

## Article

# Interdisciplinary Relationships, Influence, and Aspirations for Smart Heritage in Local Government

David Batchelor <sup>\*,†</sup>  and Marc Aurel Schnabel <sup>†</sup> 

Wellington School of Architecture, Victoria University of Wellington, Wellington 6140, New Zealand;  
marcaurel.schnabel@vuw.ac.nz

\* Correspondence: david.batchelor@vuw.ac.nz

† These authors contributed equally to this work.

Received: 15 October 2020; Accepted: 16 November 2020; Published: 18 November 2020



**Abstract:** Local governments are responding to rising complexities in service delivery, governance, and civic stewardship with novel interdisciplinary discourses that converge previously separate disciplines. Smart Heritage, the novel convergence of smart city and heritage disciplines, is one interdisciplinary discourse that local governments utilise to address these demands. To successfully deliver Smart Heritage, local governments must understand how the interdisciplinary relationships, influence, and aspirations function within their organisation. However, due to the novelty of Smart Heritage, no academic research exists on these matters, particularly within local government contexts. Therefore, this article reports how relationships, influence, and strategic aspirations between the smart city and heritage discipline intersect as Smart Heritage. It draws on interviews with smart city and heritage advisors from three local governments in Australia. It finds a case-by-case working relationship between the disciplines, which indicates an emergent-yet-tenuous Smart Heritage discourse. Moreover, the interdisciplinary relationships influence broader considerations from the advisors than their single discipline. These considerations produce innovative aspirations for local governments on heritage and smart city matters. This finding establishes the first foundational understanding of Smart Heritage within local government.

**Keywords:** Smart Heritage; smart city; heritage; governance

## 1. Introduction

Local governments across the globe are applying the smart city discipline to new contexts to address the increasing demands of urbanisation regarding service delivery, governance, and civic stewardship. The smart city discipline is the integration of smart technologies into environments to actively and dynamically service, deliver, and manage the demands of its inhabitants and resources [1–3]. In Australia, global consulting firm KPMG reports that the number of councils piloting smart city initiatives increased by eleven per cent in 2019, consisting of 21 per cent of all councils in the country [4]. Boogaard reports that there is increasing pressure for cities to become “smart” to attract investment and workers [5]. Neirotti et al. concisely describe the adoption of smart technology by governments as “a new paradigm” [6], where smart technology holds the same transformation power over the city as mass production of automobiles had in the mid-twentieth century, reshaping the physical and social cityscape.

Against this backdrop, novel smart discourses are emerging from the convergence of new technologies and traditional disciplines within local government contexts. Some of these discourses are well-documented, such as Smart Mobility, Smart Infrastructure, and Smart Governance [7]. Local governments consider these discourses beneficial primarily due to the staff and financial resource efficiencies that technology offers in the active management of mobility, infrastructure, and governance

matters. Moreover, technology is also beneficial for the dynamic ability to monitor and adapt mobility, infrastructure, and governance management to real-time demands that are informed by continuous live data feeds.

A new convergence, which is the subject of this article, is with the heritage discipline that produces Smart Heritage as a novel discourse. Along with the smart city discipline, Smart Heritage adopts the theoretical framework of the heritage discipline, which is the practice of applying the subjective and dynamic heritage concept that results from an understood significance of the past [8–10]. Therefore, Smart Heritage is the convergence of subjective interpretation and valuing of the past that is technology-led and autonomous.

Batchelor and Schnabel describe Smart Heritage as a bridge across the heritage and smart city disciplines that enable them to “intersect, converse and find value” through convergence [11,12]. Brusaporci sees that Smart Heritage enhances the cultural DNA within smart cities by unleashing the broader cultural production capabilities of a city and its people through smart technologies and its systems [13]. Notably, the discourse adopts a dynamic temperament from the smart city discipline and applies it to understandings and applications of the past, while also adopting the historical contextual basis for framing new information and technology from the heritage discipline. The result is the new Smart Heritage discourse, where heritage is a moving and subjective narrative that technology utilises, engages with, and mediates.

Like the previous smart discourses, Smart Heritage is desirable for local governments because it offers efficiencies in staff and financial resource expenditure on heritage and creates innovative and dynamic abilities for its daily management. Studies on the discourse focus on these conservation and strategic outcomes. Research in conservation contexts frequently reveals new smart methods of monitoring historical sites or objects to enhance data collection, conservation, and experiences of heritage [14–16]. In two studies, Angelidou et al. and Angelidou and Stylianidis explore similarities between smart city strategic documents and heritage themes for innovative opportunities [17,18]. Both investigations study cases from three local governments and reveal thematic similarities between the disciplines but do not consider operational matters.

However, due to the novelty of Smart Heritage as a distinct discourse, no academic research exists on the inner operational workings of Smart Heritage within local government. Therefore, for the first time in academic literature, this article reports the interdisciplinary relationships, influence, and aspirations of Smart Heritage through interviews with smart city and heritage advisors from three local governments. It continues the inductive case study methodology used by Angelidou et al. and Angelidou and Stylianidis, utilising interviews as a dataset rather than as strategic documents. While the findings are limited to the small sample size of three local governments [17,18], the research establishes a foundation for understanding the convergence of the smart city and heritage disciplines within local government in more depth.

## 2. Interdisciplinary Relationships, Influence, and Aspirations

The academic literature reports it is beneficial for organisations, like local governments, to leverage interdisciplinary relationships to unlock unique perspectives and collective productivity. However, the literature notes that this requires greater managerial oversight to ensure that interdisciplinary relationships remain productive and are suitable within the organisation. This section provides a brief overview of the academic literature on interdisciplinary relationships, influence, and aspirations.

Within organisations like local governments, interdisciplinary relationships leverage unique perspectives and collective productivity. Nonaka and Srivastava et al. highlight that knowledge-intensive organisations, those that rely on human services rather than manufacturing [19,20], are expected to be more efficient, effective, and creative when they contain interdisciplinary relationships in comparison to siloed or singular discipline organisations. These benefits are due to a higher fluidity of ideas and criticisms, which drives innovative improvements to processes. Kim argues that these interdisciplinary relationships produce a competitive edge within markets; therefore, organisations

should seek to deploy these tactics [21]. Relating to specific convergence of cultural heritage and smart city disciplines, Angelidou et al. identify available opportunities while Angelidou and Stylianidis record an ongoing iterative process of ideas and criticism among disciplines that are providing cities with a unique edge [17,18].

However, other commentators warn organisations of blindly applying interdisciplinary relationships. Harrison and Klein, as well as Boone and Hendriks, identify that interdisciplinary relationships often fail to comprehensively share knowledge among disciplines as a result of human, cultural, and social reasons [22,23]. These reasons create the inevitable knowledge silos in the organisation, removing the benefits. Moreover, Luring and Selmer state that disciplines must have complementary skills and relevant information to collaborate successfully [24]. Thus, support for interdisciplinary relationships within organisations becomes evident. However, organisations should consciously manage interdisciplinary relationships to ensure positive rapport and productiveness for the organisational goal.

Interdisciplinary relationships also influence contributing disciplines through the collaborative process. Clark et al. and Swan et al. find that sharing knowledge is a learning and reflection process that provides opportunities for disciplines to reassess their stance [25,26]. Sousa and Gonzalez-Loureiro term this “knowledge in action” [27]. Sousa and Gonzalez-Loureiro, referring to Nonaka and Takeuchi [28], detail the knowledge sharing process as four modes; these are socialisation, externalisation, combination, and internalisation. Socialisation explores the suitability of the knowledge within the relationships, and externalisation then presents it as a contribution. Combination identifies the applicability of the knowledge, and internalisation witnesses the relationship adopting it within their operational discourse. However, Lanterman and Blithe report individuals often soften the weight of their discipline within interdisciplinary relationships, as they are aware of the collaborative intent of the scenario and do not want to overextend their discipline politically [29]. These findings suggest that organisations should be aware that knowledge morphs in the sharing processes, potentially changing it from its native state within their original discipline. In these cases, the convergence of knowledge does not merely produce the sum of two isolated disciplines.

Interdisciplinary relationships may also produce unexpected and challenging aspirations for organisations in contrast with single-discipline approaches [30–34]. While potentially beneficial in the long term through innovation, the organisations should be aware that the outcomes of these relationships are unknown and may not align with the thinking of management. Nonaka and Takeuchi describe the jarring effect to existing internal discourse or processes that innovation can cause, and how merely the prospect of change can derail productivity if there is uncertainty in the organisational response [28]. If the organisation adopts a new direction, the philosophical shift requires time to embrace and permeate through the organisation and may have unforeseen implications on culture and technical processes [35–37]. Relating to heritage, attempts to converge historical conservation and tourism aspirations, such as through co-stewardship and production, often progress slowly due to building trust and evolving relationships, in comparison with single discipline efforts [38]. As such, Lattuca warns that novel directions may be inefficient or unsuitable for all organisations [39]. Therefore, organisations should prepare for unexpected and challenging aspirations from interdisciplinary relationships and critically examine the suitability of resulting directions within their contexts.

### 3. Methods

The research follows the designs of Angelidou et al. and Angelidou and Stylianidis by undertaking case studies into three local governments [17,18]. However, instead of comparing smart city strategic documents and heritage themes, this research interviewed local Australian government employees who worked in the smart city and heritage disciplines to compare their experiences with interdisciplinary relationships, influence, and aspirations. Like the previous studies, the analysis inductively identified relevant phenomena in the transcripts of these themes. The analysis then compared the phenomena across the cases to construct trends, grouping phenomena and drawing on direct quotes from the

transcripts as evidence, and then consolidated the trends into narratives that address the research of interdisciplinary relationships, influence, and aspirations.

The local governments were Broken Hill City Council, the City of Newcastle, and the City of Melbourne. Broken Hill City Council is a small council in the outback of New South Wales, the City of Melbourne is a metropolitan city and the state capital of Victoria, and the City of Newcastle is an industrial and second-tier city in New South Wales. The local governments differ in environmental contexts and operate under similar state heritage legalisation and national smart city guidelines, specifically the New South Wales Heritage Act 1977, the Victoria Heritage Act 2017, and the federal Smart Cities and Suburbs Program.

In each local government, one senior employee who worked in the smart city discipline and one senior employee from the heritage discipline were interviewed; therefore, there were six separate interviews with six participants in total. The respective team leaders of each discipline in each local government chose the participants. All participants are experienced and held a senior role in their discipline. The research provided the advisors with the generic monikers Smart City Advisor and Heritage Advisor to offer a level of anonymity. The advisors were invited to participate in the research by email and later by online video calling. The interviews were approximately one hour in length and were audio-recorded and then transcribed.

The interviews were semistructured, containing open-ended questions that led the advisors through three consecutive phases about interdisciplinary relationships, influence, and aspirations within their organisation as guided by the discussion in the previous section of this paper.

The quantitative approach to data collection and the resulting low volumes of interview participants limited the investigative depth of the research. While the chosen councils represent a range of geographies and sizes, there are 537 local government organisations in Australia, meaning the interviews merely offer an early indication to the interdisciplinary workings of Smart Heritage rather than a substantial dataset [40]. Regardless, the findings contribute to academia due to the novelty of Smart Heritage and the current absence of insights; these early indications are the first investigations into the operations of Smart Heritage within local government.

The following section reports the findings from the interviews under the themes of the research. The later sections of the article discuss and conclude the case studies collectively.

#### **4. Reporting the Findings**

The interviews emerged trends on the themes of interdisciplinary relationship, influence, and aspirations about Smart Heritage in local government. The following subsections report the dominant trends on these themes.

##### *4.1. Key Finding: The Relationship between the Disciplines*

The participants reported few problematic convergences between the smart city and heritage disciplines. Where difficulties existed, the advisors mitigated them through communication and pragmatic approaches. The difficulties stemmed from a lack of knowledge about the other discipline and different perspectives on the required processes for convergence, which reflected the novelty of the Smart Heritage discourse in local government.

The Heritage Advisor from Broken Hill City Council consciously avoided technical heritage jargon and adopted a pragmatic approach when managing heritage and historical places. The advisor did this to improve the relationship between the disciplines and support the broader economic context of the city. However, the advisor said this approach challenged the traditionalist heritage discourse, which primarily seeks to conserve historic places outright.

“I certainly clash with the level historical societies and things, who are very, very traditional”  
(Broken Hill City Council 2020, Interview with Heritage Advisor, 22 May)

“The way I view it is heritage is one of the tools you’ve got to work with. In some places, it’s a very important tool, and in others, it’s a less important tool. So, you’ve got to actually weigh up what you’re doing . . . What matters most is the places actually have a future life and meaning.” (Broken Hill City Council 2020, Interview with Heritage Advisor, 22 May) [41]

The Smart City Advisor at Melbourne City Council reported trying situations in which they had to explain smart city technology to other disciplines and periods of learning about regulatory heritage protection and processes. However, the advisor was considerate of the differences and delays. The advisor accepted the difficulties as the convergences delivered the organisational aims of the council.

“That’s okay if I remember that not everyone knows what I’m talking about.” (City of Melbourne 2020, Interview with Smart City Advisor, 4 June) [42]

“There’s like 15 different stakeholders in the City of Melbourne . . . I think that’s when it gets frustrating as it slows down things. It’s only a time thing that’s frustrating. It just slows it down because I think there’s so much organisational knowledge in people’s heads . . . it’s really hard to access knowledge about all the different stakeholders for one spot.” (City of Melbourne 2020, Interview with Smart City Advisor, 4 June) [42]

The Smart City Advisor for the City of Newcastle avoided jargon to improve the convergence of disciplines. The advisor was aware that the smart city discipline was the newcomer within the organisation, and therefore, it should be considerate of existing perspectives and methods.

“There would be two separate lexicons. And Smart City are pretty self-aware that we sit at the intersection of two of the most jargon fields, like smart city and innovation startup . . . [the Heritage Advisor is] understanding but it’s pretty easy to go down a rabbit hole in smart city with the more specific language.” (City of Newcastle 2020, Interview with Smart City Advisor, 30 June) [43]

The other smart city and heritage advisors from the local governments reported practices likewise to resolve differences between the disciplines.

Specifically noting the positives of the interdisciplinary relationship, the Smart City Advisor noted the benefits of utilising the heritage discipline for unique perspectives and the workforce within the small council.

“In order to pull a project together in a council of this size, we need to have a multi-disciplinary contribution, because otherwise it’s not going to happen and we’re not going to get all the information required.” (Broken Hill City Council 2020, Interview with Smart City Advisor, 22 May) [44]

Moreover, the Heritage Advisor from the City of Newcastle discussed the financial benefit of working with the smart city team due to the team’s ability to access funding that supported interdisciplinary initiatives. The advisor believed that this relationship significantly contributed to the high impact the heritage team has on the city.

In summary, the disciplines reported an emergent relationship in which they pragmatically addressed issues through a case-by-case approach. This indicates the gradual development of the Smart Heritage discourse within the local governments and a patchwork of knowledge within the organisations.

#### *4.2. Key Finding: Influence between the Disciplines*

Most of the participants responded that the convergences influenced their perception of their discipline. The smart city advisors became more aware of aesthetic design implications and heritage



regulatory processes. At the same time, the heritage advisors broadened their understanding of heritage management avenues through smart technologies. These influences reflected the existing knowledge of the individual advisors and the nature of the convergences within local governments.

The Smart City Advisor of the Broken Hill City Council recognised the need for closer consideration of the implications on the aesthetic of smart city initiatives after earlier ‘robust conversations’ with the Heritage Advisor on previous projects. The Smart City Advisor realised that the heritage aesthetic is a communicator of the historical value of the city, particularly as the whole city entered the National Heritage List in 2015. As a result, the Smart City Advisor desired the heritage team to be involved in the early planning stages of smart city initiatives to ensure a level of scrutiny. The Smart City Advisor stated:

“That the trigger should be as soon as we go “we got to do something in the CBD”, the heritage of advisors should go “have you thought about this, this, this, and this?”. So, there’s a lot of learnings when you introduce a new player, which is the Smart City game.” (Broken Hill City Council 2020, Interview with Smart City Advisor, 22 May) [44]

The Smart City Advisor in the City of Melbourne noted a greater awareness of aesthetics and non-tangible heritage narratives and how they now consider these in smart city initiatives. As an example, the advisor discussed recognising the heritage importance of a historic grassed site in the city.

“I think definitely as it relates to aesthetics and then probably as it relates to concepts of what is important to the organisation, but also to the community. Like I was mentioning before, I always think about whenever I walk past the lawn, and I’m like, ‘yeah, that is a heritage site, even though it’s just a patch of grass’. Like, that is like important to keep. Yeah, so it definitely has helped me in how I conceptualise in those two ways.” (City of Melbourne 2020, Interview with Smart City Advisor, 4 June) [42]

The knowledge gained through interacting with the heritage discipline also built new respect for internal and external consultation with heritage parties. The advisor discussed how they were unaware of the multitude of stakeholders in the city while attempting to upgrade a local park. The advisor now held a greater appreciation and awareness of the complex cultural landscape across the city in which the smart city discipline operates.

The Heritage Advisor for the City of Melbourne valued how the smart city discipline prioritised public communication and user experience. The advisor learned that this approach would help their heritage team in the council better understand how planning regulations and controls impact the public heritage narrative beyond private property ownership. The Heritage Advisor stated that the smart city perspective “possibly allow[s] [the heritage team] to see that it could be a whole lot of interest to people outside of just property owners” [45].

“My team is mostly planners. I think they have broadened out their view of heritage. I think my team don’t think a lot about how you communicate that to an audience, like what the gold is in the heritage review. But the actual gold is not just the control but the dramatic environmental history that tells people the story of what their areas come from.” (City of Melbourne 2020, Interview with Heritage Advisor, 21 May) [45]

The Heritage Advisor in the City of Newcastle reported their work with the smart city team encouraged a more relatable and engaging form of heritage. The emphasis on the user experience in the delivery of the smart technology highlighted to the Heritage Advisor how heritage is also a user-experience and can be immersive and strongly relate to the present. Notably, this breaks away from the passive modes of heritage interpretation that the advisor was more familiar with, such as non-digital signage, photographs, and text.

“I think that it becomes more relatable. I mean, I can imagine what it was like 100 years ago, or a few thousand years ago. I can probably guess, but it’s much more immediate with using

immersive technology . . . It's very is quite powerful. Then you can bring in sound, and it gets stronger. I can see it being more powerful of an experience." (City of Newcastle 2020, Interview with Heritage Advisor, 23 June) [46]

The Smart City Advisor in the City of Newcastle described how a previous heritage advisor in the council advocated for heritage during the early phases of establishing the smart city team in the council. In conjunction with the personal sociological educational background of the Smart City Advisor, their perspective of the smart city discipline became more open and conscious of the past as an active tool in smart city initiatives. The advisor appeared to be aware of the novelty of this perspective and thankful for its early integration by the smart city team in the council.

"When I first started, I worked quite closely with one of [the Heritage Advisor's] predecessors. She did make sure that when we were building this forward focus narrative for smart cities that there was room in it for the value of the past . . . We used to have great philosophical discussions with her." (City of Newcastle 2020, Interview with Smart City Advisor, 30 June) [43]

An exception to the trend was the Heritage Advisor for Broken Hill City Council, who held views that already aligned with the flexible and future-oriented smart city discipline. The advisor frequently expressed concern for the future of the city and already advocated for the activation of heritage narratives by smart technology. Particularly to address the population and economic challenges in Broken Hill, the advisor noted that a new perspective is required within the council to attract, retain, and serve the population and economy.

"[Broken Hill is] an extraordinary place, and it's got the extraordinary city character. But people want to change that because of their own aspirations" (Broken Hill City Council 2020, Interview with Heritage Advisor, 22 May) [41]

"the future of the place has got to be a heritage future or heritage tourism future for a large part of the viability of the town, but a new one. One that smart technology gives heritage an edge." (Broken Hill City Council 2020, Interview with Heritage Advisor, 22 May) [41]

The alterations in perspectives reflected the unique convergences in the personal knowledge experienced by each advisor and the contexts of each local government. For example, as the Smart City Advisor in the City of Melbourne dealt with heritage overlays regarding telecommunication infrastructure installations, the advisor, therefore, gained an understanding of the architectural and regulatory impact of smart city infrastructure. These learnings also reflected the large size of the organisation and how processes dominate many initiatives in the local government.

In Broken Hill City Council, as the Smart City Advisor confronted heritage regulations for installing smart city technologies in the heritage park, the advisor reflected on the need for better interdisciplinary communication. For the Heritage Advisor in the city, their awareness of depopulation and economic hardships in Broken Hill led them to highlight alternative, technology-led initiatives that showcase the heritage of the city and to attract tourists.

In the instances of the City of Newcastle, the existing close collaborative efforts between the advisors reflect in the responses on how they advocate for interdisciplinary visibility in the process and engagement stage of the projects. Both advisors from the council indicated visibility of the other discipline as driving the alterations to their perspectives.

"I think Smart City technology unless it's invisible, requires a lot more conversation in a heritage precinct. Because the whole central business district of Broken Hill is a heritage precinct, you can't do anything without the heritage lens being put over it. So, it just requires that extra element of detail in planning" (Broken Hill City Council 2020, Interview with Smart City Advisor, 22 May) [44]

“I think in the end, there’s a limit to how many conserved buildings people want to see or walk into . . . the traditional way of dealing with a heritage site, whether it’s a town or individual building, is it you restore it in some way, you find a use for it, and then you put a sign up outside telling you what it was with some pictures. I mean, that’s all right. That’s pretty boring . . . so we try to get meaning into places so that you walk into a place and you actually have a sense of what it was like.” (Broken Hill City Council 2020, Interview with Heritage Advisor, 22 May) [41]

“Certainly, with my involvement with the smart city, it has changed my perspective, and I’ve tried to reflect that in the new heritage strategy or mention it in passing.” (City of Newcastle 2020, Interview with Heritage Advisor, 23 June) [46]

In summary, the interdisciplinary interactions influenced the advisors’ understanding of their discipline. The advisors also became aware and appreciative of the value and processes of the other discipline. The changes reflected the personal learnings of the advisors and the context of the local government. This finding suggests Smart Heritage is an ongoing learning process for the smart city and heritage disciplines within local government, and the relationship is still evolving.

#### *4.3. Key Finding: Aspirational Directions for Smart Heritage*

When asked about their aspirations for Smart Heritage, the interviewees expressed their unique vision, which reflected their understanding of the disciplines, local issues, and organisational contexts.

The Heritage Advisor for Broken Hill City Council discussed multiple opportunities where smart city and heritage disciplines could converge. The opportunities primarily supported economic growth in the city. They sought to resolve the lack of local expertise and public funds, such as the deployment of smart technology for self-guided tours of historical mine sites, buildings, and artefacts that are around the city. The technology—likely QR codes, mobile telephone GIS tracking, and automated personalised interpretation software—would provide visitors with the ability to register and pay for tours remotely, track and guide the visitors through the sites, and automate the unlocking and management of historic assets, buildings, and artefacts during and after the tours. This method enables the vast historic mines and numerous assets to be unstaffed and flexible to seasonal demand, reducing operational costs.

“You can use smart technology in all these desert sites; you’ve got all sorts of things that people need to travel around to explore the area. So smart technology becomes, I think, the way to get access into things. There’s no reason you can’t organise access into buildings with smart technology like that. You know, all sorts of things. So you because staffing costs are the killer of everything.” (Broken Hill City Council 2020, Interview with Heritage Advisor, 22 May) [41]

Additionally, the Heritage Advisor for Broken Hill City Council suggested an online marketing platform to attract tourists to Broken Hill and assist in the service of tourists in the city. In this example, the smart technology targets tourists via personalised advertisements through online tracking systems. It actively monitors their experience while in Broken Hill through an application or other tracking systems. Digital nudges for local accommodation, museums and galleries, restaurants, and other attractions would engage tourists with convenient services based on personal information. This platform would integrate with other city information feeds and would encourage opportunistic and unplanned explorations of historical and civic sites. In the opinion of the advisor, the city lacked marketing and digital tourist infrastructure. Therefore, the advisor saw an opportunity for smart technology to improve marketing effectiveness.

“You can’t get a package; you can’t actually get a Broken Hill, go online, book a flight, book three nights’ accommodation, and a whole series of events. You can’t do that. Everything’s isolated. So, I mean, that’s where your digital or your smart technology has to be absolutely at its most basic level functioning, and that is you can go onto one platform and get all these



things sorted. That'd be perfect because that's what people look for." (Broken Hill City Council 2020, Interview with Heritage Advisor, 22 May) [41]

The Smart City Advisor for Broken Hill City Council aspired for two initiatives. The first opportunity was to install smart street lighting citywide that dim at night when no pedestrians or cars are near to emphasis indigenous heritage narratives in the night sky. The advisor recognised that the remote location and small urban scale of Broken Hill provided an opportunity to explore this unique angle of Aboriginal heritage. While smart street lighting typically concerns reducing electricity consumption in cities, the opportunity to create heritage outcomes from the technology is novel. The Smart City Advisor further mused on partnering with surrounding local governments to create a dark sky region in the surrounding outback.

"One of the big projects like you would love would be to change out every streetlight, so it's dims; and park light and everything else. So, they dim if no one is walking under them, but they light again when they need to be lit ... We're very much aware of the heritage and the storytelling that comes from the sky ... Because [European cultures] join the dots to make the picture, but the indigenous people look at the black spaces in between, so it's in reverse ... That would be a really fantastic project to be able to, to invest in." (Broken Hill City Council 2020, Interview with Smart City Advisor, 22 May) [44]

The second initiative the Smart City Advisor aspired for was the installation of digital pedestrian trackers in waypoints and historical sites throughout the city. The trackers would automatically recognise the volume and direction of people who pass by. The resulting information would support understanding the effectiveness of tourist initiatives and attempts to bring people back into the city centre.

"In terms of movement, that would be a really interesting piece of smart technology to put in with the CBD activation as it's a wayfinding project as well. So, with the wayfinding signs, we could build in those electronic counters that feedback to us about who's where and what direction they're going in. But that's not on the agenda, but you just put it into my head. So, it may end up on the agenda." (Broken Hill City Council 2020, Interview with Smart City Advisor, 22 May) [44]

The Smart City Advisor for the City of Melbourne sought wide-reaching initiatives across the city. For example, the advisor described an "intuitive city" system that monitors public streets and spaces and "reprogrammes" them in real-time from a central city control centre to enhance meaning and functionality. The advisor discussed how traffic lanes in public streets could reallocate space to accommodate vehicle demand better, likely distributing them between cars, cyclists, and pedestrians. The advisor translated this knowledge to the heritage discipline, where public spaces can better accommodate historical narratives and identities through changeable heritage symbols, artworks, and spatial arrangements of objects and information of historical significance.

"Blue sky thinking, my colleagues and I were just like, 'we need no roads, no gutters. We need to be able to program the road according to the need. Let's get rid of cars as much as we can. Let's understand the city better ... I think it would cross over with heritage because it could highlight different heritage spaces and different heritage buildings. And I think the way that people understand the city as well.'" (City of Melbourne 2020, Interview with Smart City Advisor, 4 June) [42]

The Smart City Advisor saw opportunities for Smart Heritage to lift Aboriginal history, customs, and values in the cityscape. The advisor recognised that smart technology offers a vehicle to make visible non-tangible cultural values.

"I think making it a part of everything that we do is important. It doesn't have to be like, 'oh, this is Aboriginal content now'. It's just, and there's this Aboriginal lens to everything that we would do." (City of Melbourne 2020, Interview with Smart City Advisor, 4 June) [42]

Additionally, the advisor also discussed a “digital twin”—a digital-sandbox replica of the city where urban planning simulations can be tested—of Melbourne that integrates historic building information, current protections, and heritage narratives. In the digital twin, the heritage information is a novel addition alongside the prioritised data feeds of transportation, infrastructure, crime, economics, and others. The advisor considered that if heritage information were more visible in the decision-making process, then historic buildings and their value would likely be retained. The Smart City Advisor briefly contemplated an immersive virtual reality experience of the city, inclusive of all human-senses, that targeted the emotional aspect of heritage digitally.

“In a digital twin of the city, building information. Even if information modelling and those types of things, I think, and bringing out what’s happening to not only like internal stakeholders that run the city but also to people who visit and understand it ... There’s such an opportunity to bring some of that to life. There are so many beautiful secrets in the city, but you would only know to look at if somebody had told you. I also think just in the way that people engage with the city. I think it’s so easy to just go along Swanston Street, and then leave.” (City of Melbourne 2020, Interview with Smart City Advisor, 4 June) [42]

The Heritage Advisor for the City of Melbourne liked the idea of using smart technology within their heritage work and stated they have worked with Digital Heritage in previous roles. The advisor was interested in exploring visualisation, data collection, and data application for archaeological heritage. The advisor thought there would be opportunities for economic development through better activation of heritage sites through smart technology but found it hard to materialise the initiative.

“I feel like I’m so locked down in what we have to do that blue-sky thinking is really tricky for me at the moment. I don’t know. It’s like I only know what I know and I feel like; what this conversation is showing me and the conversation that we had last week; there’s a whole lot of ways that we could be engaging, but I can’t even think about what they are at the moment.” (City of Melbourne 2020, Interview with Heritage Advisor, 21 May) [45]

The Heritage Advisor for the City of Newcastle considered smart technology could support the repackaging and promotion of heritage collections, historic buildings, old streets, and other heritage places to new audiences. Smart technology would deliver heritage on digital medians and in innovative formats to pique interest. The advisor appeared to prioritise engagement of audiences with heritage as an outcome for convergence. When asked about other outcomes, namely economic, historical conservation, governance, and environmental sustainability, the advisor acknowledged other outcomes were likely possible but could not substantively materialise them.

“We’ve got a lot of heritage collections, old buildings, old streets, and places. There’s a lot of heritage, which people don’t really know about, and it needs to be repackaged, promoted, and sold to the local population, visitors and tourism. It’s always pushing that bigger picture, which is what we are trying to get across in the updated strategy.” (City of Newcastle 2020, Interview with Heritage Advisor, 23 June) [46]

The Smart City Advisor saw the potential to expand the ongoing placemaking and smart technology upgrades in historic buildings further to enhance immersive, interactive, and delightful heritage experiences. The advisor desired to see a more “mediatised environment” where sites in the city communicate in real-time to improve the user experience. For example, each site would utilise and analyse personal and big data to continually improve the experience of the sites and have the assets react to current trends in the audience. Interestingly, the advisor recognised benefits in the additive installation of smart technology across the city. The advisor described how technological advancements and growth in perspectives over time would unveil new and more ambitious aspirations. Therefore, the continual process of convergence itself was an aspiration.

“For example in the museum, we put out something that helps them to understand how people move through the building in terms of tracking, with WiFi and cool and heat mapping of where people go, that helps them to understand which exhibitions are well attended. If people go to this exhibition, where else do they go in the museum? So they’re getting intelligence on the audience, which helps them to improve their delivery of that product and content.” (City of Newcastle 2020, Interview with Smart City Advisor, 30 June) [43]

“I see a potential overlap with public domain upgrades in a way that uses technology to deliver really immersive and interactive and delightful experiences of the history of a place.” (City of Newcastle 2020, Interview with Smart City Advisor, 30 June) [43]

“It’s not going to be done in one massive \$1 billion project. Instead, it’s gonna be done piece by piece. And as we do that we get better. And as we do that we come up with more ideas for the next thing. So, the process is actually propelling us forward, both in terms of applied technology and ambition of the stories we’re telling.” (City of Newcastle 2020, Interview with Smart City Advisor, 30 June) [43]

Later in the interview, both advisors from the City of Newcastle reflected on their aspirations and agreed that they should further review opportunities to explore new outcomes. The Heritage Advisor noted that the explicit convergence between smart city and heritage disciplines should be featured in the new heritage strategy that was in development.

“We’ve got a way to go, I think. And thank you for raising the topic of smart cities and heritage, because it is something that is unnaturally separated. As soon as you think about it for more than a few minutes, then you can see a lot of potential and mutually beneficial outcomes. And certainly, some of the projects that we’ve done with a heritage flavour have been some of our most interesting and successful ones.” (City of Newcastle 2020, Interview with Smart City Advisor, 30 June) [43]

“There is an opportunity to mention [convergence] in the new strategy. I don’t see there’s an issue not to mention it. I think it would probably help to be honest. It’s scarce an issue. In my mind, it’s in there, but it might actually help and strengthen things to state it explicitly. That’s probably a good pick up on the draft heritage strategy.” (City of Newcastle 2020, Interview with Heritage Advisor, 23 June) [46]

In summary, all of the advisors aspired to improve the convergence of disciplines within their local governments. The personal knowledge and the context of the cities coloured their aspirations. These formed a range of unique applications for Smart Heritage and highlighted the existing issues and visions that local governments have.

## 5. Discussion

The Smart City and Heritage Advisors reported a working relationship between the disciplines. While the advisors reported differences in perspectives and knowledge, the advisors resolved these issues through pragmatic communicating on a case-by-case approach. This finding indicates a supportive environment within the organisations for Smart Heritage but suggests that the interdisciplinary relationship is additive, dependent on advisors addressing pain points as they arise. Taking the lead from the academic literature, this approach suggests that knowledge silos exist between the disciplines, which would hinder efficiencies, effectiveness, and creativity in the relationship. Therefore, the disciplines within local government require ongoing support to ensure the sharing of knowledge and familiarity between them to remove the knowledge silos and enhance Smart Heritage operations [19,20,24].

Additionally, the advisors reported that the convergences influenced their perspectives on their disciplines. The advisors welcomed these influences. The heritage advisors gained a greater

understanding of smart technologies and the capabilities of smart cities, and the smart city advisors understood the aesthetic design and regulatory implications of their work. These findings are in keeping with the academic literature regarding the learning and reflection process of collaboration [25,26]. In particular, the advisors reflected the four modes of interdisciplinary influence by Nonaka and Takeuchi and tempered their discipline in the relationship [28,29]. The disciplines will likely continue to influence each other through ongoing Smart Heritage initiatives, resulting in further evolutions of Smart Heritage operations within a local government.

The advisors expressed a range of novel aspirations for their organisations resulting from the Smart Heritage collaborations. Some challenged the existing direction of the organisation, like for a citywide smart technology rollout and marketing initiative by the Heritage Advisor in Broken Hill City Council. Others aligned with the existing direction of the organisation, such as continuing installation of smart technology in historic buildings by the City of Newcastle's Smart City Advisor. These aspirations reflected the perspectives of the advisors and the context of the organisations. This finding echoed the academic literature on how novel interdisciplinary relationships lead to novel outcomes and how these can place unexpected demands on organisations [35–37]. Local governments should examine these aspirations optimistically as inspiration to address the growing complexities in their cities.

## 6. Conclusions

The research explores the interdisciplinary relationships, influence, and aspirations for Smart Heritage in local government for the first time in academic literature. Smart Heritage offers local governments a means of improving efficiencies and effectiveness in their outcomes. However, the research reveals additional knowledge regarding the operations of the Smart Heritage discourse within organisations.

The research identifies a relationship for Smart Heritage between the smart city and heritage disciplines in local government. The findings established there is an existing foundation for councils to construct Smart Heritage in their organisations. Yet, the finding also shows that the disciplines manage convergence on a case-by-case basis and through pragmatic communication. The unstructured approach is beneficial for project-specific outcomes but does not forge a replicable or scalable pathway within organisations for Smart Heritage to develop. The disciplines are still developing processes to share knowledge and converge comprehensively. This finding shows that the local government requires further guidance on integrating the disciplines structurally within organisations.

The research also demonstrates that interdisciplinary relationships influence the perspective that smart city and heritage advisors have of their discipline, with both disciplines experiencing greater awareness and appreciation for the other. This finding recognises that Smart Heritage is a driver of innovative perspectives on the smart city and heritage disciplines by challenging modes of thinking and introducing new lenses to the interdisciplinary discourse.

The research reveals that there are interdisciplinary aspirations for Smart Heritage in local government. The advisors expressed a range of novel aspirations to enhance the effectiveness of civic goals, such as economic uplift and liveability. Some challenged the existing direction of the organisations and others aligned. This finding signals that local governments should examine these aspirations optimistically for innovations to address the growing complexities in their cities, such as from urbanisation and climate change. Further research into the delivery and applicability of these aspirations would proffer valuable insights.

**Author Contributions:** Conceptualization, D.B. and M.A.S.; methodology, D.B. and M.A.S.; software, D.B. and M.A.S.; formal analysis, D.B. and M.A.S.; investigation, D.B. and M.A.S.; resources, D.B. and M.A.S.; data curation, D.B. and M.A.S.; writing—original draft preparation, D.B.; writing—review and editing, D.B. and M.A.S.; visualization, D.B. and M.A.S.; project administration, D.B. and M.A.S.; funding acquisition, D.B. and M.A.S. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Acknowledgments:** All interviews with the local governments were conducted with approval from the Victoria University of Wellington Human Ethics Committee # 0000028394.

**Conflicts of Interest:** The authors declare no conflict of interest.

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