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Mapping cultural and creative industry clusters in a World Heritage Site: a social network analysis approach

Abstract

This study focuses on the development of a cultural and creative industry cluster in the city of George Town, Penang, Malaysia. Since George Town was awarded World Heritage Status in 2008, there has been an increase in the number of organisations active in the cultural and creative sector. The city is characterised by its rich, multicultural heritage which includes both architectural and non-tangible heritage embedded in traditional crafts, oral history and languages. Besides this rich tradition, new initiatives developed by cultural entrepreneurs, artists and policy-makers aim to position George Town as a cultural centre and enhance its attractiveness as a tourist destination. The paper applies a relational approach to study the development of George Town's creative and cultural cluster using Social Network Analysis Methodology (SNA). The relational approach shifts the focus from the characteristics of individual actors to their connections with others since social embeddedness is a fundamental aspect of cluster development.

115 organisations from different subsectors in the local cultural and creative industries were interviewed in a semi-structured survey. The survey collected data regarding organisational attributes, the organisations' engagement with innovative activity and their networks of relations. Different relations were examined including collaboration, funding, advice, training and talent recruitment. The data suggest that organisations are mainly linked to other actors in George Town or Penang Island indicating local clustering. The collaboration network is extensive including relatively few isolated actors and a large main component. The network of funding is rather dependent of particular government organisations indicating the need to diversify funding sources. The network of advice shows some tendency of sectoral clustering in that there is limited interaction between sectors such as museums and heritage tourism. Finally, there is limited evidence of external training shown in the training network. The talent network is also relatively sparse and dominated by Penang-based educational institutions.

1. Introduction

The paper examines the development of a cultural and creative cluster in the context of a UNESCO World Heritage Site (WHS) in the city of George Town, Penang, Malaysia. Cultural clusters are a variant of the industrial clusters concept where it is assumed that the geographical concentration (co-location) of firms and supporting institutions can provide a source of competitive advantage (McDonald et al., 2006). There is stronger evidence of clustering among firms in the creative sector (Chapain et al., 2010) therefore there is a need for empirical analysis on the formation and resilience of these clusters. An examination of the related concepts of cultural districts argues that the concentration of small firms in an area is a key attribute although their interdependency is a more meaningful indicator of the existence of a district because it enables the flow of information, including tacit knowledge, and access to specialised inputs of production (Santagata, 2002). Hence, cultural districts can be viewed as networks of interdependent actors defined by the production of idiosyncratic goods based on creativity and intellectual property (ibid.). Considering the importance of interdependency, the study applies Social Network Analysis (SNA) methodology to investigate the cultural cluster in George Town in the form of networks of actors participating in an innovative milieu.

In Penang, Malaysia, the formation of cultural districts can be observed in the capital city of George Town which was historically divided into various districts and settlements based on ethnic groupings and cultural idiosyncrasies such as the cultural enclave, leisure zone, clan jetties, enterprise zone, the waterfront and the business district (GTWHI, 2016). With this unique cultural diversity, George Town was inscribed as a UNESCO World Heritage Site on 7 July 2008. Specifically, the capital city's inscription was due to fulfilment of three (3) criteria of the Outstanding Universal Value, namely, criteria (ii) George Town as an exemplar of a multi-cultural trading town, (iii) George Town's intangible and distinctive cultural heritage such as its diverse beliefs, ethnic enclaves, festivals, religious events, food and culture; & (iv) George Town's unique built heritage illustrated through the city's ensemble of shop houses and town houses (SGP, 2016). The site acts as "...living testimony to the multi-cultural heritage and tradition of Asia, and European colonial influences. This ... tangible and intangible heritage is expressed in the great variety of religious buildings of different faiths, ethnic quarters, the many languages, worship and religious festivals, dances, costumes, art and music, food, and daily life" (SGP, 2013: 4-1).

After the UNESCO listing, the Penang state government responded to global interest and began to use 'arts' to brand George Town WHS. Annual arts initiatives such as the George Town Festival and Urban Xchange projects have rapidly transformed George Town into a creative milieu for arts and aspiring artists (Penang Global Tourism, 2017). By 2011 George Town was mirroring other global heritage cities where cultural tourism has been unfolding in an unprecedented manner while the city is increasingly positioning itself to be a creative industries hub based on the vibrancy of contemporary arts, creativity and culture. Despite the growing interest in the creative and cultural industries, arguably, a 'monumental catalytic shift' is required to move Penang's creative industries up the value chain and to be more knowledge-based (Think City, 2016: 8). Five years later, the creative and cultural synergy escalated with

state and national levels initiatives undertaken to form more creative hubs and cultural districts such as the Penang Science Cluster/Accelerator for Creative Analytics & Technology Hub in George Town, a proposal for a Penang Arts District along with private small-scale cultural investments (e.g. Hin Bus Depot, Star Pitt Street) and other ongoing annual month-long George Town Festival (Think City, 2016: 8).

Evidence from other sites suggests that being awarded UNESCO World Heritage status has impacts on the local creative industries and on tourism flows but these impacts may concentrate on the early years following the inscription but are hard to sustain the momentum over the long term (Cuccia, 2012). Research in Asian WHS has controversially argued that the UNESCO badge is a powerful brand but sometimes fails to protect the cultural heritage it recognises (Caust and Vecco, 2017). Even the benefits to tourism are not always realised; research on Italian WHS indicated that the inscription has some negative associations with the performance of a tourism destination, possibly due to mismanaged expectations (Cuccia et al., 2016). Hence, it is still early to evaluate the full impact of the WHS inscription on George Town's cultural and creative sector. Nonetheless, there has been an increase in policy and entrepreneurial activity in the city following the inscription though more research is needed to identify the role of established organisations and those founded after the WHS inscription.

The creative and cultural value chains embedded within these cultural districts involve a myriad of local and external actors, constituting private firms, government institutions and civil society organisations. However, existing models of innovation and entrepreneurship ecosystem revealed a gap in the scope of these models in identifying civil society actors and the inadequacies in elucidating the phenomenon of cultural clusters. For instance, the widely used triple helix model examines innovation through the links among university-industry-government. Yet, recent reviews of the triple helix model position a strong civil society as the foundation of the triple helix since it can encourage interactions between the three components of the helix and thus enhance organisational innovation (Etzkowitz and Zhou, 2017). It is more obvious in the George Town context where there is a dearth of studies that investigate this enquiry given that research in creative and cultural value chains, cultural districts and creative cities are still at its infancy (Khoo et al., 2015). To fill this research gap, this paper aims to develop a relational model of innovation and entrepreneurship ecosystem for creative and cultural enterprises in George Town World Heritage Site. More significantly, the novelty of this paper resides in the application of Social Network Analysis to understand social network insights for the development of creative industries, creative economy and conservation of cultural heritage in George Town World Heritage Site.

The study aims to address the following questions

- What are the characteristics of the actors participating in the George Town creative and cultural sector? Attributes of the organisations include their creative industry sub-sectors, the organisation type, age and size
- What is the nature of interactions among the organisations in the sectors? Social Network Analysis (SNA) is applied to visualise and represent different types of relations including flows of funding and advice

- What organisations occupy influential positions in the different networks? These organisations could hold a mediator role enabling interactions among other actors and they can be instrumental in supporting innovative activity
- What does the structure of the resulting networks indicate regarding the potential for innovation in the sector? Attributes of network structure such as the tendency to form times with similar organisations (homogeneity), cohesion and networks closure affect openness to new ideas and practices
- What are the implications for policy makers in order to support an industrial cluster that has evolved organically over the history of George Town?

The paper is divided into five sections. The first section introduces the study, establishes the problem statement and ascertains the research objectives. Section 2 reviews literature regarding creative districts, creative clusters and the role of social networks in the development of the cultural and creative industries. Subsequently, section 3 briefly outlines the methodology before discussing the key findings in section 4. Section 5 concludes this paper by evaluating to what extent clustering is observed in George Town WHS. suggesting pragmatic policy implications and recommendations to develop creative and cultural districts in George Town WHS.

2. Literature Review: cultural clusters, creative districts and network formation in the creative industries

The literature review explores the concept of creative and cultural clusters & creative districts in order to examine the organisation and structure of the creative industries. In addition, the review examines the role of network formation in these clusters in order to justify the methodological approach.

The development of cultural clusters and cultural districts is positioned within the wider discourse of the creative city. Jacobs (1984) firstly developed the concept in innovation research regarding small scale craft industries. A creative city is meant to comprise elements such as specialist labour, bohemian population, availability of employment in new economy industries, a dynamic cultural environment including festivals and vibrant nightlife as well as distinctive architectural heritage which develop into a unified and symbolic identity with the potential in turning the city into a global brand (Scott, 2014). However, this account provides a simplified, ideal version of the creative city (ibid.). Changing urbanisation patterns and a shift from the Fordist paradigm towards a cognitive-cultural economy have led to increasing interest on the concept of the creative cities (Scott, 2008). Andersson et al. (2011) present different aspects of the concept such as the role of individual creative people, policy formulation, the supporting infrastructure, and the formation of networks and markets for creative industries outputs.

The concept of creative city is often linked to regeneration however, in the Asian context there are examples of successful cities such as Hong Kong and Singapore which aim to improve their overall competitiveness by positioning themselves as cultural destinations (Zukin and Braslow,

2011; Kong, 2009; Wang, 2009; Cartier, 2008). For instance, a thriving arts and cultural scene is considered to be a pre-requisite for the emergence of Singapore as a truly global city (Ooi, 2010; Kong, 2012). Many East Asian cities aim to become creative centres of the region; yet, relevant investment tends to focus on infrastructure development rather than on nurturing talent and skills (“hardware” over “software” investment) (Wu, 2005). Asian cities participate in the global trend towards cultural/creative city making; this process may generate tensions between culture as the living experience of residents and policy-making (Wang et al., 2015). Still, these initiatives are not only limited to promoting the local creative industries but also aiming to enhance the global identity of the city, strengthen the narrative of national culture and support the overall structural competitiveness of the city (ibid.).

The concept of cultural clusters is positioned within the debate on creative cities. A recent systematic review of the concept identifies that there is often lack of clarity in the terminology as the term cultural cluster is often used interchangeably with creative cluster, cultural/creative district or cultural quarters with the choice of term depending on the country context (Chapain and Sagot-Duvaouroux, 2018). Despite this lack of clarity one can identify the origins of the term in the wider literature on industrial clusters/districts and the benefits of clustering. Marshall (1920) first noted knowledge spillovers among firms, labour market pooling and the sharing of industry specific non-traded inputs as benefits of co-location and clustering.

There have been many attempts to imitate successful clusters through targeted policies. However, many successful cultural clusters have developed organically. According to Parilli (2009) policy inducement is only one parameter of cluster development: successful clusters also rely on social embeddedness (social cohesion, local demographics and attitudes to entrepreneurship) and collective efficiency, which can include actions such as joint sourcing and marketing efforts, and positive externalities such as access to labour and knowledge available in the cluster. Hence, top-down policy initiative complements bottom-up processes of cluster formation.

Cultural and creative clusters are characterised by both formal and informal collaboration, risk and information sharing through networks, and may also include “anti-establishment” action in the form of resistance to licensing authorities or to corporate power (Evans, 2009). Mommaas (2009) argued that an understanding of creative-cultural clusters should consider the changes in the cultural realm itself which has become less hierarchical but more commercialised. Ghafele and Santagata (2006) refer to the related term of tourist cultural cluster where natural, historical and social resources, and cultural experiences blend into the tourist space.

Proximity is another important parameter in industrial and cultural clusters. Despite assumptions that the rise of digital technologies would reduce the significance of geographical distance, co-location remains important: as Gottdiener (2000) predicted cultural producers still work within the built environment. Lazeretti et al. (2008) have noted the importance of geographical concentration in cultural clusters. Proximity is not limited to geographical distance but also has cognitive and social dimensions (Boschma, 2005). Firms located in the

same cluster are by definition spatially close but their cognitive distance could be high according to their knowledge base. The spatial dimension of creative clusters depends on the history and architecture of the cities; for instance, in Shanghai former colonial zones have a role in the organisation of the creative districts thanks to their heritage connection and the availability of workshop space (He and Gebhard, 2014).

In urban planning discourse, the concept of creative city and the planning of cultural districts in urban settings have moved to the forefront of urban policy agenda especially in developed cities like London, Berlin, Toronto, Melbourne and such. As a variant of industrial district, the birth of cultural districts in many Western cities occurred due to industrial decline in the city's economic base shifting from manufacturing to services and knowledge-based industries where elements of culture, creativity and innovation are now key factors of production that are integral towards sustaining the city's production and consumption. As an urban regeneration strategy, the presence of creative industries in cities has reorganised the city's economic base as well as its spatial form. The adaptive reuse of old industrial buildings for creative industries offers a space and place for collaboration between creative and knowledge enterprises which results in innovative clusters (Rutten, n.d.: 8). In the case of London and New York loft conversions have led to more creative use of space (Hamnett and Whitelegg, 2007; Zukin, 1982).

Essentially, a cultural district comprises of culture and creative enterprises or 'creative cluster' that refers to a connected ensemble of creative industries, firms and/or cultural activities that have spatial agglomeration (Foord, 2008: 99). The clustering effect within the urban milieu, arguably, is due to the enabling environment, cultural atmosphere and infrastructure that are attractive to the creative class which attributes to creative place making and liveability of the city (Florida, 2002, 2004, 2008; Kakiuchi and Takeuchi, 2014). Though the concepts of creative cities and cultural districts have scored highly as a viable urban development strategy, but scholars have also critiqued that the strategy exacerbates economic inequality and social exclusion by marginalising socially disadvantaged groups in cities (Pratt, 2011).

It is noted that the existence of proximity and the importance of social embeddedness in cultural clusters fosters collaboration and exchange of information among actors. SNA methodology is a suitable tool for visualising and analysing the different relations that are developed within the cluster. There is already a wide body of work that applies SNA to the study of the creative industries although many of these studies focus on particular sub-sectors rather than geographical location.

The research project applies a relational approach to the examination of cultural and creative industries drawing on Social Network Analysis methods. It explores how a relational approach would apply to the examination of an ecosystem in the cultural/creative industries. The debate on the development of cultural industries ranges between approaches that focus on individuals and their talents, and approaches that focus on firms and their ecosystems i.e. clusters (Chapain and de Propriis, 2009). The latter approach is more consistent with a relational analysis using SNA.

The concept of social network markets (Potts et al., 2008) provides further support to the application of SNA to the study of creative industries. According to the DCMS and other standardised classifications, the creative industries are identified by their outputs. Instead of focusing on classifications and industry boundaries which cannot fully represent the complexity of the industry, Potts et al. (2008) argue in favour of examining the nature of the markets that operate in these industries: these markets are not only dependent on the market mechanism but also on social networks since consumer choice is affected by the choice of others.

There are a number of examples where Social Network Analysis was applied to the examination of arts, culture and creative industries. A seminal article on art history used a network approach to examine the emergence of cities as cultural centres looking at births and deaths of notable individuals (Schich et al. , 2014). Another historical paper looked into the formation of networks of artists in Amsterdam and Rome in the early modern period using data from bibliographic databases and arts archives (van Heuvel, 2014). Regarding the contemporary creative industries Joel (2009) applied SNA to an analysis of the design sub-sector and its relation to other sectors. There are also examples from the sectors of film (Delmestri et al., 2005; Gattani and Ferriani, 2008; Grugulis and Stoyanova, 2012), communities of designers (Bettiol and Sedita, 2011) and fashion (Godard and Mears, 2009). A relational approach also enables us to evaluate the contribution of gatekeepers and cultural intermediaries who help cultural producers to access an audience for their products. Despite the claims that digital technologies would render their role obsolete, new forms of cultural brokers have emerged (Foster and Ocejo, 2015). The methodology of Social Network Analysis provides techniques to identify actors with a gatekeeping/brokerage role.

3. Methodology

Respondents

One hundred fifteen (115) respondents representing organizations within the creative and cultural cluster in Georgetown, Penang were interviewed. Most of the respondents held a key position in the organization (e.g. chairperson, co-founder, coordinator, director, managers and supervisors). The average number of years they were in the current position was 6.72 years (SD 6.289).

Organizations

Ninety-three (93) of these organizations reported that they are mainly focuses in the creative and cultural sector. The rest of the organizations are still involved in the creative and cultural sector but not as their main activity. Their main sectors included academic and education, hardware wholesale and technology. When reporting the more specific areas within creative and cultural sectors, most respondents identified more than one sectors. Only 7 organizations reported a single sector (i.e. Advertising and marketing, Craft (traditional and modern), Design (product, graphic and fashion design), Music and performing and visual arts, Cultural/religion centre & association, Gastronomy (traditional & modern). The rest reported involvement in

more than one sector. A closer analysis enabled these organizations to be categorised into one main sector (see Table 1). A majority of the organizations were business-private company (85 or 73.9 %) and based in Penang (104 or 90.4%). 38.3 % of the organizations reported a sales turn over of below RM300,000 or less than 5 full time employees. 27.0 % reported a sales turn over of between RM300,000 to RM3 million or 5 to 30 full time employees.

Table 1. Organizations based on their primary sector

No	Sectors	Frequency
1	Advertising and marketing	5
2	Architechture and interior design	3
3	Craft (traditional and modern)	4
4	Design (product, graphic and fashion design)	9
5	IT, software and computer services	2
6	Publishing	2
7	Museum, gallery and library	15
8	Music and performing and visual arts	14
9	Film, TV, video, radio and photography	6
10	Literary arts	1
11	Cultural/religion centre & association	9
12	Gastronomy (traditional & modern)	17
13	Training & education (in creative & cultural knowledge)	4
14	Other heritage tourism	11
15	Other (Please specify)	5
	Total	115

Data collection

There are different approaches that can be used to select participants for SNA research (see Knoke and Yang, 2008). Networks are in principle unbounded so different methods are used to delineate network boundaries. Some studies specify the population in advance and aim to collect data from each actor. However, it is not possible to implement this approach when a census is lacking. A combination of approaches was used in order to maximise the number of respondents and to deal with non-response issues. The study used a combination of the reputational approach where actors are selected on the basis of recommendations from key informants and the chain referral method (snow-balling) where actors are included in the network because they were mentioned as a contact by other respondents. In the case of the chain referral method respondents could refer up to five contacts without having to select from a list.

The process of data collection began with selecting the organizations. Once an organization was selected, arrangement was made to interview the respondent (i.e. key person). Interviews were conducted with only one key person from each organization. The key person was

identified based on their key role in the organizations (e.g. director, manager). The interview lasted one to two hours. The interview was conducted at a place and time convenient to the interviewee. Consent form was obtained prior to the interview. All interviews were conducted in 2017.

Selection of Organizations in the first layer interviews

Chain-referral method was used to identify and select the sample. The sample was selected by selecting the organizations. Organizations must meet the main criteria i.e. part of creative and cultural sector in George Town, Penang World Heritage Site. In the first layer of the interview, there were three approaches used to recruit the first layer of the organizations; 1) top down 2) bottom up and 3) personal links. Seventy (70) interviews were conducted in the first layer.

Top-down Sampling Approach

In the top down approach, three major organizations in the sectors namely Think City, Penang Institute and Georgetown World Heritage Incorporated were requested to recommend key players of the creative and cultural sectors in George Town World Heritage Site, Penang.

Think City was first established in 2009 with the objective to rejuvenate George Town. It is an urban regeneration organization with the aim to build liveable cities. It works closely with local governments, international agencies and local communities. Penang Institute on the other hand is a think tank funded by Penang state government. Its main objective is to help build Penang as an intellectual hub and cultural capital. It provides avenue for collaborations and exchanges that can help informed policy making and promote Penang's cultural activities. George Town World Heritage Incorporated (GTWHI) was established in 2010, also by Penang state government. The organisation is dedicated to protect, promote and preserve George Town as a UNESCO World Heritage Site. GTWHI works closely with the federal, state, and local governments and other non-governmental organisations to manage, monitor, promote, and execute heritage-related activities.

These three organizations work closely with the key players of creative and cultural sectors in George Town World Heritage Site, Penang. In the first round, 20 organizations were recommended by Think City, Penang Institute and Georgetown World Heritage Incorporated. However, only 10 organizations were willing to participate in the study. In the second round, 18 more organizations were recommended by Georgetown World Heritage Incorporated. Out of this, only 7 participated. In the end 17 organizations were recruited using this approach.

Bottom-up Sampling Approach

To further enhance the data collection process, a bottom-up approach was also administered. This approach can further be divided into two parts. Combining the contact lists provided by Think City and Penang Institute, a list of 421 organizations was created (see Think City report). Using Google random number generator, 11 organizations were randomly selected. These organizations again must meet the criteria as part of the creative and cultural sector in George Town Penang World Heritage Site. Out of the 11 organizations, only 4 organizations were willing to take part in the study.

In the second part of the bottom-up approach, a list of organizations was sourced from Google Maps and Yellow Pages. In the first round, 169 organizations were identified. Out of this list, 11 interviews were conducted. In the second round, 58 organizations were identified. Out of this list, 18 interviews were conducted. The selection of organizations in this phase was conducted to ensure representations from different sectors that have not been identified in the top-down and the first phase of bottom-up sampling.

Personal Recommendations

In this part, individuals working closely in George Town’s creative and cultural sector but were not part of the participants in this study were requested to identify key players within the sectors. Out of 37 organizations identified, 20 interviews were conducted.

Selection of Organizations in the second layer interviews

In the second layer interviews, participants were recruited based on the networks reported by the first layer organizations. There were a total number of 103 organizations identified. Out of this list, 45 interviews were conducted as shown in Table 2 below.

Table 2. Breakdown of Interviewees

		First Layer	Second Layer	Total
Top-down Approach	Sampling	17		
Bottom-up Approach	Sampling	33		
Personal Recommendations		20		
		70	45	115

Interview protocol

The interview schedule can be divided into 3 main sections:

- i. Respondent’s Background and Organization Information

For interviewee background the questions focused on their position with the organization including number of years, other roles and their general experience working in the creative/cultural sector. For questions regarding the organisation/company, they included the historical background, founders, activities and size of the organizations.

- ii. Innovation

Questions on innovation were further divided into 3 components: a) innovativeness, b) risk taking and c) pro-activeness. The questions applied an ordinal scale. For each question, respondents had to select whether their organizations employ ‘mainly high’, ‘mainly low’, or ‘about the same as high and low’ innovations in their activities. They were also asked to provide qualitative explanations for their answers.

iii. Social Network

One section of the survey focused on the relations of the respondent organisations. In these questions the respondents were asked to choose up to five organisations for each question and rank them according to the strength of the relations. The following relations were examined

1. Collaboration: this is a non-directed relation which may include different forms of collaboration such as joint exhibitions, performances or more broadly working with other organisations in any type of shared cultural project or initiative.
2. Advice: this is a directed network which indicates the flow of knowledge and information among network partners. Respondents were asked the question from the perspective of advice-giver and advice provider
3. Funding: this is also a directed networks which examines the flow of finance. Funding refers to grants, investment or subsidies rather than income from clients. Two relevant questions were asked regarding receiving and providing funding in order to generate the funding network
4. Talent flows: access to specialist skills is important in these sectors so respondents were asked to mention which educational establishment they tend to recruit from.
5. Training: This is also a directed network which relates to the flow of knowledge and information. However, training refers to more structured initiatives such as participating in a specific programme while the advice networks refers mostly to the informal exchange of knowledge
6. Value chain: information on key clients and suppliers was also provided. However, due to lack of clarity in the responses the resulting value chain network is not presented in this paper.

4. Results

This section will include visualisations of each of the respective networks in order to develop an understanding of the network structure. Due to confidentiality reasons the social network maps will not include the names of the organisations. The networks maps are included in the appendix. Table 3 summarises some of the descriptive data for each of the five networks discussed in this paper. These data refer to attributes of the whole network such as network size. Due to the nature of data collection not all networks are the same size: respondents did not have to select answers from a list so the size of the networks depends on the different nature of the relations.

Table 3: Network descriptive data

Collaboration network	Funding Network	Advice Network	Talent network	Training Network
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Network size	300	243	272	164	174
Main component size	203	117	101	78	10
Number of ties	624	202	211	110	69
Number ties in Main component	506	141	114	99	10
No of Isolate Actors	18	43	38	68	73
No of components	22	24	39	9	34
Average degree centrality	2.080	0.831	0.776	0.671	0.397

The 115 respondents are included in all the networks. Those that have mentioned no connections regarding the respective questions are listed as isolate actors. There are fewer isolate actors in the collaboration networks. The collaboration network is the largest in size and also more densely connected according to the degree centrality variable. The smallest network in size refers to talent: the respondents mentioned ties mainly to educational institutes in Penang. However, the training network is less densely connected according to average degree centrality (ties/number of actors). Many respondents mentioned that they only use internal training. The advice networks includes a substantial main component where the position of the actors indicates that there is limited interaction among the sub-sectors (see Figure 3).

The networks are divided into components. There are no paths among actors in different components. In the collaboration network the main component (the largest component) includes proportionately the largest part of the network indicating greater connectivity. However, the question arises regarding whether actors in smaller networks components would benefit from developing links to actors in the main component.

Core-periphery analysis is applied in order to evaluate the structure of the networks. It is assumed that actors in the network core are more likely to have a shared knowledge base and similar potential for innovation. Core periphery analysis is applied to the collaboration network as it is larger and more closely connected. According to the core-periphery analysis, only one actor George Town festival should be placed at the network core. The concentration measures indicating core periphery structure drop substantially is additional actors are moved into the core from the periphery. The core –periphery analysis examines how well the network fits a model where strong ties are observed within the core and limited links between the core and the periphery of the network. The model is tested for different size of network core

Finally, correlation analysis is used to examine the relations between innovativeness measures and network metrics such as centrality. A composite measure of innovativeness was developed to incorporate three dimensions (Chan and Lean, 2018). The correlations between centrality measures in the collaboration networks and the innovativeness construct are shown below.

Table 4: correlation of centrality measures and innovativeness

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Innovativeness	1	0.26	-0.031	0.276
Degree	0.26	1	-0.512	0.883
Closeness	-0.031	-0.512	1	-0.493
Between	0.276	0.883	-0.493	1

Positive but rather weak correlation is observed between innovativeness and betweenness centrality & degree centrality. Degree centrality indicates the number of ties an organisation has while betweenness addresses how many geodesic paths (shortest possible paths) a network node belongs to (Freeman, 1979). Hence, betweenness indicates to what extent an actor could act as mediator. However, it is not clear whether more innovative actors are more likely to develop collaboration links or whether additional collaboration links enhance their innovativeness. Actors with high closeness centrality have shorter average distances with other actors in the network meaning that they are easier to reach (1979). This should improve their absorptive capacity for innovation but negative correlation was observed in this case.

Additional analysis is needed in order to apply regression models and identify the direction of causality between innovativeness construct and networks positions, controlling for organisational attributes such as size, subsector and age.

5. Discussion and conclusion

There is sufficient evidence regarding the establishment of a cultural and creative sectors cluster in George Town. The inclusion of heritage tourism and gastronomy actors suggests that there are connections between cultural clusters and tourism clusters although there is not sufficient evidence at this stage to refer to a tourist-cultural cluster. The information on network size and the observed overlaps in the composition of the different networks indicate that the study is to a degree representative of the network formation activities undertaken by industry actors.

There are a number of organisations that occupy central roles within the network structure. The annual festival holds an important role to the degree that it can be perceived as a field-configuring event in the sector (Lampel, 2011). Similarly, one can observe that government organisations such as the State Government and public sector tourism organisations have substantial role in the funding network which is quite centralised. Yet, there is a need to diversify funding sources to ensure the sustainability of the clusters particularly as support from the urban regeneration think tank may shift to other regions of Malaysia in the future. The diversification of the funding sources to include commercial investment could also improve information provision to small, cultural entrepreneurs. The reasons why creative sector organisations do not request commercial funding are varied: evidence from UK suggests that they are more likely to worry about rejection or the terms of commercial loans (BIS, 2011). With regard to the advice network the central role of the WHS organisation is noted along with the role of museums and tourism organisations in some of the network clusters. However, there is limited interaction between organisations with a heritage preservation focus and the tourism sector.

Preliminary data do not indicate strong links between the centrality position of the organisations and their attitude to innovation. Additional analysis is needed to demonstrate the links between centrality (network positions) and the three constructs of innovativeness used in

the study controlling for factors such as the age of the organisation (since older organisations may have had more time to develop an extensive network).

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Appendix Figure 1 Collaboration Network

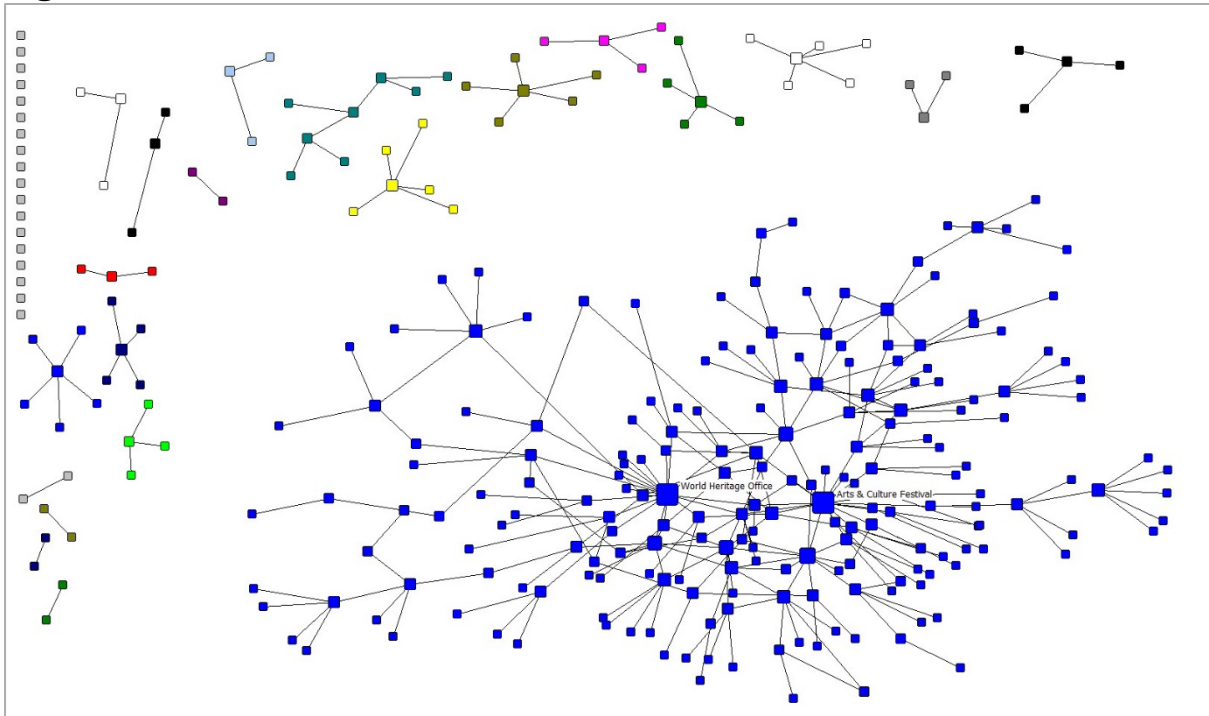


Figure 2 Funding Network

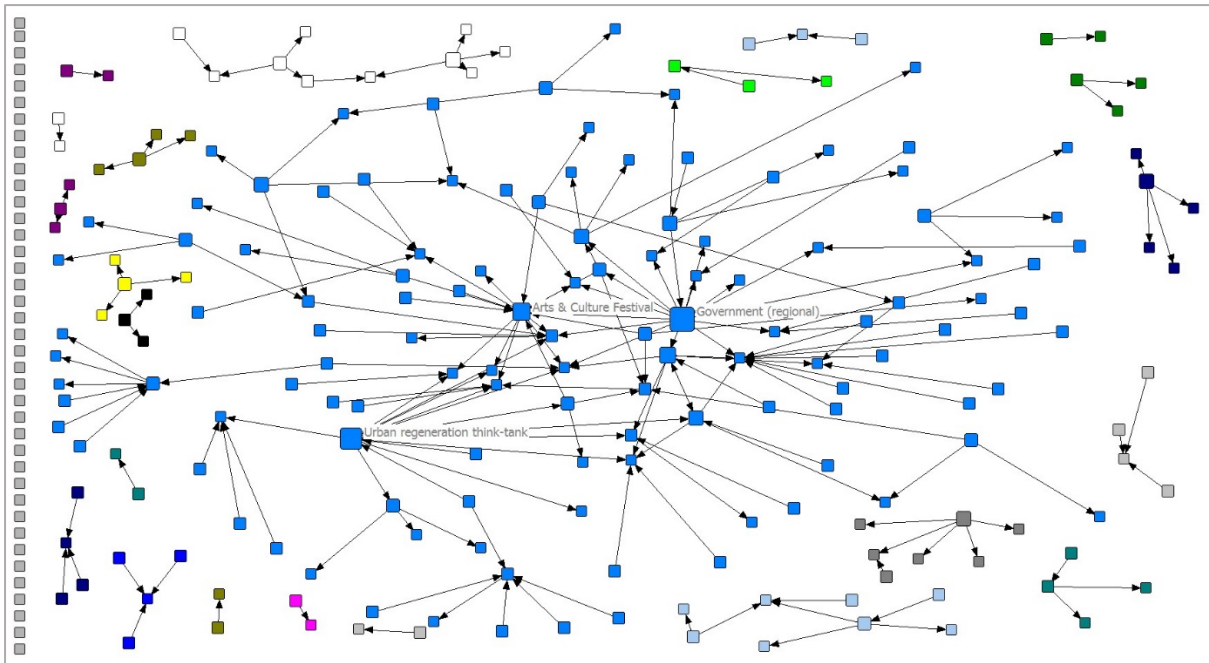


Figure 3 Advice Network

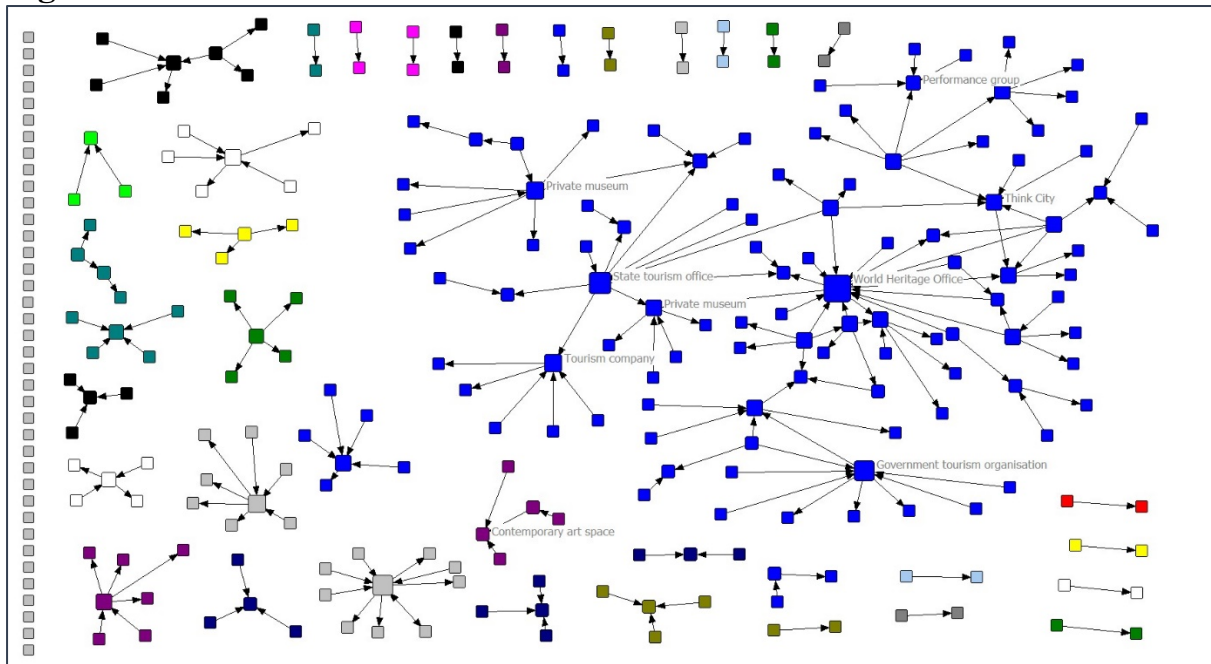


Figure 4 Talent Network

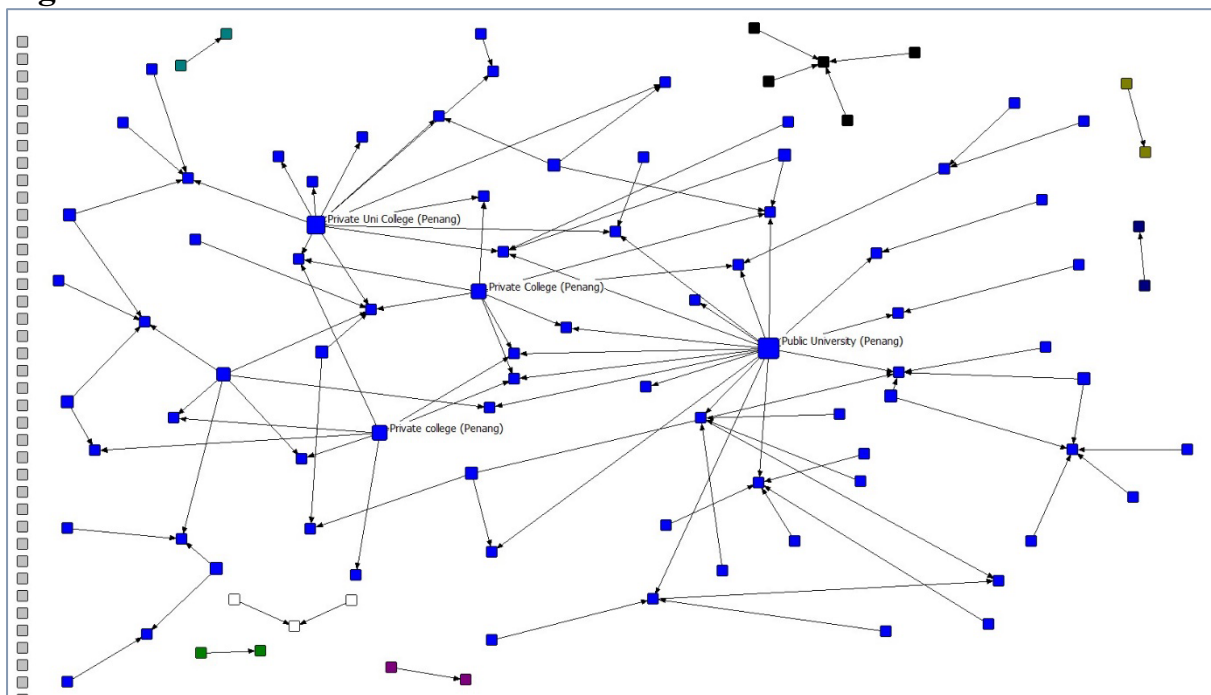


Figure 5 Training Network

