-style-type: none">Developing and implementing policies to facilitate international collaboration by establishing partnerships with other governmentsAllocating budgets for international collaborations |
| Policymakers and implementers | <ul style="list-style-type: none">Formulating and executing research support strategies and programmesEstablishing funding schemes | <ul style="list-style-type: none">Establishing initiatives for international collaboration projectsDesigning and implementing research support strategies and programmesProviding resources and funding to support partnerships |
| Museums and galleries | <ul style="list-style-type: none">Creating and delivering immersive and interactive experiencesConducting market research | <ul style="list-style-type: none">Establishing collaborative exhibitions through the development of diverse cultural contentProviding resources and funding for academic research |
| Creative businesses | <ul style="list-style-type: none">Designing immersive and interactive experiences tailored to specific needs and requirementsUndertaking market research | <ul style="list-style-type: none">Creating immersive and interactive experiences for cultural contentOffering opportunities for international collaboration and seeking out new partnersConducting international collaboration projects |
| Universities | <ul style="list-style-type: none">Conducting market researchDemonstrating the value of immersive and interactive experiences | <ul style="list-style-type: none">Developing and implementing international collaborative research projectsSupporting museums in engaging target audiences and communicating effectivelyFacilitating interactive exchanges between academics |
| Audiences | <ul style="list-style-type: none">Providing support for market researchAssisting in enhancing immersive and interactive experiencesSupporting the demonstration of the value of immersive and interactive experiences | <ul style="list-style-type: none">Providing support for international collaboration researchAssisting in the development of immersive and interactive experiences for cultural contentOffering feedback for international collaborative exhibitions |

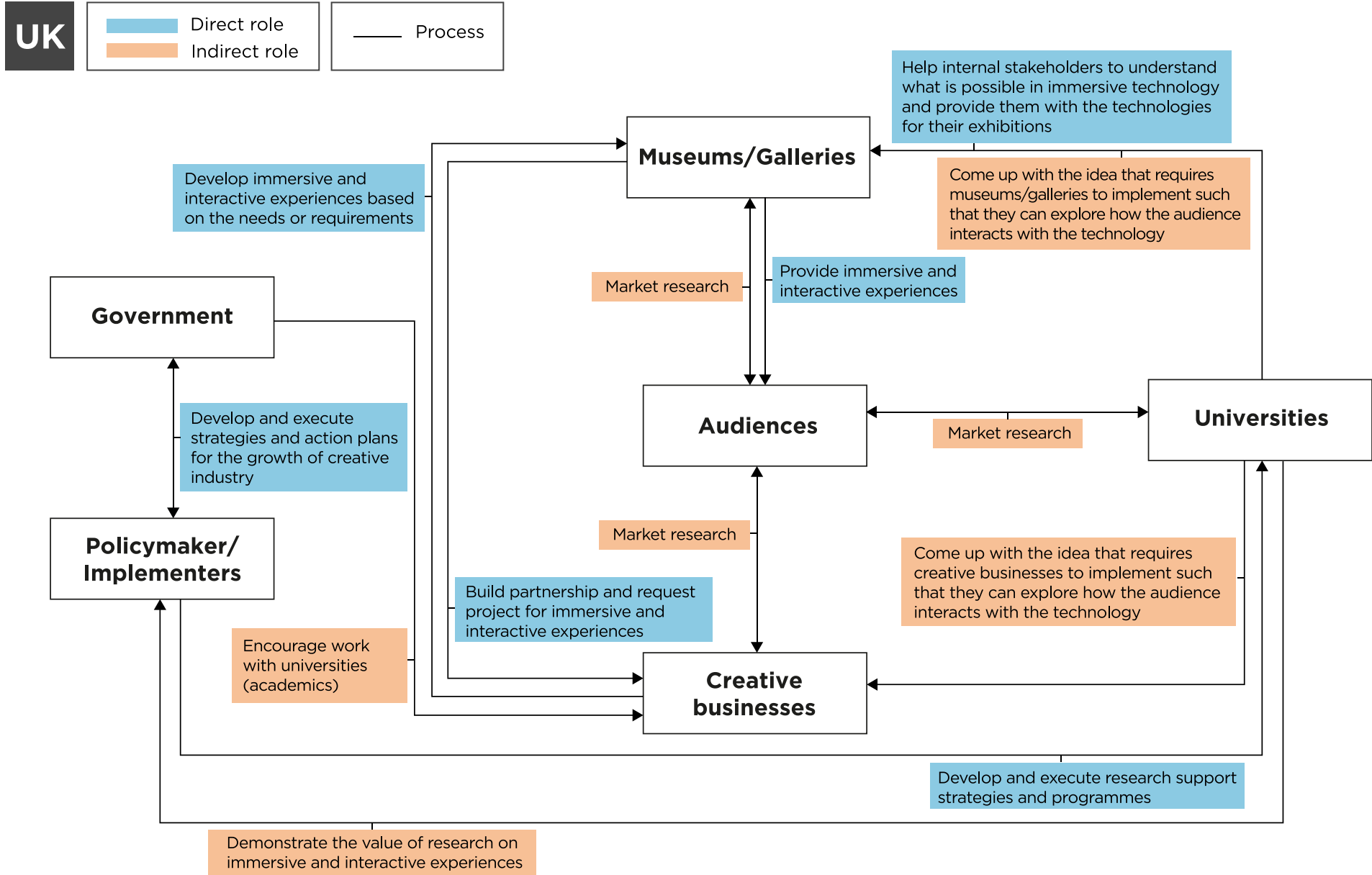
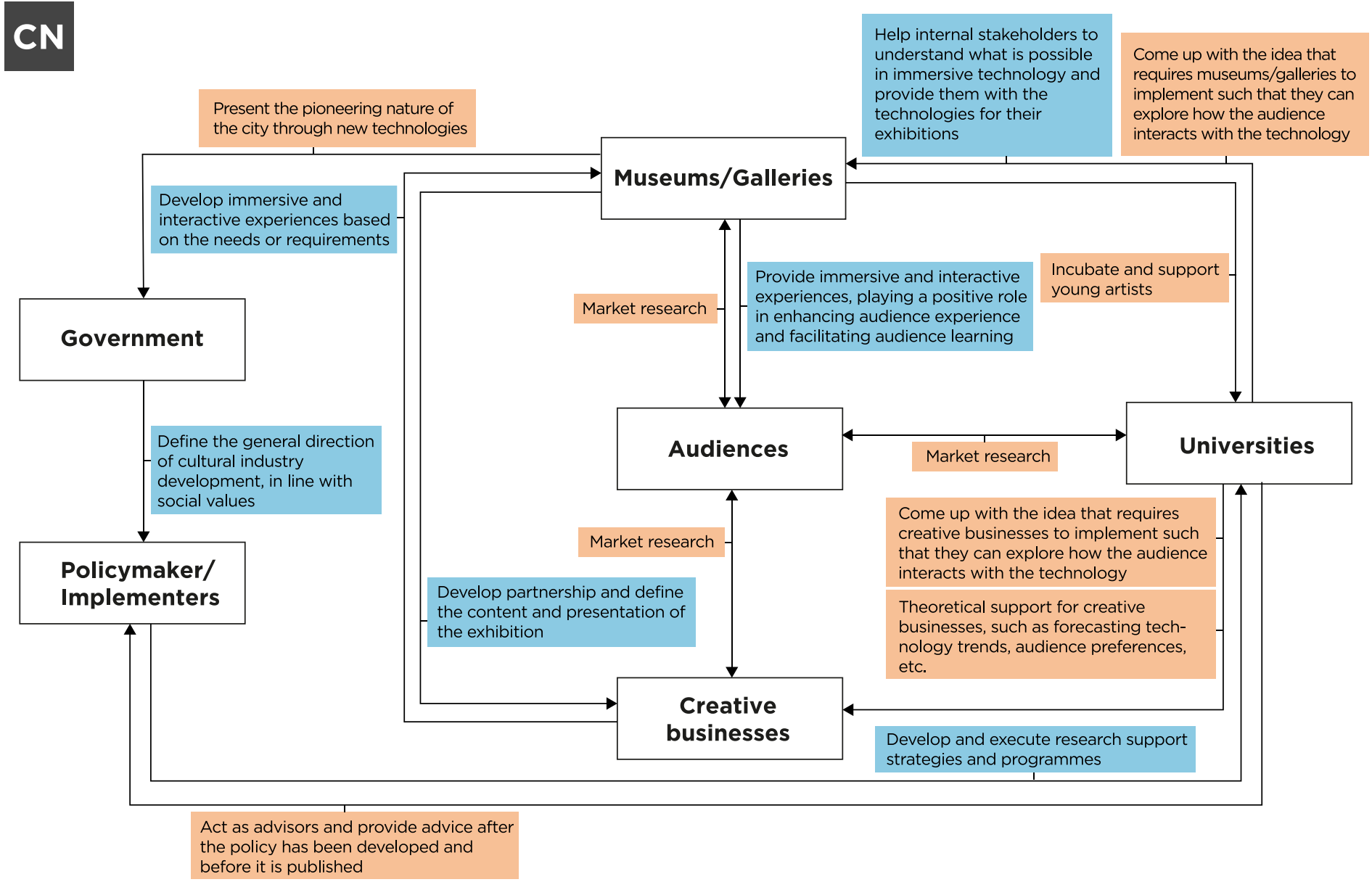


Figure 8 Key stakeholder roles for immersive and interactive museum and gallery experiences



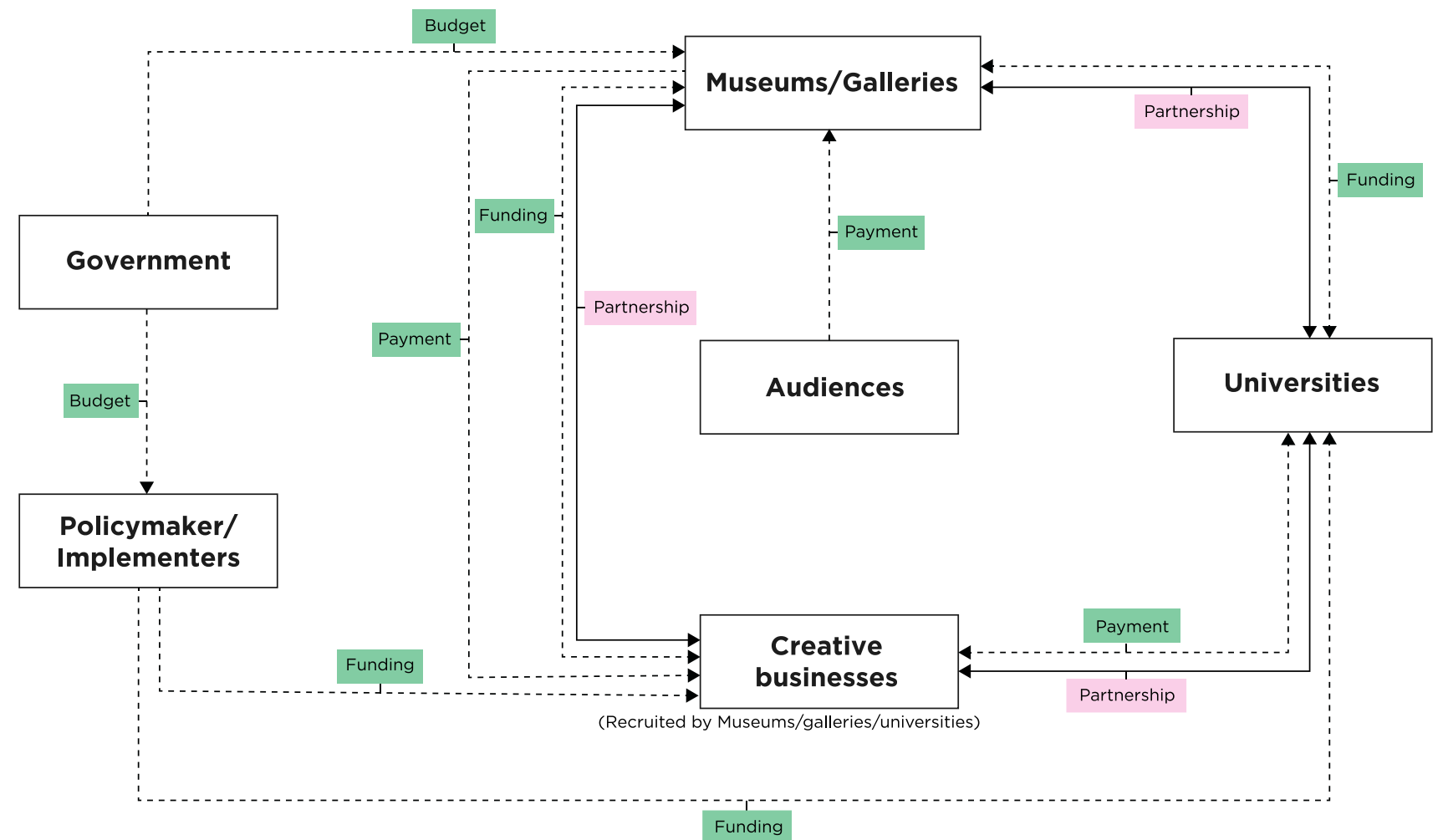
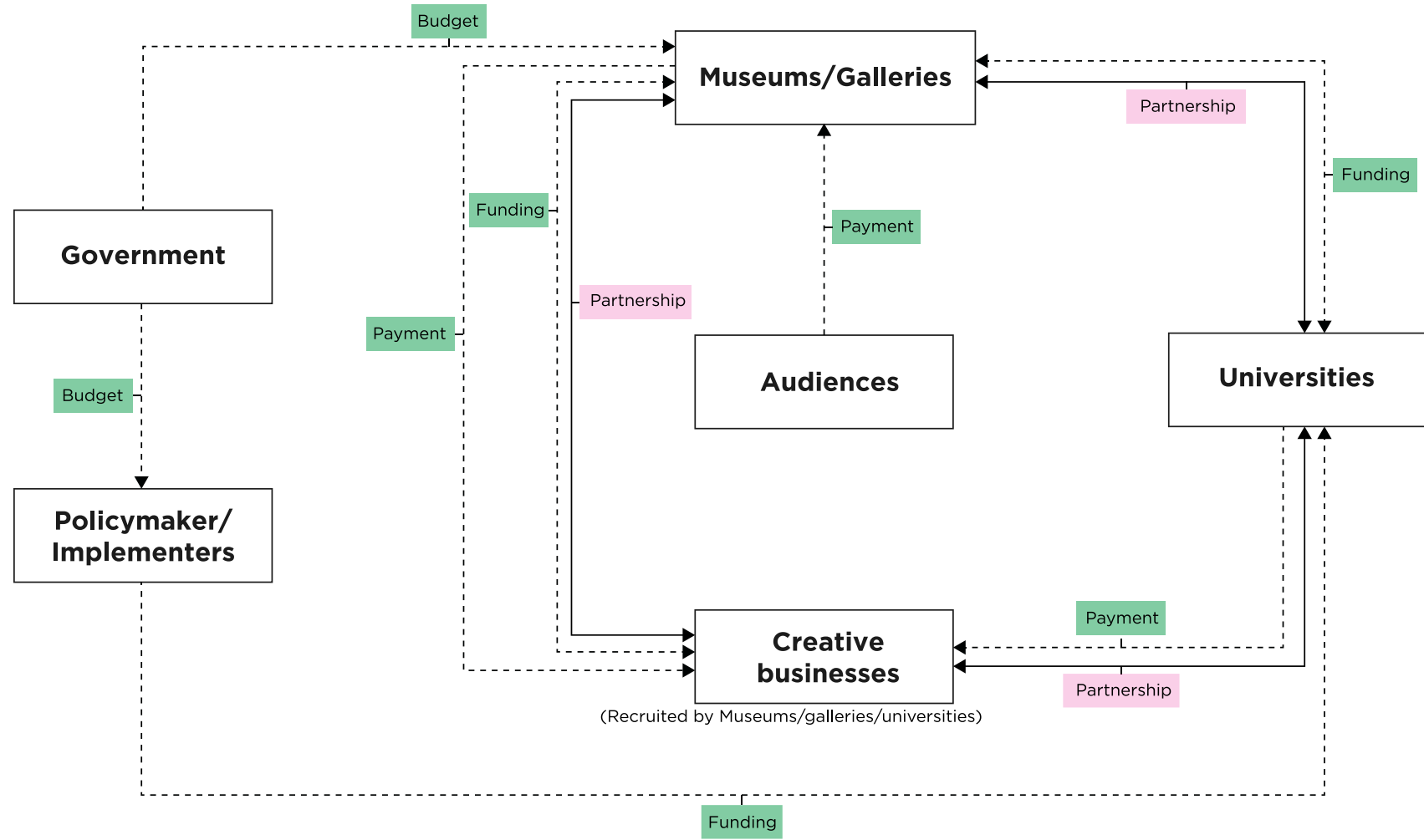


Figure 9 Key stakeholder relationships for immersive and interactive museum and gallery experiences

Figures 10 and 11 illustrate the stakeholder landscape for international collaboration between the UK and China. Again, the key stakeholders play similar roles and maintain comparable relationships, albeit with some exceptions. For instance, the Chinese government delegates international collaboration projects to museums and galleries, whereas UK museums and galleries provide resources and space to test research ideas from universities. Conversely, museums and galleries in China launch programmes to support young curators. Elsewhere, UK universities support museums and galleries in engaging target audiences and tailoring communication to resonate with them, while Chinese universities offer technical assistance for multimedia exhibition presentations. Regarding relationships and financial resources, the association between museums and galleries and creative businesses in the UK typically relies on contractual agreements, with museums and galleries often paying for creative businesses. However, in China, there are instances where partnerships are forged between museums and galleries and universities to jointly develop funding initiatives.

By exploring the stakeholder landscape for the development of immersive and interactive museum and gallery experiences and international collaboration, this research identified two critical issues. First, the stakeholders (including museums and galleries, creative businesses, and universities) in both countries heavily rely on government financial resources, and governments, policymakers and implementers, and museums and galleries lack international funding schemes and programmes to support international collaboration between the two countries. This underscores the necessity of securing and developing more financial resources and support across private and public sectors, as well as developing income generation models. Second, the stakeholders – particularly museums and galleries, creative businesses, and universities – often form partnerships for specific projects only. Consequently, there is a scarcity of partnerships that involve multiple stakeholders collaborating on a broader scale. This highlights the importance of improving stakeholders’ understanding of their roles and establishing collaborative networks to efficiently foster an environment conducive to developing multilateral partnerships between stakeholders.

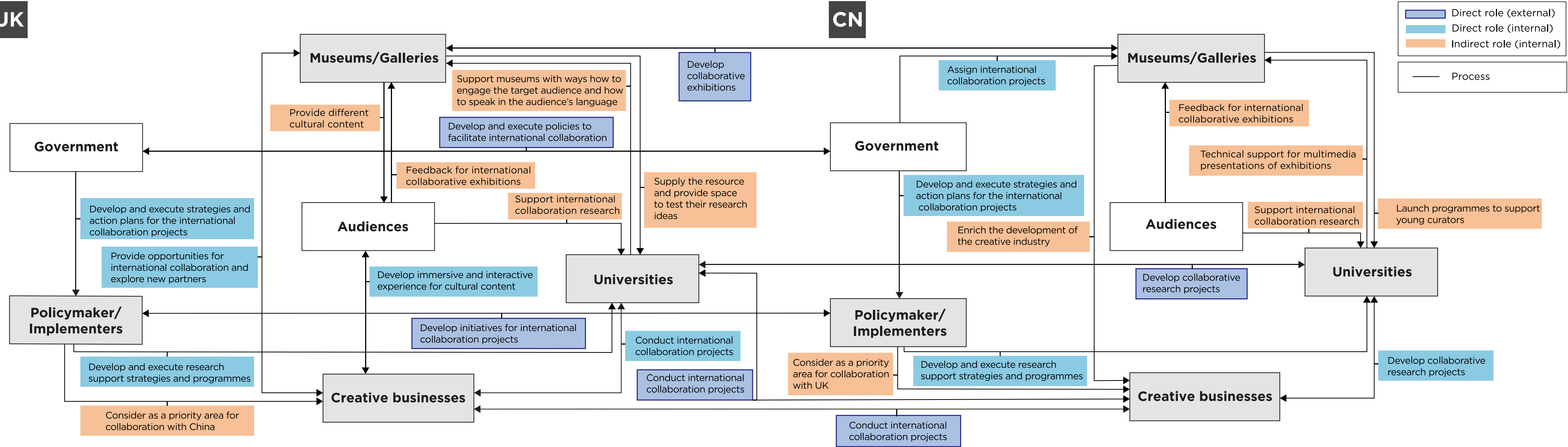


Figure 10 Key stakeholder roles for international collaboration between the UK and China

UK

CN

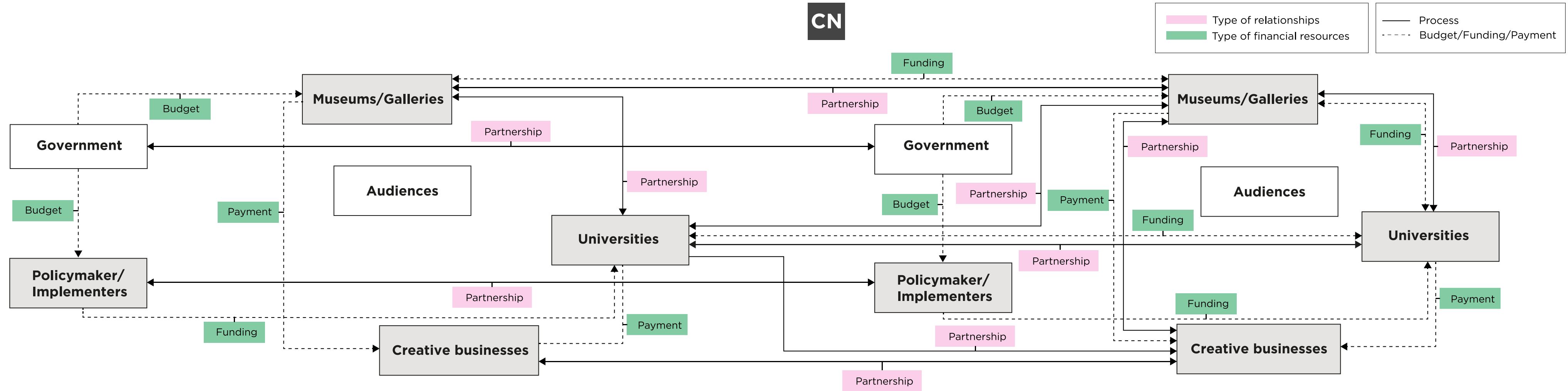


Figure 11 Key stakeholder relationships for international collaboration between the UK and China

6 STRATEGIC FRAMEWORK FOR LONG-TERM RD&I COLLABORATION

长期RD&I合作的战略框架

Crafting the framework involved considering the strategic elements of stakeholder roles and relationships and operational components encompassing required implementations and stakeholder and audience engagement. The process aimed to (i) enhance immersive and interactive museum and gallery experiences and (ii) foster international RD&I collaboration between the UK and China.

To enhance immersive and interactive museum and gallery experiences, the framework encourages:

- Emphasising the critical and distinctive roles of each stakeholder;
- Enhancing understanding of audience needs to address diverse audience types and requirements through tailored information and reflect their interests and knowledge levels, a process that also entails strengthening credibility and exploring perspectives on knowledge transfer;
- Implementing interactive educational methods, including collaboration with industries in research projects;
- Establishing resource platforms to share artefacts, information, knowledge and experiences between UK and Chinese museums and galleries;
- Striking a balance between physical and digital experiences (on-site/online), focusing on the value added through the experience rather than rushing to integrate technology, and implementing diverse engagement methods;
- Increasing access to immersive and interactive technologies to familiarise people with such technologies;
- Providing continuous funding to secure further development of immersive and interactive experiences.

For international RD&I collaboration between the UK and China, the framework advocates:

- Showcasing collaborative cases to promote international collaboration, aiming to share the experience and retain previous collaborators from both the UK and China;
- Exploring opportunities with existing funding schemes that require partners from other countries, which involves developing long-term funding strategies, securing follow-up funding, establishing match funding mechanisms, and designing future funding availability;
- Creating opportunities for students to collaborate with external partners, including industry, particularly from an international perspective;
- Viewing research as a means to generate economic value to sustain ongoing and future R&D initiatives;
- Establishing a platform for listening to other stakeholders' voices across different sectors and exploring further opportunities;
- Building multilateral connections between stakeholders from different sectors;
- Establishing partnerships from the policy and funding development stage in both countries.

Drawing on the key insights extracted, this research developed a strategic framework for the future of UK–China RD&I collaboration in the museums and galleries sector. The framework features six essential elements, three core qualities, and six key stakeholders (Figure 12).

- Main goal
- Key considerations
- Essential elements
- ➡ Core qualities
- Key stakeholders

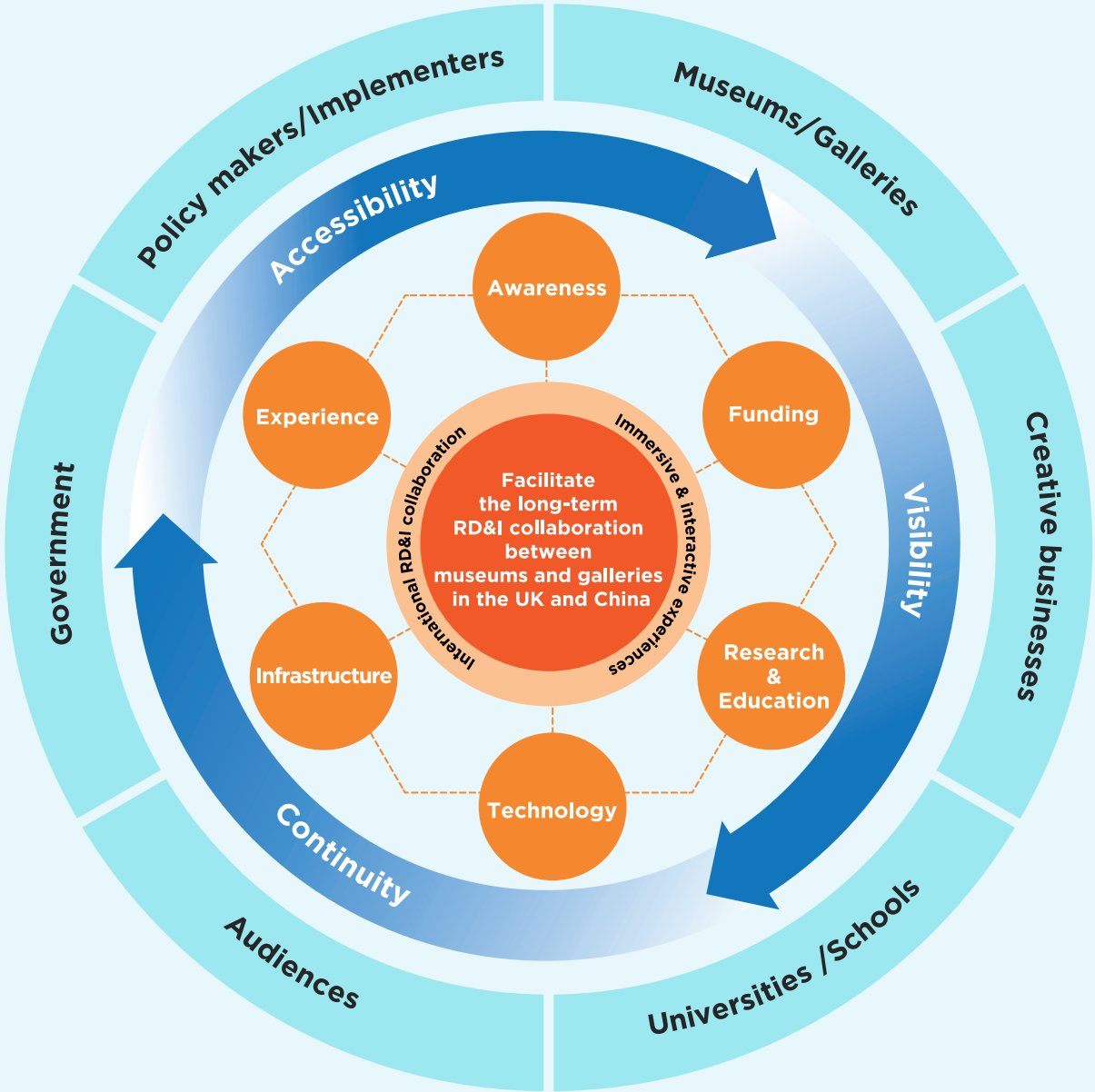


Figure 12 Strategic framework for the future of UK-China RD&I collaboration in the Museums and Galleries sector

The six essential elements for long-term RD&I collaboration between museums and galleries in the UK and China are awareness, experience, funding, research and education, technology and infrastructure.

Awareness plays a significant role in influencing key stakeholders and other essential elements. The level of stakeholder awareness regarding immersive and interactive experiences and international collaboration can greatly impact the extent and diversity of their roles. Ultimately, it determines the maturity of the other essential elements.

- For immersive and interactive experience, this element facilitates easy access for individuals to experiment, learn, and interact with immersive and interactive technologies both within and outside museums and galleries.
- For international collaboration, this enables sharing experiences of collaborations and highlighting successful collaborations to a wider audience, fostering further international collaboration efforts.

Experience is essential for shaping the future trajectory of immersive and interactive experiences and international collaboration. Because it is closely tied to awareness, the degree of satisfaction with experience influences the extent and type of awareness.

- For immersive and interactive experiences, this means (i) providing segmented experiences tailored to meet the specific needs and interests of the target audiences and (ii) offering opportunities for individuals to learn about immersive and interactive technologies and their applications.
- For international collaboration, this means (i) showcasing examples to promote international collaborations, encouraging experience-sharing and retaining previous collaborators from both the UK and China, (ii) creating additional opportunities for staff exchange programmes to facilitate learning from international partners and (iii) exploring the involvement of international companies as supporters of the collaborative endeavours.

Funding serves as a crucial element for developing and enhancing other components. Securing sustainable funding is considered both a key driver and a barrier to advancing immersive and interactive experiences and international collaboration.

- For immersive and interactive experiences, this element enables (i) exploring additional opportunities for partnership development and (ii) creating effective business models to generate bigger economic values through strategic utilisation of immersive and interactive technologies.
- For international collaboration, this element enables securing long-term and follow-up funds to sustain collaborative efforts.

Research & education significantly impact the development of other essential elements and play a critical role in shaping future immersive and interactive experiences and international collaboration. They provide guidance to key stakeholders on what aspects should be considered, developed, or enhanced.

- For immersive and interactive experiences, this element sees (i) stakeholders collaborating with creative businesses (i.e. industry) for more practical research projects, and (ii) universities offering more interactive educational opportunities to other stakeholders who may be interested in immersive and interactive experiences and international collaboration.
- For international collaboration, this element enables the development and provision of opportunities for students from the UK and China to collaborate, allowing for new insights.

Technology is a pivotal component of both immersive and interactive experiences and international collaboration. It enables the development of immersive and interactive experiences and encourages communication and cooperation between stakeholders from different countries.

- For immersive and interactive experiences, this element encourages (i) utilising technologies to create high-quality immersive and interactive content and (ii) offering a balance between physical and digital experiences to engage audiences both on-site and online.
- For international collaboration, this element encourages (i) leveraging technology to explore market and user needs and (ii) educating potential parents to develop a better understanding of new technologies.

Infrastructure is vital, providing physical and digital spaces for stakeholders to convene, share knowledge, insights and experiences, and explore collaboration opportunities.

- For immersive and interactive experiences, this means exploring potential stakeholders to gather perspectives from various sectors.
- For international collaboration, this means building a resource platform to facilitate exchange and connections between stakeholders.

Meanwhile, the three core qualities that should be incorporated into the development of the essential elements are accessibility, visibility, and continuity:



Accessibility

Accessibility is ultimately related to the **maturity of the essential elements**. Because if the elements are easy to access by key stakeholders, stakeholders can have more opportunities to observe and evaluate the elements in order to develop more practical solutions that can be used to minimise barriers and challenges as well as maximise drivers and opportunities.



Visibility

Visibility is about **solid planning and direction** for the development of the essential elements; It brings confidence about the future. Via visibility of the elements, stakeholders can observe the situation and environment related to the essential elements and develop practicals to maximise the impact and benefits of the elements.



Continuity

Continuity is related to the **evolution of the essential elements**. An optimised environment/system to operate the elements can be established by continuously repeating evaluation and improvement/development of the elements.

Table 2 Recommendations for the role of key stakeholders

| | | Key roles | |
|-------------------------------|-------------|--|---|
| | | Immersive and interactive experience development | International collaboration |
| Governments | Current | <ul style="list-style-type: none">Allocating budgets for developing immersive and interactive technologies and experiences | <ul style="list-style-type: none">N/A |
| | Recommended | <ul style="list-style-type: none">Formulating and implementing strategies and action plans for the growth of the creative industryOffering support to creative businesses for the development of immersive and interactive technologiesProviding financial assistance to universities for research on immersive and interactive technologiesEncouraging creative businesses to collaborate with academics | <ul style="list-style-type: none">Formulating and implementing strategies and action plans for international collaboration projectsOffering financial support to universities for the development and execution of research on international collaboration |
| Policymakers and implementers | Current | <ul style="list-style-type: none">Formulating and executing research support strategies and programmesEstablishing funding schemes | <ul style="list-style-type: none">Establishing initiatives for international collaboration projectsDesigning and implementing research support strategies and programmes |
| | Recommended | <ul style="list-style-type: none">Advocating to government for supporting the development of immersive and interactive experiencesEstablishing connections with other key stakeholdersIdentifying new stakeholders for engagement with entities including museums/galleries and creative businessesInvestigating audience preferences for immersive and interactive technologies | <ul style="list-style-type: none">Advocating to government for supporting collaborative exhibitionsEstablishing connections between other key stakeholdersOffering financial support to universities for the development and execution of research on international collaborationInvestigating audience preferences for cultural exchange |
| Museums and galleries | Current | <ul style="list-style-type: none">Creating and delivering immersive and interactive experiencesConducting market research | <ul style="list-style-type: none">Establishing collaborative exhibitions through the development of diverse cultural content |
| | Recommended | <ul style="list-style-type: none">Investigating audience preferences for immersive and interactive technologiesDelivering more immersive and interactive experiencesAdvocating to government, policymakers and implementers for supporting the development of immersive and interactive experiencesIdentifying and engaging with new partnersEstablishing connections with research communities | <ul style="list-style-type: none">Investigating audience preferences for cultural exchangeOffering more international collaborative exhibitionsAdvocating to government, policymakers and implementers for supporting collaborative exhibitionsIdentifying and engaging with new partnersEstablishing connections with research communities |

| | | Key roles | |
|---------------------|-------------|---|---|
| | | Immersive and interactive experience development | International collaboration |
| Creative businesses | Current | <ul style="list-style-type: none">Designing immersive and interactive experiences tailored to specific needs and requirementsUndertaking market research | <ul style="list-style-type: none">Creating immersive and interactive experiences for cultural contentOffering opportunities for international collaboration and seeking out new partnersConducting international collaboration projects |
| | Recommended | <ul style="list-style-type: none">Investigating audience preferences for immersive and interactive technologiesEnhancing the experience of working with industries and academicsAdvocating to government, policymakers and implementers for supporting the development of immersive and interactive experiences | <ul style="list-style-type: none">Investigating audience preferences for cultural exchange |
| Universities | Current | <ul style="list-style-type: none">Conducting market researchDemonstrating the value of immersive and interactive experiences | <ul style="list-style-type: none">Developing and implementing international collaborative research projectsSupporting museums in engaging target audiences and communicating effectivelyFacilitating interactive exchanges between academics |
| | Recommended | <ul style="list-style-type: none">Investigating audience preferences for immersive and interactive technologiesIncreasing awareness and engaging audiences in immersive and interactive experiencesFostering connections between museums and galleries and creative businessesActing as a hub to represent the voice of stakeholdersAssisting museums and galleries to identify new stakeholders and collaborating with creative businesses | <ul style="list-style-type: none">Investigating audience preferences for cultural exchangeActing as a hub to represent the voice of stakeholders |
| Audiences | Current | <ul style="list-style-type: none">Providing support for market researchSupporting the demonstration of the value of immersive and interactive experiences | <ul style="list-style-type: none">Providing support for international collaboration researchAssisting in the development of immersive and interactive experiences for cultural contentOffering feedback for international collaborative exhibitions |
| | Recommended | <ul style="list-style-type: none">Assisting government, policymakers and implementers in developing and implementing strategies and action plans for immersive and interactive technologies | <ul style="list-style-type: none">Assisting government, policymakers and implementers in developing and implementing strategies and action plans for international collaborationSupporting the demonstration of the value of international collaboration |

7 CONCLUSION

结论

The research aimed to develop a strategic framework to foster long-term RD&I collaboration between museums and galleries in the UK and China, with a specific focus on immersive and interactive museum and gallery experiences. The study revealed that the museums and galleries sector widely employ immersive and interactive technologies to attract and engage audiences, particularly the younger generation, through emotional engagement, social experiences, cultural exchange, embodied and spatial interaction and knowledge dissemination. Although most museum and gallery audiences and stakeholders expressed positive sentiments towards immersive and interactive technologies for museum and gallery experiences and international collaboration, a notable reliance on government funding is observed by most stakeholders. The absence of strategic, multilateral and continuous partnerships among stakeholders was also evident. Furthermore, financial resources and partnership issues impacted international collaboration between the UK and China. Despite the positive views of immersive and interactive technologies for cultural exchange between the UK and China, for most audience members, practical experience with such technologies for cultural exchange remained minimal.

The strategic framework focuses on optimising potential drivers and opportunities while minimising the barriers and challenges that currently exist for collaboration between museums and galleries in the UK and

China. This involves comprehending and implementing key considerations, including essential elements, core qualities, and the roles and relationships of key stakeholders.

This research produces significant benefits for the museums and galleries sectors and the broader creative industries in the UK and China. In terms of practical contributions, the findings can aid in understanding each other's markets, fostering the establishment and expansion of partnerships, and helping creative businesses from both countries to extend their operations and networks in the other countries. Policymakers and government bodies can also benefit from developing methods to encourage and monitor international collaborative activities. Furthermore, UK and Chinese audiences interested in transnational cultural exchange can broaden their knowledge and interest. This research is also valuable for research funders interested in transnational RD&I collaborations focused on immersive technologies in galleries and museums, who can also benefit from this research.

For academia, the research represents a solid foundation for future studies investigating the creative industries of both countries. It offers in-depth explorations of audience and stakeholder awareness, interests and preferences regarding immersive and interactive museum and gallery experiences, as well as insights regarding international collaboration

between the UK and China. In particular, the research enriches theoretical knowledge by identifying the essential elements and core qualities necessary to facilitate long-term RD&I collaboration between museums and galleries in the two countries. These findings can serve as foundational pillars for theoretical frameworks in future research focusing on international RD&I collaboration within the museums and galleries sector and the broader creative industry.

Building upon this study's key findings, further research could explore strategic and practical aspects for crafting international collaborative policies. This may entail the development of funding schemes, initiatives and programmes between the UK and China. Such endeavours could effectively aid practitioners and scholars in addressing the constraints identified in this study and mitigating disparities between the two countries. Additionally, identifying country contexts conducive to facilitating international collaborative activities may yield valuable contextual data concerning the essential factors associated with nurturing such collaborations. Exploring possibilities to apply these insights in a global context beyond the UK and China could further enhance understanding and implementation of international collaborative initiatives worldwide.

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Framework for the UK-China future RD&I collaboration

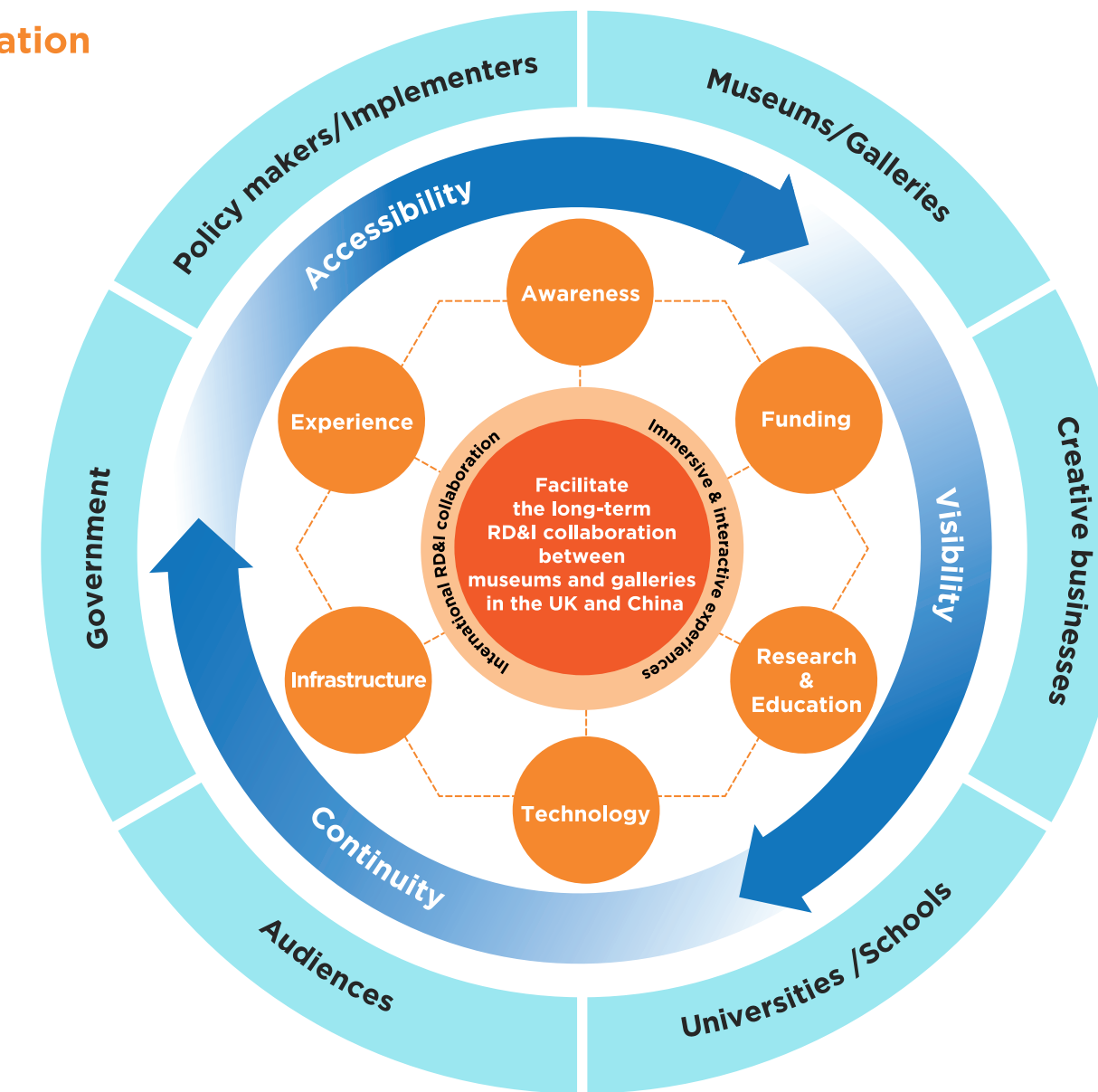
01

Overview of the framework for the UK-China future RD&I collaboration

This overview gives a brief of the mechanism of the framework, by addressing the four critical questions:

- (i) What is the main goal of the framework?
- (ii) What should be primarily considered to achieve the main goal?
- (iii) What essential elements should be considered?
- (iv) What should be considered in developing the essential elements?
- (v) Who should be involved in developing the essential elements?

- Main goal
- Key considerations
- Essential elements
- ➔ Core qualities
- Key stakeholders



02 – Essential elements; required implementations for the elements

- 1 Immersive & interactive experiences
- 2 International collaboration

| | Characteristics of the elements | Considerations for the elements |
|------------|---|--|
| Awareness | Awareness affects key stakeholders and other essential elements. Depending on the level of stakeholder awareness of immersive & interactive experiences and international collaboration, the roles of stakeholders may be limited or varied; It ultimately determines the maturity of the other essential elements. | <div>1 It is required to provide easy access to stakeholders to try, learn, and interact with immersive technologies in and outside of museums and galleries</div> <div>2 It is required to share experiences of collaboration and showcase successful collaborations to a wider audience</div> |
| Experience | Experience guides the future directions for the immersive & interactive experience and international collaboration. Because it is interrelated with awareness; the degree of satisfaction toward experience determines the level and type of awareness. | <div>1 It is required to (I) provide segmented experiences considering target audience needs and interests, and (ii) give opportunities to learn about immersive & interactive technologies, such as providing video tutorials via museums/galleries apps or websites<div><div>UK: (i) Focus on the added value of the experience; balancing between technology and experience, and (ii) Develop modular experiences that can be enjoyed by all categories</div><div>CN: (i) Deeply integrate technology and collection content, and (ii) Consider different technical characteristics providing the envisioned exhibition experience</div></div></div> <div>2 It is required to (i) more showcase examples to promote international collaborations in order to share the experience and try to retain previous collaborators both from UK and China, (ii) develop more opportunities for staff exchange to learn from international partners and, (iii) International companies could play a key role in supporting collaborations</div> |
| Funding | Funding is the crucial element that is utilised in developing or improving other elements. Securing sustainable funding is considered a key driver and barrier for immersive & interactive experiences and international collaboration. | <div>1 It is required to (i) explore more opportunities for partnership development, and (ii) develop an effective business model to generate income using the immersive & interactive technologies<div><div>UK: (i) Develop mixed funding (cultural institutions & research councils), and (ii) Produce content that can be scaled and proposed in multiple occasions/-locations/museums & galleries</div><div>CN: (i) Provide equipment resources by multinational corporations, (ii) Secure financial support from the private sector, and (iii) Explore a more standardised industrial chain/business cooperation model</div></div></div> <div>2 It is required to securing long-term and follow-up fund<div><div>UK: (i) Develop an international funding scheme together for the collaboration, (ii) Provide match funding and in-kind contributions, (iii) Develop partnership with a particular research direction, and (iv) Consider collaborating with content creators to develop cultural content that appeals to the general public</div><div>CN: (i) Develop foundation sponsorship by improving the role of foundations and artist estate management committees, and (ii) Develop domestic fund support for exhibition research</div></div></div> |

| | Characteristics of the elements | Considerations for the elements |
|----------------------|--|--|
| Research & Education | Research & Education affect the development of other essential elements and for future immersive & interactive experiences and international collaboration. They guide key stakeholders to what should be considered, developed or improved for immersive & interactive experiences and international collaboration. | <div>1 UK: (i) Connect with creative businesses (industry) for research projects, and (ii) Provide more interactive education</div> <div>2 It is required to develop and provide an opportunity that students from the UK and China can collaborate in order to gather new insights<div><div>UK: (i) Develop an income generation model to continually support the new RD & I research, (ii) Utilise relevant technologies in alignment with STEM/STEAM education, and (iii) Develop opportunities for the students to work with external partners</div><div>CN: (i) Develop an exact and Interoperable standard for immersive and interactive both industrially and academically, (ii) Build a platform to share resources between museums and galleries in the UK and Chin, and (iii) Increase interdisciplinary opportunities for more comparative studies</div></div></div> |
| Technology | Technology is a key to immersive & interactive experiences and international collaboration. It allows the development of immersive & interactive experiences and communication and cooperation between stakeholders in different countries. | <div>1 It is required to use technologies to (i) develop better immersive and interactive experiences by creating high-qualified content, and (ii) make a balance between a physical and digital experiences (audience engagement in onsite & online)</div> <div>2 UK: (i) Explore museums/galleries and market needs on technologies, and (ii) Educate potential partners to develop a better understanding of new technologies<div>CN: Develop a deep understanding of the user experience in exhibitions</div></div> |
| Infrastructure | Infrastructure, such as the Creative Hub in Shanghai providing physical and digital space is important in terms of allowing stakeholders to meet each other to share knowledge, insights and experience and explore the potential for work together. | <div>1 + 2 It is required to explore potential stakeholders to hear voice from different sectors<div><div>UK: Build more creative hubs in big cities in the UK and China</div><div>CN: (i) Build a resource platform between the UK and Chinese governments to help museums and galleries sectors to exchange and connect, and (ii) Open channels for artists and international collaboration</div></div></div> |

03 – Stakeholders’ key responsibilities for the essential element development

1 Immersive and interactive experiences

| Element | Key player | Responsibilities | Who should be involved |
|------------|----------------------|---|--|
| Awareness | Museums/Galleries | <ul style="list-style-type: none">Develop audience engagement via onsite and online;<ul style="list-style-type: none">Provide very simple experiences (for free) at the entrance of the museums/galleries to let the audience can get used to immersive and interactive technologiesProvide opportunities to learn about immersive and interactive experiences by providing video tutorials via museums/galleries apps or websites | <ul style="list-style-type: none">Creative businessesUniversities/Schools |
| | Universities/Schools | <ul style="list-style-type: none">Conduct more research projects to explore successful cases of museums/galleries immersive and interactive experiences, especially focusing on cultural and historical aspects and user preferences (i.e. commercial needs) | <ul style="list-style-type: none">Creative businessesMuseums/galleriesAudiences |
| | Creative businesses | <ul style="list-style-type: none">Develop a deeper understanding of audiences (needs and interests)Develop a greater collaboration with museums/galleries and universities for content development | <ul style="list-style-type: none">UniversitiesMuseums/galleriesAudiences |
| Experience | Museums/Galleries | <ul style="list-style-type: none">Provide segmented experiences considering target audience needs and interestsDevelop a deeper understanding of audiences (needs and interests) | <ul style="list-style-type: none">Creative businessesUniversities/SchoolsAudiences |
| | Creative businesses | <ul style="list-style-type: none">Develop a deeper understanding of audiences (needs and interests)Focus on the added value of the experiences by integrating technology and collection content (i.e. balancing between technology and experience)Develop modular experiences that all categories can enjoyDevelop standardised technologies (or devices) with better user experience | <ul style="list-style-type: none">Museums/galleriesUniversities/SchoolsAudiences |
| | Universities/Schools | <ul style="list-style-type: none">Explore audience needs and interests in immersive and interactive experiencesSupport museums/galleries to engage the target audience by speaking in the audience’s language | <ul style="list-style-type: none">Museums/galleriesCreative businessesAudiences |

| Element | Key player | Responsibilities | Who should be involved |
|----------------------|---------------------------|---|--|
| Funding | Government | <ul style="list-style-type: none">Develop a mixed funding schemeEncourage partnership development between key stakeholders (e.g. museums/galleries, creative businesses and universities) to develop immersive and interactive experiences | <ul style="list-style-type: none">Policymakers/ImplementersCreative businessesMuseums/GalleriesUniversities/Schools |
| | Policymakers/Implementers | <ul style="list-style-type: none">Develop a mixed funding schemeEncourage partnership development between key stakeholders (e.g. museums/galleries, creative businesses and universities) to develop immersive and interactive experiences | <ul style="list-style-type: none">GovernmentsCreative businessesMuseums/GalleriesUniversities/Schools |
| | Museums/Galleries | <ul style="list-style-type: none">Develop partnership with creative businesses and universitiesBuild a business model to generate income by providing the immersive and interactive experiences | <ul style="list-style-type: none">Creative businessesUniversities/Schools |
| Research & Education | Universities/Schools | <ul style="list-style-type: none">Conduct museums/galleries visitor studies and culture segments (e.g. seeking new knowledge, self-expression, stimulating ideas, enrichment, etc.)Develop an opportunities that students can work with external partnersEducate internal stakeholders in museums/galleries to enhance the understanding of immersive and interactive experiencesLink up between creative businesses and museums/galleries | <ul style="list-style-type: none">Museums/GalleriesCreative businessesUniversities/Schools |
| | Creative businesses | <ul style="list-style-type: none">Develop opportunities for the students to work in practiceSupport universities to conduct practical research on immersive and interactive experiences | <ul style="list-style-type: none">Museums/GalleriesUniversities/Schools |
| | Museums/Galleries | <ul style="list-style-type: none">Build a platform to share resources between museums/galleries in the UK and ChinaSupport universities and creative businesses to conduct practical research on immersive and interactive experiencesDevelop an income generation model to continually support the new RD&I research | <ul style="list-style-type: none">Museums/GalleriesCreative businessesUniversities/Schools |

| Element | Key player | Responsibilities | Who should be involved |
|----------------|-------------------------|---|---|
| Technology | Creative businesses | <ul style="list-style-type: none">Seek greater stakeholder involvement in technology developmentExplore museums/galleries and market needs on technologiesDevelop immersive and interactive technologies considering museums/galleries and market needs | <ul style="list-style-type: none">Museums/GalleriesCreative businessesUniversities/SchoolsAudiences |
| | Museums/Galleries | <ul style="list-style-type: none">Explore museums/galleries and market needs on technologiesDevelop immersive and interactive technologies considering museums/galleries and market needsEducate potential partners to develop a better understanding of new technologies | <ul style="list-style-type: none">Museums/GalleriesCreative businessesUniversities/SchoolsAudiences |
| Infrastructure | Government | <ul style="list-style-type: none">Explore potential stakeholders to hear voice from different sectorsBuild a resource platform between the UK and Chinese governments to help museums/ galleries and creative industry to exchange and connect | <ul style="list-style-type: none">GovernmentPolymakers/ImplementersMuseums/GalleriesCreative businessesUniversities/Schools |
| | Polymakers/Implementers | <ul style="list-style-type: none">Lobby government to build a platform for current and potential stakeholders in creative industry to share knowledge, experience and insights | <ul style="list-style-type: none">GovernmentPolymakers/ImplementersCreative businesses |
| | Universities/Schools | <ul style="list-style-type: none">Build a platform for the relationship between UK & Chinese universities to share knowledge, experience and insights | <ul style="list-style-type: none">GovernmentPolymakers/ImplementersUniversities/Schools |
| | Creative businesses | <ul style="list-style-type: none">Build a platform for the relationship between UK & Chinese creative businesses to share knowledge, experience and insights | <ul style="list-style-type: none">GovernmentPolymakers/ImplementersCreative businesses |
| | Museums/Galleries | <ul style="list-style-type: none">Build a platform for the relationship between UK & Chinese museums/galleries to share knowledge, experience and insights | <ul style="list-style-type: none">GovernmentPolymakers/ImplementersMuseums/Galleries |

2

International collaboration

| Element | Key player | Responsibilities | Who should be involved |
|------------|----------------------|---|--|
| Awareness | Museums/Galleries | <ul style="list-style-type: none">Build a platform to share experiences of international collaborationOrganise networking events and conferences to showcase successful international collaborations and seek new opportunities and stakeholdersShowcase successful collaborations to a wider audience | <ul style="list-style-type: none">Museums/GalleriesCreative businessesPolymakers/ImplementersUniversities/Schools |
| | Universities/Schools | <ul style="list-style-type: none">Explore potential stakeholders who interested in international collaborationOrganise networking events and conferences to showcase successful international collaborations and seek new opportunities and stakeholdersShowcase successful collaborations to a wider audience | <ul style="list-style-type: none">Museums/GalleriesCreative businessesPolymakers/ImplementersUniversities/Schools |
| | Creative businesses | <ul style="list-style-type: none">Explore potential stakeholders who interested in international collaborationShowcase successful collaborations to a wider audience | <ul style="list-style-type: none">Museums/GalleriesCreative businessesPolymakers/ImplementersUniversities/Schools |
| Experience | Museums/Galleries | <ul style="list-style-type: none">Explore potential stakeholders who interested in or have similar vision for international collaborationExplore audiences' interest and preference for cultural exchangeDevelop opportunities for staff exchange to learn from international partners | <ul style="list-style-type: none">Museums/GalleriesCreative businessesUniversities/SchoolsAudiences |
| | Creative businesses | <ul style="list-style-type: none">Explore potential stakeholders who interested in international collaborationExplore audiences' interest and preference for cultural exchangeDevelop immersive and interactive experience for cultural contentShowcase examples to promote international collaborations | <ul style="list-style-type: none">Museums/GalleriesCreative businessesUniversities/SchoolsAudiences |
| | Universities/Schools | <ul style="list-style-type: none">Explore potential stakeholders who interested in international collaborationExplore audiences' interest and preference for cultural exchangeDevelop opportunities for staff exchange to learn from international partnersShowcase examples to promote international collaborations | <ul style="list-style-type: none">Museums/GalleriesCreative businessesUniversities/SchoolsAudiences |
| | | | |

| Element | Key player | Responsibilities | Who should be involved |
|----------------------|---------------------------|---|--|
| Funding | Government | <ul style="list-style-type: none">Develop an international funding scheme for the UK and China collaboration with Chinese governmentDevelop a match funding scheme | <ul style="list-style-type: none">GovernmentsPolicymakers/ImplementersMuseums/GalleriesCreative businessesUniversities/Schools |
| | Policymakers/Implementers | <ul style="list-style-type: none">Showcase funding scheme for international collaborationEncourage building partnerships between key stakeholders in the UK and China with a particular research directionDevelop a match funding development strategy and action plan | <ul style="list-style-type: none">GovernmentsPolicymakers/ImplementersMuseums/GalleriesCreative businessesUniversities/Schools |
| | Museums/Galleries | <ul style="list-style-type: none">Consider collaborating with content creators (i.e. creative businesses or universities) to develop cultural content that appeals to the general public (i.e. income generation) | <ul style="list-style-type: none">Creative businessesUniversities/Schools |
| Research & Education | Universities/Schools | <ul style="list-style-type: none">Explore market drives for international collaborationDevelop opportunities that students from the UK and China can collaborate in order to gather new insights and external partnersDevelop opportunities for staff exchange to learn from international partners | <ul style="list-style-type: none">Museums/GalleriesCreative businessesUniversities/SchoolsAudiences |
| | Museums/Galleries | <ul style="list-style-type: none">Build a platform to share resources between museums and galleries in the UK and China | <ul style="list-style-type: none">Museums/Galleries |

| Element | Key player | Responsibilities | Who should be involved |
|----------------|---------------------------|--|---|
| Technology | Creative businesses | <ul style="list-style-type: none">Explore museums/galleries and market needs on technologies for cultural exchangeDevelop optimised and/or new technologies for cultural exchange | <ul style="list-style-type: none">Museums/GalleriesUniversities/SchoolsAudiences |
| | Universities/Schools | <ul style="list-style-type: none">Explore museums/galleries and market needs on technologies for cultural exchangeAdopt digital platform to work with international partnersEducate potential partners to develop a better understanding of technologies for cultural exchange | <ul style="list-style-type: none">Museums/GalleriesCreative businessesAudiences |
| | Museums/Galleries | <ul style="list-style-type: none">Explore market needs on technologies for cultural exchangeAdopt digital platform to work with international partners | <ul style="list-style-type: none">Creative businessesUniversities/SchoolsAudiences |
| Infrastructure | Government | <ul style="list-style-type: none">Explore potential stakeholders to hear voice from different sectorsBuild a resource platform between the UK and Chinese governments to help museums/ galleries and creative industry to exchange and connect | <ul style="list-style-type: none">GovernmentPolicymakers/ImplementersMuseums/GalleriesCreative businessesUniversities/Schools |
| | Policymakers/Implementers | <ul style="list-style-type: none">Lobby government to build a platform for current and potential stakeholders in creative industry to share knowledge, experience and insights | <ul style="list-style-type: none">GovernmentPolicymakers/ImplementersCreative businesses |
| | Universities/Schools | <ul style="list-style-type: none">Build a platform for the relationship between UK & Chinese universities to share knowledge, experience and insights | <ul style="list-style-type: none">GovernmentPolicymakers/ImplementersUniversities/Schools |
| | Museums/Galleries | <ul style="list-style-type: none">Build a platform for the relationship between UK & Chinese museums/galleries to share knowledge, experience and insights | <ul style="list-style-type: none">GovernmentPolicymakers/ImplementersMuseums/Galleries |
| | Creative businesses | <ul style="list-style-type: none">Build a platform for the relationship between UK & Chinese creative businesses to share knowledge, experience and insights | <ul style="list-style-type: none">GovernmentPolicymakers/ImplementersCreative businesses |

04 – Core qualities should be considered in developing the elements

Accessibility

Accessibility is ultimately related to the *maturity of the essential elements*. Because if the elements are easy to access by key stakeholders, stakeholders can have more opportunities to observe and evaluate the elements in order to develop more practical solutions that can be used to minimise barriers and challenges as well as maximise drivers and opportunities.

Visibility

Visibility is about *solid planning and direction* for the development of the essential elements; It brings confidence about the future. Via visibility of the elements, stakeholders can observe the situation and environment related to the essential elements and develop practicals to maximise the impact and benefits of the elements.

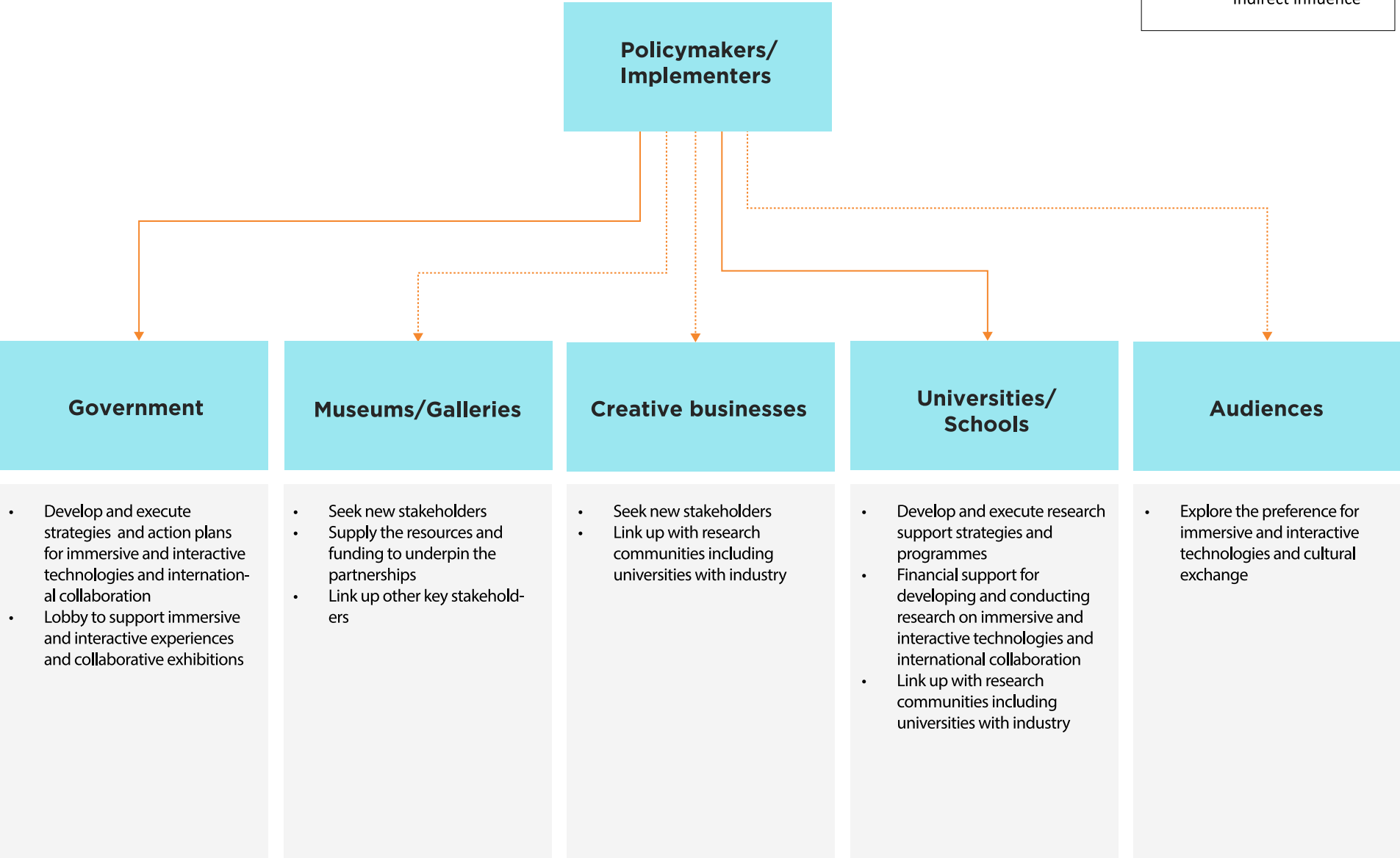
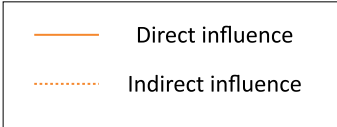
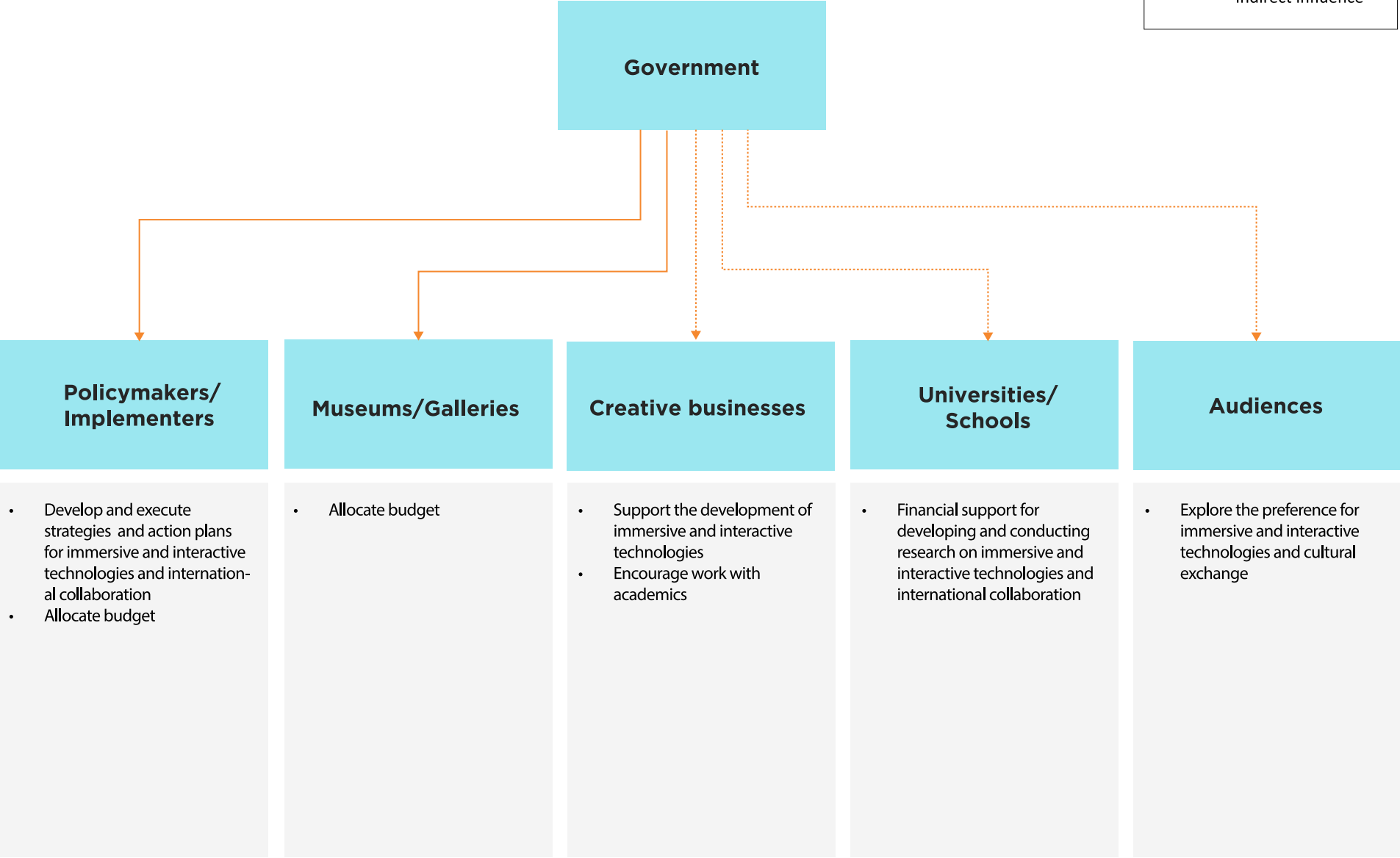
Continuity

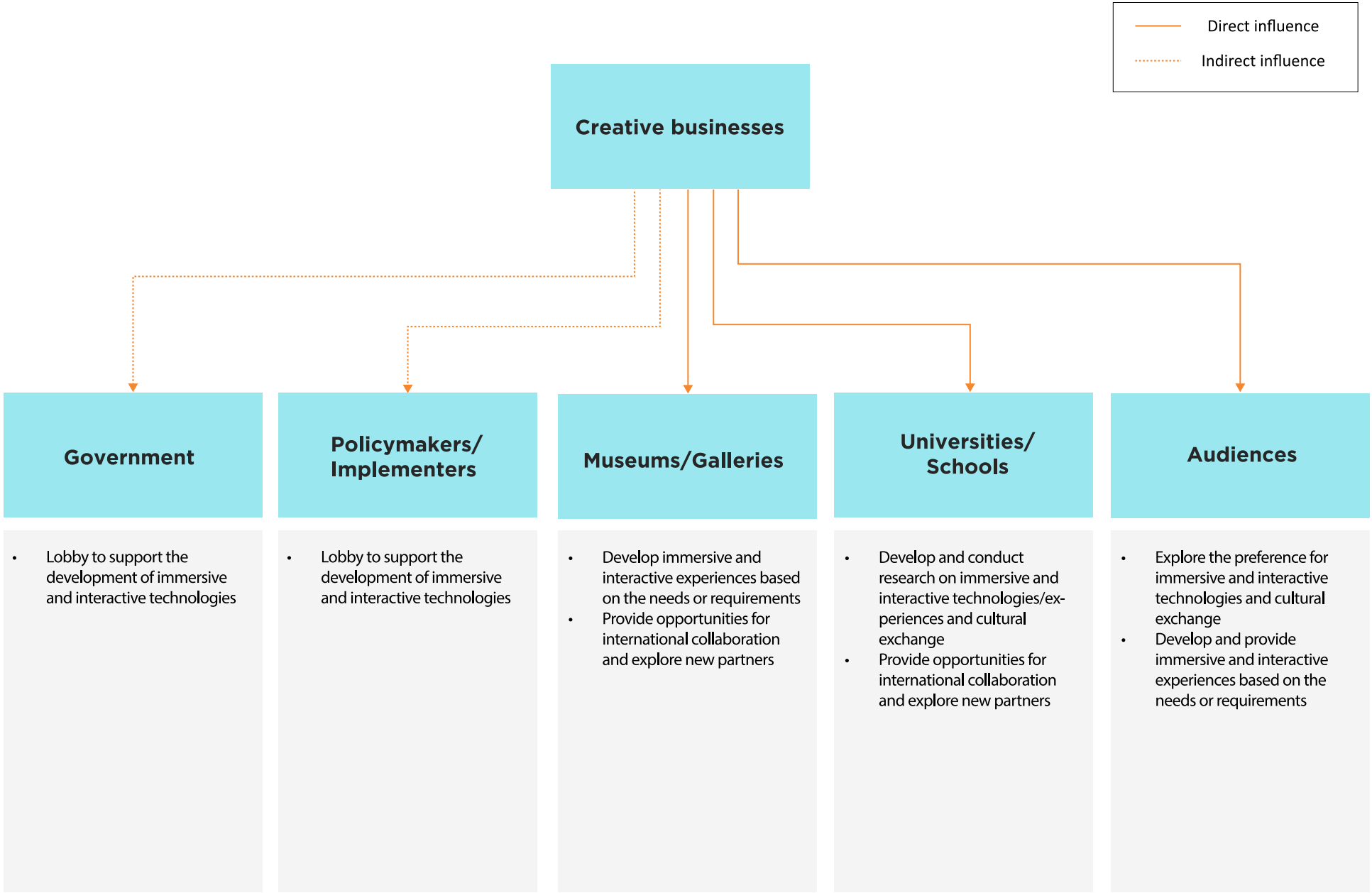
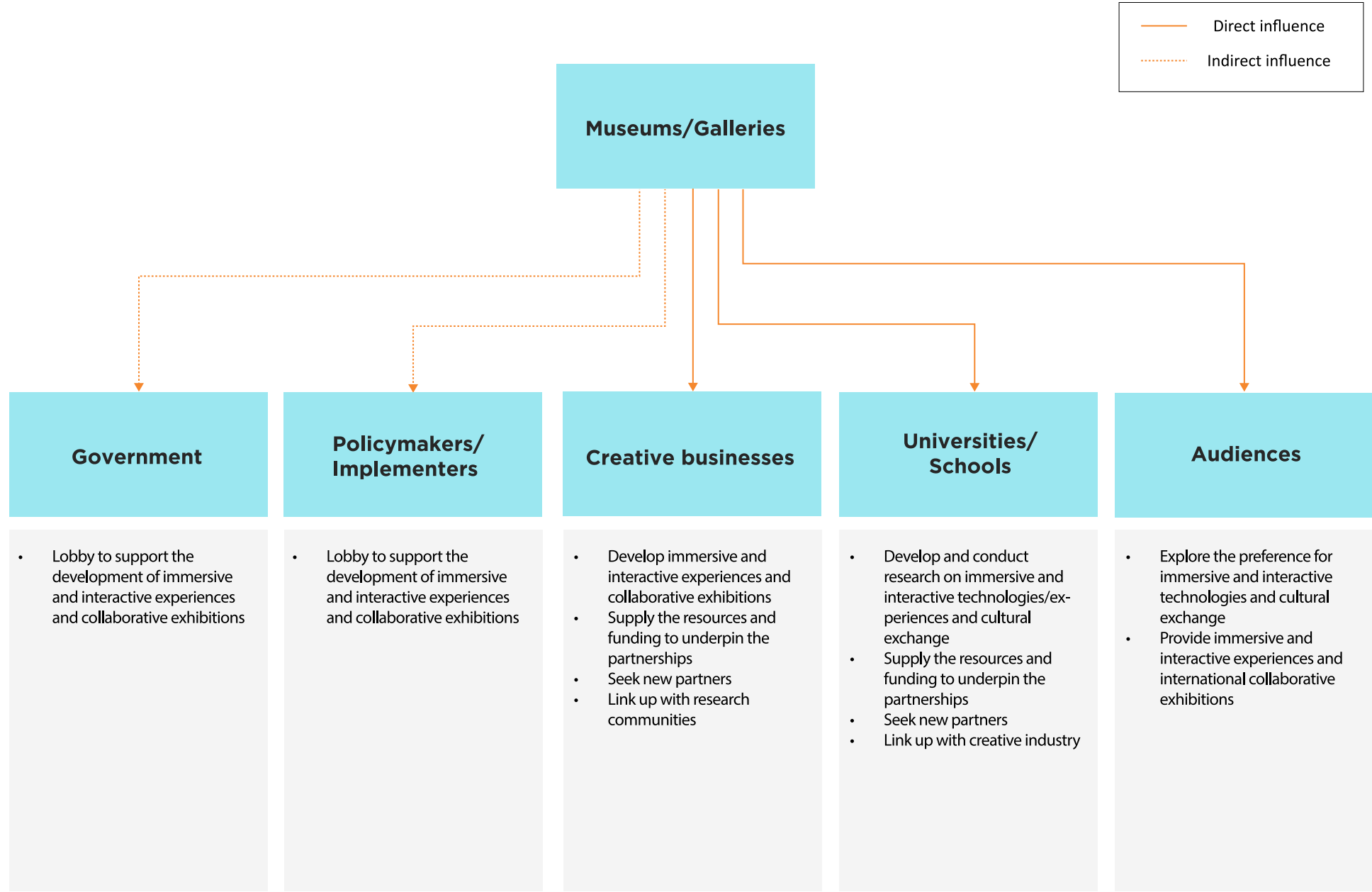
Continuity is related to the *evolution of the essential elements*. An optimised environment/system to operate the elements can be established by continuously repeating evaluation and improvement/development of the elements.

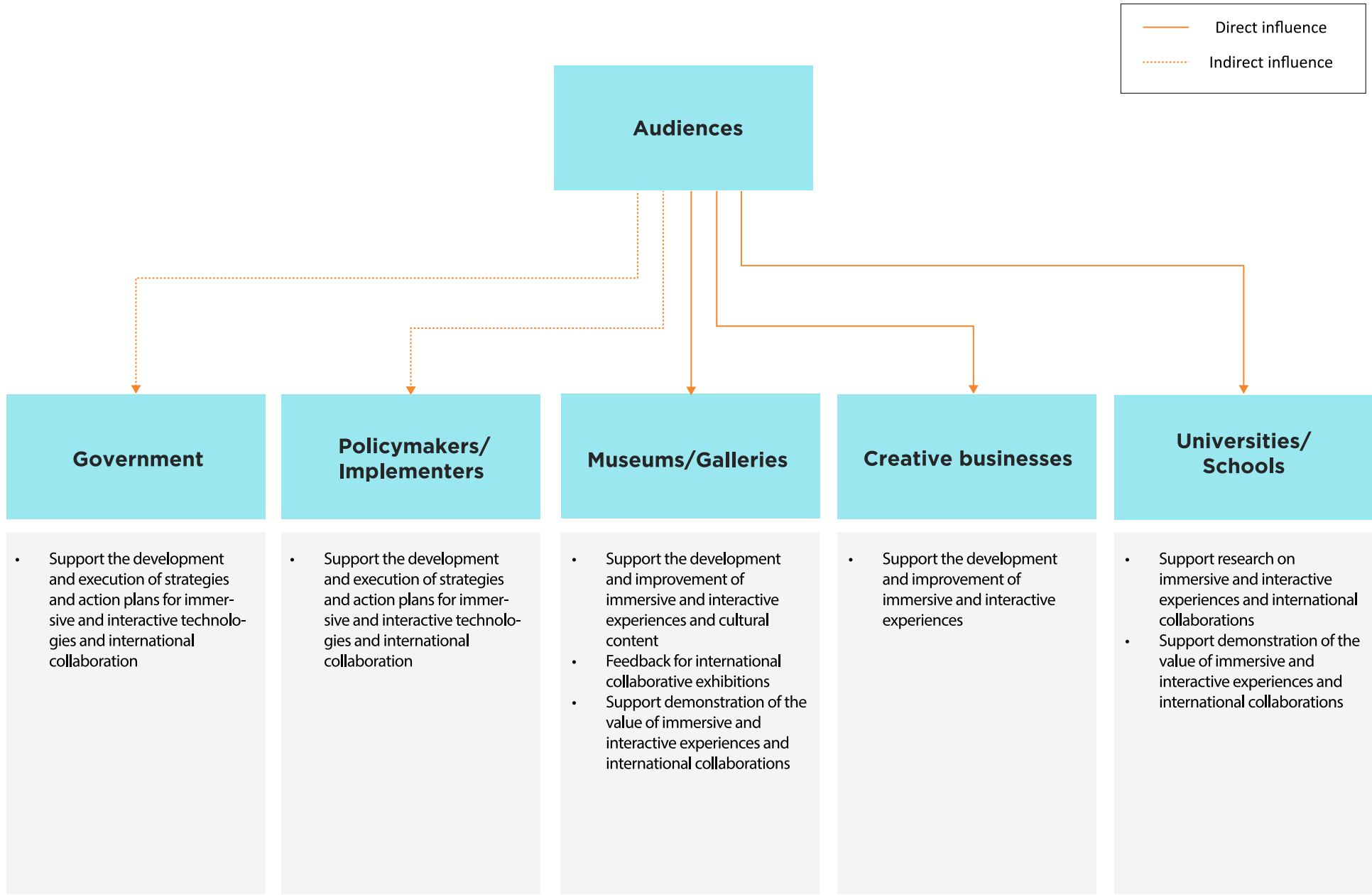
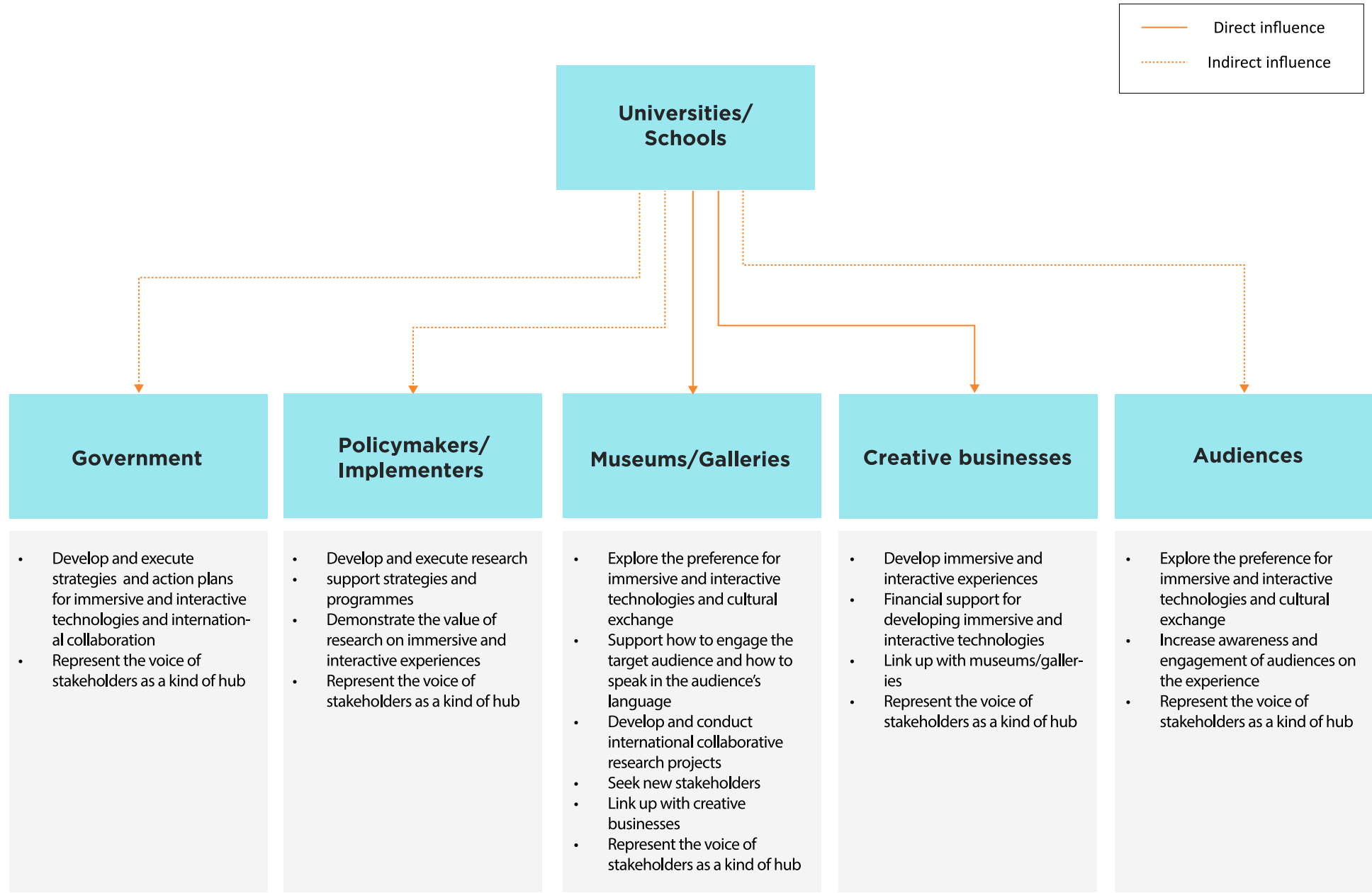
05 – Key stakeholders and their key roles

| | Key roles | |
|---------------------------|--|---|
| | Immersive & interactive experiences | International collaboration |
| Government | <ul style="list-style-type: none">Develop and execute strategies and action plans for the growth of the creative industryEncourage creative businesses to work with academicsAllocate the budget for developing the immersive and interactive technologies and experiences | <ul style="list-style-type: none">Develop and execute policies to facilitate international collaboration by establishing a partnership with other governmentsDevelop and execute strategies & action plans for the international collaboration projectsDevelop and allocate a budget for international collaborations |
| Policymakers/Implementers | <ul style="list-style-type: none">Develop and execute research support strategies and programmeDevelop funding scheme | <ul style="list-style-type: none">Develop initiatives for international collaboration projectsDevelop and execute research support strategies and programmesSupply the resources and funding to underpin the partnershipsLink up other key stakeholders |
| Museums/Galleries | <ul style="list-style-type: none">Develop and provide immersive and interactive experiencesConduct market research | <ul style="list-style-type: none">Establish collaborative exhibitions by developing different cultural contentSupply the resources and funding for academic research |
| Creative businesses | <ul style="list-style-type: none">Develop immersive and interactive experiences based on the needs or requirementsProvide better experience working with industries and academicsConduct market research | <ul style="list-style-type: none">Develop immersive and interactive experience for cultural contentProvide opportunities for international collaboration and explore new partnersConduct international collaboration projects |
| Universities/Schools | <ul style="list-style-type: none">Conduct market researchDemonstrate the value of immersive and interactive experiencesIncrease awareness and engagement of audiences on the experienceLink up museums/galleries with creative businesses | <ul style="list-style-type: none">Develop and conduct international collaborative research projectsSupport museums with ways how to engage the target audience and how to speak in the audience's languageRepresent the voice of stakeholders as a kind of hubFacilitate an interactive exchange between academics |
| Audiences | <ul style="list-style-type: none">Support market researchSupport the improvement of immersive and interactive experiencesSupport demonstrating the value of immersive and interactive experiences | <ul style="list-style-type: none">Support international collaboration researchSupport development of immersive and interactive experience for cultural contentFeedback for international collaborative exhibitions |

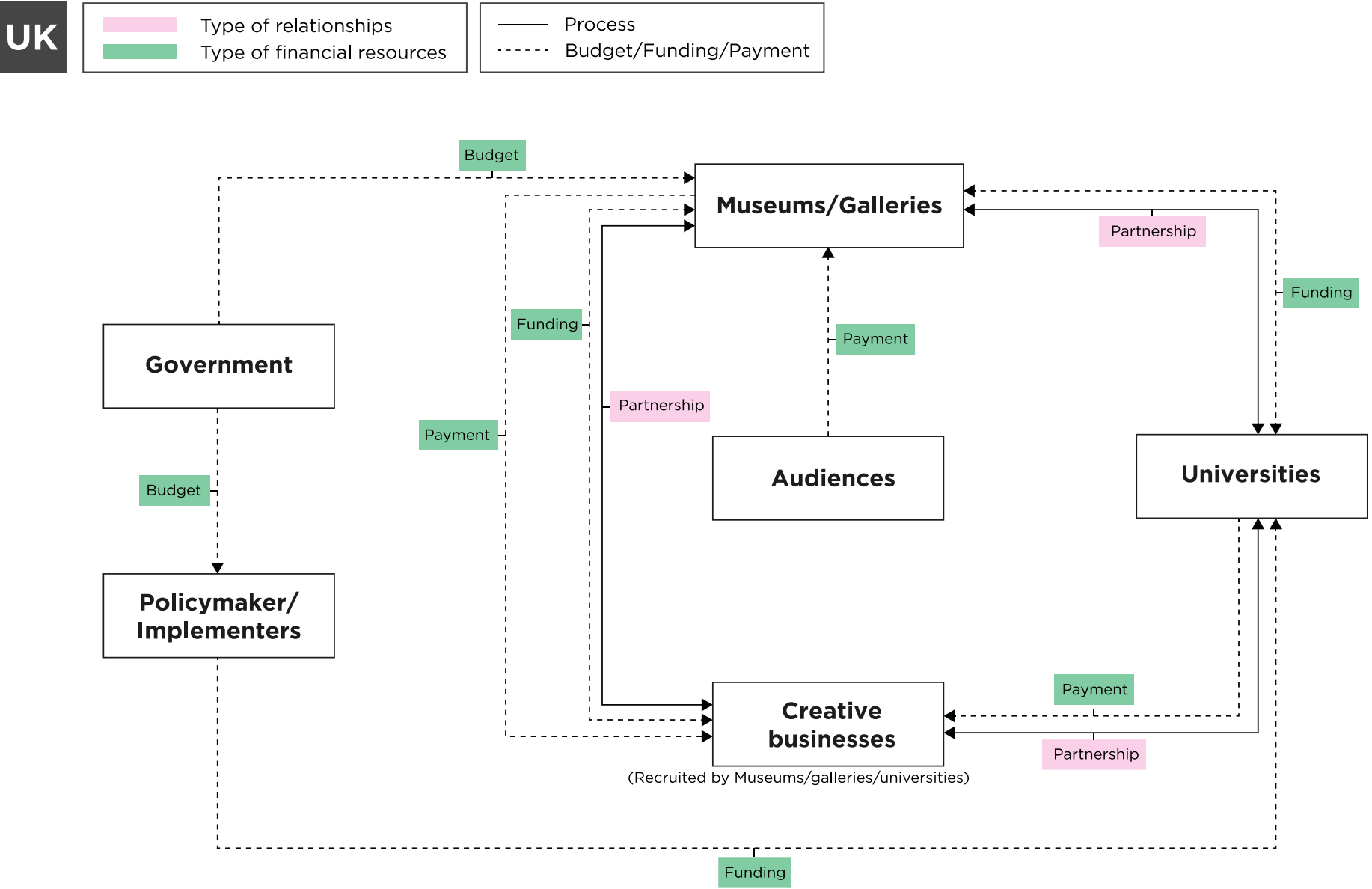
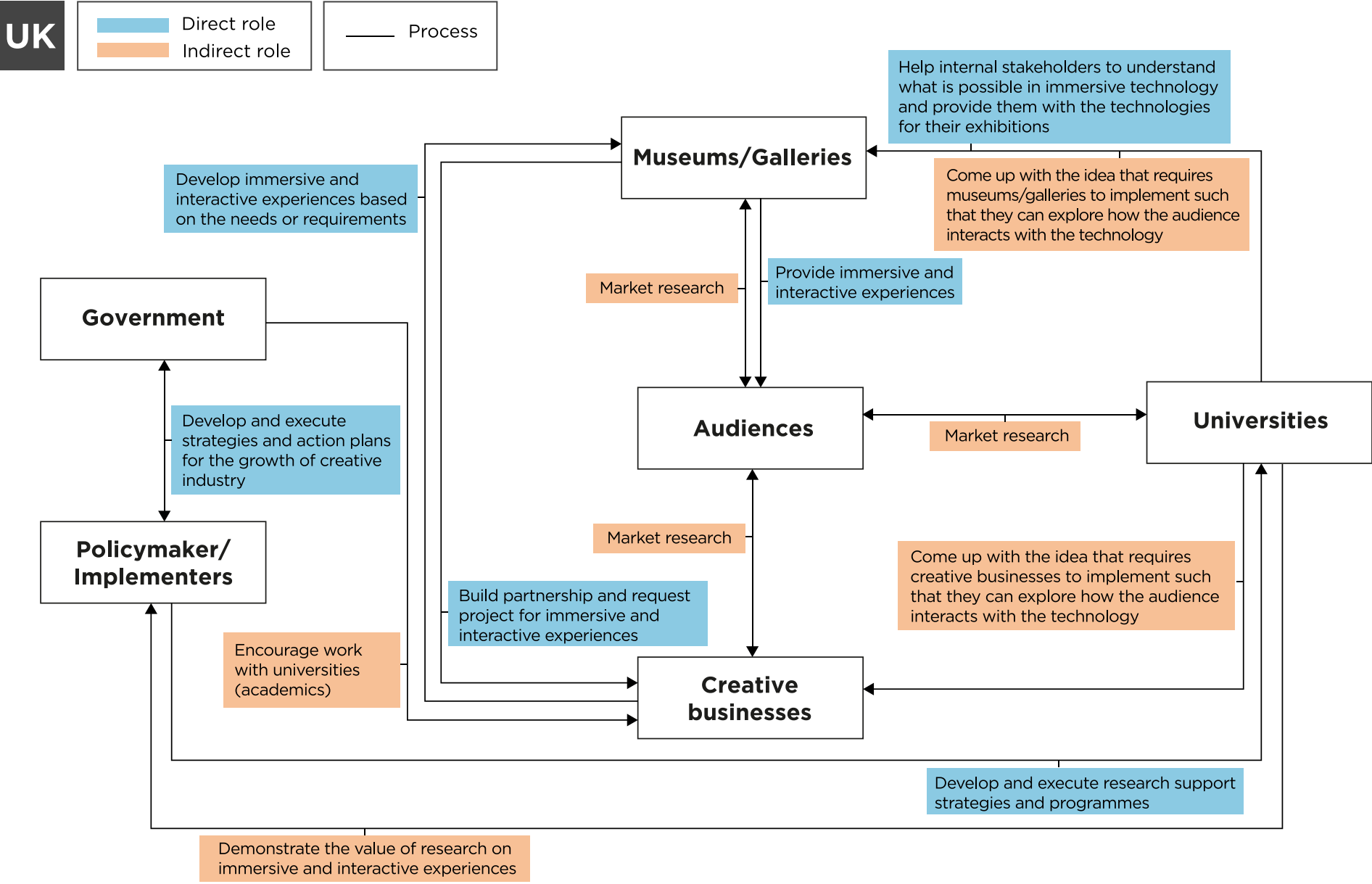
05.1 – Working mechanism between key stakeholders

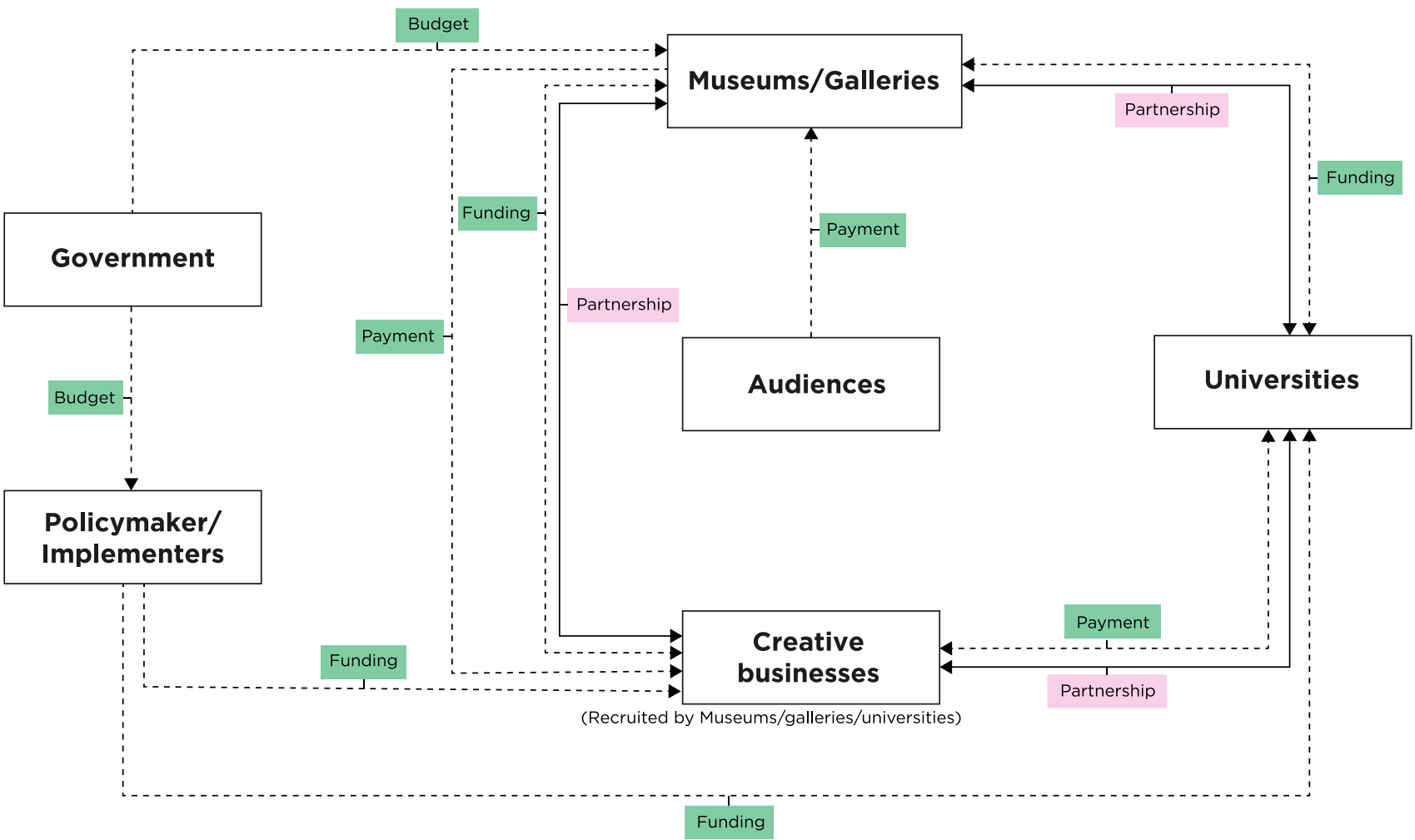
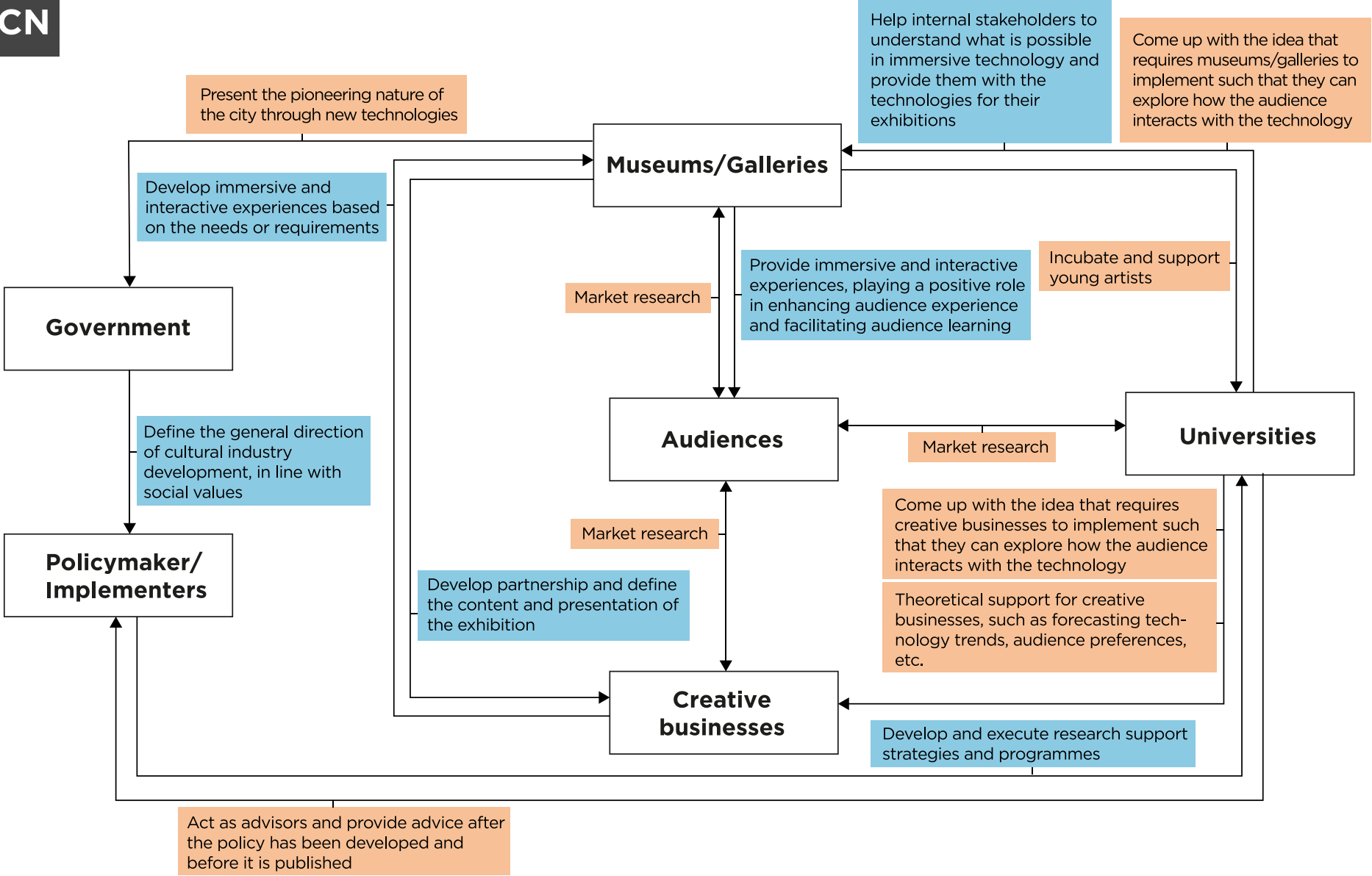






05.2 Value network for immersive and interactive experiences

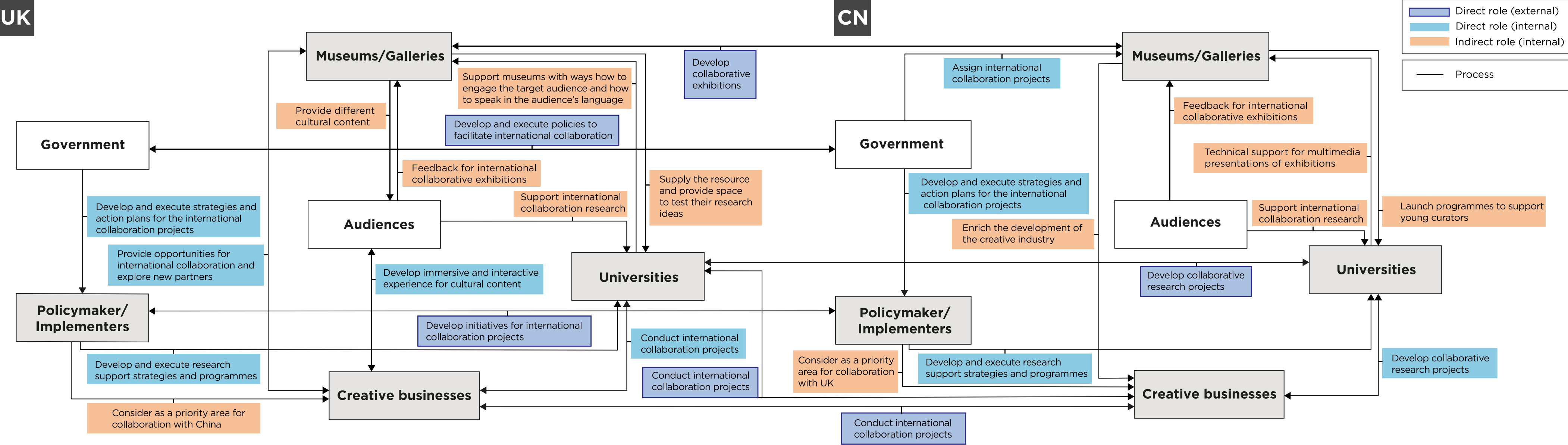


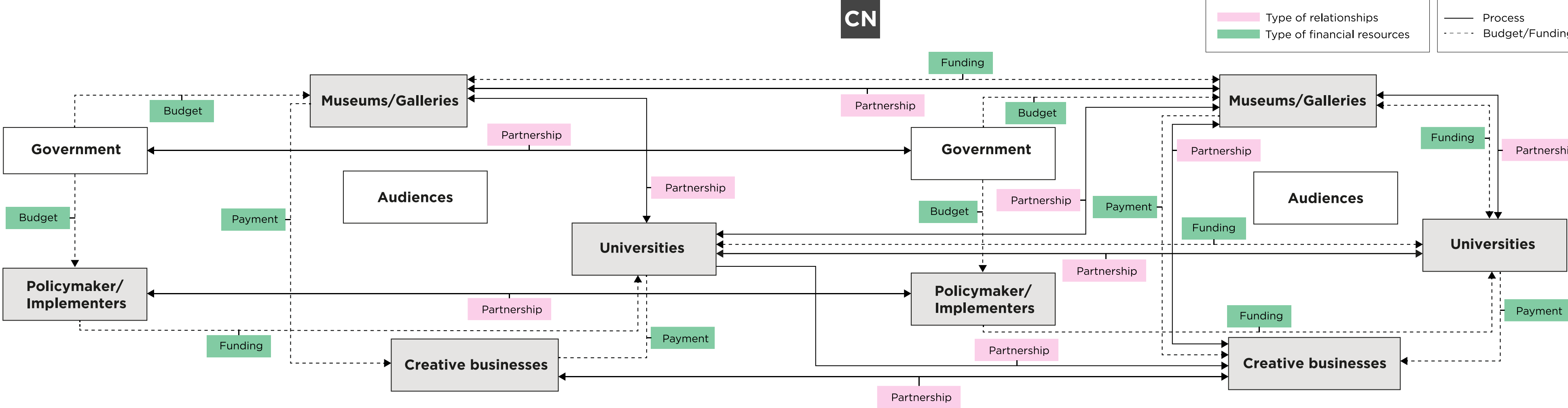


05.3 – Value network for international collaboration

UK

CN





Brunel Design School
College of Engineering,
Design and Physical Sciences
Brunel University London



Collaborated with:



上海交通大学
SHANGHAI JIAO TONG UNIVERSITY

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