

Insights on Creative Networks: A Social Network Analysis of Five Arts Organisations

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Abstract: Many arts organisations can generate large amounts of value through their activities and networks, but often find it difficult to gather, analyse and evidence the data that can inform business decisions and leverage opportunities for product and service innovation. Compared to larger corporations, the creative ecosystem in which they operate depends on “quick business” and requires them to be more agile, adaptive and faster when identifying hidden potential within their networks. Moreover, their interdisciplinary and collaborative ways of working create emerging opportunities for spin-off companies and other entrepreneurial ventures. This study (part of the Arts API Project) aimed to examine the networks of arts organisations to understand some of their defining features and characteristics. The project aimed to show that by visualising and analysing relational data, it was envisioned that arts organisations would be able to operate on a more evidence-based, commercial and entrepreneurial basis, enabling better informed decision making and more defined business strategies. This paper focuses on the role and value of big data in the Arts and Humanities, provides the context and background to the Arts API Project and outlines the methodological approach, presenting one particular aspect of the larger research project. Adopting the technique of Social Network Analysis (SNA), the networks of five UK-based art organisations were visually mapped and analysed using measures such as Density, Connectivity, Centralization and Clique Participation Index. Within the limitations of the study, the findings reveal valuable insights on the effect of de/centralisation of information flow within creative networks, the importance of maintaining a balance between weak and strong network ties and mitigating risk by distributing responsibility across networks.

Keywords: big data, creativity, relationships, value, network structures, innovation

1. Big Data in the arts and humanities

In 2006 when Clive Humby, the inventor of the Tesco Loyalty Card, announced that “data was the new oil”, there were very few people that recognised the value of data in the creative and cultural sector. Fast forward to the 2020’s and we are arguably amid a new economy, an economy that is driven by understanding and using “big data”. De Mauro, Greco and Grimaldi (2015) usefully point out that:

“Big Data represents the Information assets characterized by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods for its transformation into Value”
(p. 103).

Some people claim that the use of data within the arts and humanities is only “in its embryonic state” as they have traditionally not engaged in collecting data to inform their business strategy to the same extent as other sectors (Lilley and Moore 2013; Schiuma and Carlucci 2018). Moore (2016) elaborates on the reasons behind the slow uptake compared to other sectors, pointing out that arts organisations find it difficult to drive forward their business according to traditional Key Performance Indicators (KPI) and that technology might be perceived as not making desired contributions in a creative and cultural context. Others, however, claim the arts are now leading the way in reimagining the human relationships with data (Scott 2019). The reality is something in-between. Indeed, there are areas of the cultural sector which are leading the way in using data, but there are others that drastically need updating. It is in this complex web that a vast array of practices that an answer or several answers will likely emerge. As with all forms of interpretation, the understanding we draw from data will depend on the methods, practices, processes, and techniques we use. Writing from a digital transformations perspective, Prescott (2015) suggests, in the prompting of creative endeavours within the arts and humanities, that “among the many important contributions they can make is a strong awareness of the significance and cultural contexts of design and visualisation, a profound sense of the way in which data is culturally and socially situated, an awareness that data is never ‘raw’, and an ability to move between macro and micro perspectives”. It is therefore pragmatic that this paper focuses on the different uses of digital tools and methods and their appropriateness in the Arts and Humanities, particularly in the context of how arts and other cultural organisations can identify and use data to demonstrate impact and drive decision making inside their businesses. Indeed, arts organisations are unique in the way in which they operate, relying heavily upon the informal and formal networks they create and sustain (Bruce, Malcolm and O'Neill 2017). This is largely a result of the

precarious employment, and reliance on external funding, which is prevalent in the sector therefore impacting on long-term business commitments (Opara et al, 2019). Understanding their own data and the value it offers can enable them to discover the hidden potential that lies within their network and allow them to leverage opportunities for product and service innovation. Compared to larger corporations, the creative ecosystem in which they operate depends on “quick business” and requires them to be more agile, adaptive, and faster when identifying and responding to arising opportunities within their networks (Opara et al, 2019). Moreover, their interdisciplinary, inclusive, and collaborative ways of working create emerging opportunities for spin-off companies and other entrepreneurial ventures, which can be better exploited through the analysis of network relationships (Bruce, Malcolm and O'Neill 2017). Therefore, more studies are clearly needed to understand how data can be used to create added value, which in turn helps arts organisations align and strengthen their core competencies and improve their interactions with stakeholders (Pesce et al, 2019). It is this knowledge gap that was the catalyst for this research study. In 2013, recognising the importance of understanding data to create value in the cultural sector, a £7 million fund from Arts Council England, the Arts and Humanities Research Council and Nesta was launched to support collaboration between arts projects, technology providers and researchers to explore the potential of innovating new business models and services around data. The Arts API project was a year-long project led by FutureEverything (lead arts organisation), University of Dundee (academic partner) and Swirrl (technology partner), made possible through the Digital R&D Fund for the Arts. Many arts organisations can generate large amounts of data through their activities and networks. The wider aim of the Arts API project was to develop a web-based analytical tool that would allow arts organisations to make more sense of a variety of data sources (such as email or social media) relating to their business activities and networks (Bruce, Malcolm and O'Neill 2017). In doing so, it would enable organisations to improve their decision-making and subsequently increase productivity and innovation potential. Applying the technique of Social Network Analysis (SNA), data was gathered and analysed from across five UK arts organisations to ‘model’ their existing network structures to inform the development of the Arts API tool. Creating a blueprint and automating certain aspects of SNA processes (a tailored version of SNA) the tool would allow the organisations to filter the data in specific and targeted ways, categorise, recognise and add value to their business endeavours. This paper presents one aspect of the larger research project, which focuses on the analysis of the network measures and what they can reveal in terms of innovation activity of an arts organisation.

2. Social networks analysis and creative networks

In the past two decades, the growth of social media along with the widespread adoption of social networking platforms like Instagram, Facebook, Twitter and LinkedIn have transformed the way in which people communicate, interact, and build personal and professional relationships online (Scott 2017; Yang, Keller and Zheng 2017). These platforms have, to some extent, become an integral part of everyday life, helping people connect, share and use knowledge and information online. In sociology, however, the analytical use of social networks can facilitate a much broader contribution around all kinds of network relationships, anything from geopolitical environments and countering terrorism (Choudhary and Singh 2015), to measuring health and infectious diseases (Nagarajan, Muniyandi, Palani and Sellappan 2020). Acknowledging the many conceptual-theoretical explanations of Social Network Analysis (SNA), Professor of Sociology, John Scott, offers the following definition (Scott 2012):

“Social network analysis is a collection of concepts, measures, and techniques for relational analysis. It is an approach that is specifically designed to grasp the most important features of social structures and it is unrivalled in this task. It can be used to explore social relations themselves and also the cultural structures of norms and ideas that help to organise those relations in conjunction with material circumstances” (p. 85).

SNA can therefore be used to make sense of relational data that connects people within a distributed network by capturing a visual representation of social structures (e.g., status, roles, groups, and institutions) across micro, meso and macro levels, as well as deriving insights through deeper quantitative analysis (Bruce, Malcolm and O'Neill 2017). Borgatti, Everett and Johnson (2018) usefully point out that “a generic hypothesis of network theory is that an actor’s position in a network determines in part the constraints and opportunities that he or she will encounter, and therefore identifying that position is important for predicting actor outcomes such as performance, behaviour or beliefs” (p. 1). Furthermore, understanding the connections within and across the extended boundaries of a network, especially in terms of recognising weak and strong ties, can either facilitate or impede problem solving, decision making and innovation performance (Bruce & Baxter 2008). Arts organisations in particular, rely heavily on the creativity and characteristics of individuals as well as their ability to establish and sustain positive working relationships via networks to identify and generate new business

opportunities (Kim et al, 2016). However, Gaggioli et al (2013) usefully point out that creativity “is never the result of [an] individual acting alone” (p. 2) and that all individuals are influenced by the social landscapes in which they operate (Csikszentmihalyi 1999). Research has also shown that “creativity as a social process is premised on the idea that exposure and interaction with others stimulates the generation of new ideas” (Perry-Smith & Mannucci, 2015 p. 8) and therefore Social Network Analysis can be a useful tool in identifying the structure and patterns of relationships within a network to understand creative endeavours. Further research on social networks and creativity has revealed that “weak ties enhance creativity when information recipients are highly open to experience, have more domain knowledge, have an innovative style, and are intrinsically motivated” (Kim et al, 2016, pp. 285). So, the fluidity of arts organisation networks can contribute to the creative process, through idea generation, project development and delivery, and reflexivity through the evaluation of their activity. The flow of information facilitates communication within these networks, and it is useful to know how the ‘flow’ operates.

3. Data gathering

The overarching goal of the wider 1-year research project was to explore the creative networks of arts organisations to help inform the development and testing of the Arts API tool. Within that 1-year project the research team spent 6 months understanding the value in the inter- and intra-organisational relationships that exist within their networks, both formally and informally, resulting from their daily business operations. Due to the high-risk nature of the R&D project, the arts organisations were pre-selected by the lead project partner, FutureEverything, as there was already a high level of trust and well-established working relationships. In addition, the project aimed to further enhance these relationships through the development of the Arts API Tool. Adopting the technique of SNA, the internal and external networks of five UK-based arts organisations were visually mapped and analysed over the same 4-week period, using a modified version of Cross and Parker (2004) six-step process, as outlined in detail in a previous paper by Bruce, Malcolm and O'Neill (2017):

- 1. establishing the objectives of the analysis – through a detailed review of the literature the different components of a creative ecosystem were established, for example, information exchange, sharing ideas, and the creative process.
- 2. administering the online survey/questionnaire in the form of a modified Lickert Scale for data collection based on these key components.
- 3. organising and processing the data into numerical values, exported as Excel data (.csv) to import directly into SNA software package (Cyram NetMiner) to create visualisations of the network maps.
- 4. analysing data gathered through network measures, such as, density, centralisation, and Clique Participation (see below).
- 5. formulating findings and insights to establish key features (or ontology) of the Arts API tool; and
- 6. reflecting on the process and preparing to present findings back to project partners.

For this paper specifically, four key questions from the online survey were used to explore the data and draw cross comparisons across the five arts organisations:

- 1. Who do you regularly engage with professionally outside of any particular project? For example, in ongoing or strategic activity? (Mapped as Professional Engagement Network)
- 2. Who would you most likely engage with when initiating and generating new ideas for business opportunities?
- 3. Who do you actively collaborate with in the delivery of a project or activity? (Mapped as Collaboration & Project Delivery Network)
- 4. Who would you most likely engage with in the evaluation of project outcomes, impacts and benefits?

For the purposes of this paper, only a sample of the data gathered is presented below (Questions 1 and 3). However, key findings from all the questions are considered in the evaluation and analysis of the data when drawing comparisons across all arts organisations studied.

The following SNA measures used to inform both the arts partners and the development of the Arts API tool are briefly outlined below:

- **Density** is a measure that determines the degree of connectedness among nodes within a network. It is defined by the number of direct connections a node has, expressed as a percentage of the maximum possible (Kilduff and Tsai 2003). It provides insights into the network potential that could exist, if new connections are established among nodes (in this paper, “nodes” are used synonymously with the term “actors”). Networks with high density can exchange information much more quickly than low-density networks (Bruce, Malcolm and O'Neill 2017). Density is also highly correlated with Degree Centrality and Connectivity.
- **Connectivity** is a measure of the minimum number of nodes which would need to be removed to disconnect a network. Connectivity therefore provides insights into the vulnerability of a network if nodes in a network are removed. A highly connected network will generally have a high-density score and low levels of vulnerability. In contrast, a network with weak connections will have a higher level of vulnerability.
- **Centralization Index** is a measure of how central nodes are within a network. It is a percentage measure of how similar a network is to the Star Network (i.e., a network where all other nodes in the network are only connected to one central node and no other. Thus, for all nodes to reach other nodes in the network, information exchange must be passed through the central node. The central node is the most powerful node in the network and acts as the gate keeper of all communication and information exchange. Highly centralised networks have high Centralization Index scores, as they are more like Star networks, with one or two highly powerful central nodes controlling information flow.
- **Clique Participation Index (CPI)** is a measure of to what extent the nodes of a network are involved in sub-groups (cliques) within a network. It is calculated by firstly establishing the number of cliques within a network as well as the number of participant nodes in each clique. The number of nodes in each clique is then added together and divided by the number of actual nodes in the network. High CPI identifies high participation by nodes within subgroups (i.e., lots of nodes actively engaging and connecting with each other from group to group). Recent studies have identified a link between high CPI and high social presence within a network. This has also been correlated with a move towards the optimal experience of networked ‘flow’ and thus an impulse towards originality and creativity in group performance. So, high CPI scores can be viewed as an indicator of how well a group might perform creatively in a particular context.

In sum, the SNA software package provided both visual and mathematical analysis of all network maps across the 5 arts organisations to be performed. This allowed the research team to identify ways of structuring the data in standard formats based on the classifications of Impact Indicators and Innovation Drivers developed through SNA research, which in turn was then used to inform the development of the tool as well as further analysis on innovation potential inside the organisations.

4. Drawing comparisons and generating insights

Applying SNA measures of Density, Connectivity, Centralization Index and Clique Participation Index (CPI), comparisons of network scores were observed across all five arts organisations and insights generated about the wider arts sector. Table 1 shows the results of the SNA measures generated for (Q1): *Who do you regularly engage with professionally outside of any particular project?* Figures 1-2 show Connectivity and CPI measured in relation to Density. Density was used as a baseline measure to allow the data to be organised in a useful and logical way across the arts organisations. It is clear to see that Organisation 1 has the lowest Density score (0.012), whereas Organisation 5 has the highest density score (0.044). This is because Organisation 1 has a much larger, more distributed network than Organisation 5. The high Centralisation score of Organisation 5 is therefore a function of its smaller size. Interestingly, the density scores for the networks of all the arts organisations are particularly low, indicating the type of networks they create and sustain are loosely connected through many pendant nodes lying on the periphery. In other words, the networks are characterised by a densely connected core group of people that work for the organisations, some of whom are broadly connected to multiple external nodes by weak ties. What is also noteworthy is that as Density increases linearly so does Centralization. The findings are not surprising as they reflect the way in which arts organisations generally operate with a small core team engaging with a larger network of peripheral freelancers, temporary project partners or service providers. Due to prevalent funding structures and project-based activities of arts organisations, they are required to be flexible and adaptive to change to grow, develop and innovate. While this small core team act as gatekeepers or brokers, generating connectivity and information exchange across the network, business opportunities can possibly be lost or unexploited, if already well-established peripheral connections are not continually nurtured and developed.

In Figure 1, the step change in Connectivity indicates that it is not highly correlated with Density, even though the trend suggests otherwise. The network scores for all the organisations are relatively low. Scores close to 1 indicate that it will only take the removal of one or two highly central nodes to disconnect the network, thus exposing how vulnerable all the arts organisations are should they lose key individuals. As discussed above, relying solely on a core group of people also suggests that innovation potential can be limited or even lost if any unforeseen changes in the network occur.

Table 1: SNA measures – Professional Engagement Network (PEN)

Professional Engagement	Density	Centralization	Connectivity	CPI
Organisation 1	0.012	0.181	0.843	0.427
Organisation 2	0.020	0.242	1.120	0.512
Organisation 3	0.022	0.328	1.082	0.510
Organisation 4	0.038	0.374	1.387	1.583
Organisation 5	0.044	0.483	1.253	1.047

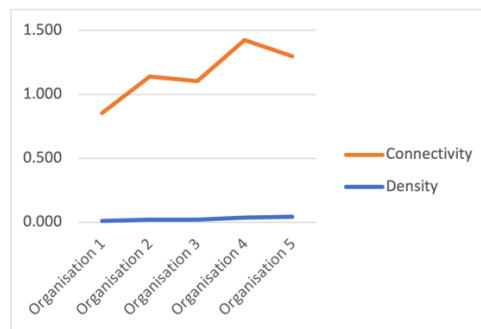


Figure 1: Density and Connectivity – (PEN)

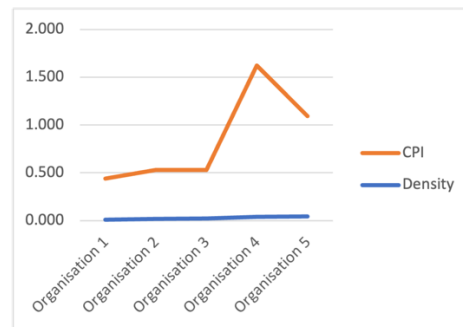


Figure 2: Density and CPI – (PEN)

Organisation 4 has high Connectivity and High Centralization scores compared to all the other art organisations studied (Table 1). Organisations 1, 2 & 3 all exhibit lower levels of CPI within their networks (Figure 2). Organisation 5 has a moderately high CPI score in relation to higher Centralisation and Connectivity scores. Indeed, these scores highlight something uniquely different in the way in which Organisation 4 creates and sustains its professional engagement network, in comparison to the other organisations. For instance, its network contains a very high number of overlapping cliques (sub-groups) that contain a range of both internal and external stakeholders. Most of the cliques appear to be internal sub teams within the organisation but there are several cliques where external stakeholders play a significant role when engaging in project activity. In addition, many of the nodes are involved in multiple cliques. This is highly significant in terms of developing open channels of communication, where attaining optimal flow within the network and ultimately the creative endeavour of the organisation is paramount. Organisations 1, 2 & 3 have very few cliques beyond the internal organisational structure while Organisation 5's higher score reflects its relationship with several key external nodes that are clearly involved in the professional strategic activities of the organisation. Overlapping cliques tend to be quite powerful within a network as they promote knowledge exchange and provide a good foundation

for innovation activity to occur. However, if innovation is complex and requires sharing of tacit knowledge, arts organisations might need to think more carefully about how they integrate and foster multiplex relationships.

Table 2 shows the results of the SNA measures for (Q3): *Who do you actively collaborate with in the delivery of a project or activity?* Figures 3-4 show the Connectivity and CPI scores measured in relation to Density.

To gain additional insights into the day-to-day working of arts organisations, it was important to consider levels of network collaboration around the delivery of projects. It was found that the networks generated were much smaller and more focused when compared to professional engagement activities, resulting in a slight increase across all network scores.

Looking at Centralization, similar patterns to the Idea Generation Network were observed. Scores were around similar lower levels (between 35% and 45%), except for Organisation 2 (65%). Again, this suggests that Organisation 2 has a highly centralised network for both collaboration around project delivery and idea generation activities (to be discussed at a later stage).

Table 2: SNA measures – Collaboration & Project Delivery (C&PD)

Collaboration & Delivery of Projects	Density	Centralization	Connectivity	CPI
Organisation 1	0.050	0.352	1.234	0.860
Organisation 2	0.076	0.652	1.508	0.529
Organisation 3	0.031	0.465	1.096	0.450
Organisation 4	0.053	0.414	1.552	1.458
Organisation 5	0.036	0.434	1.11	0.818

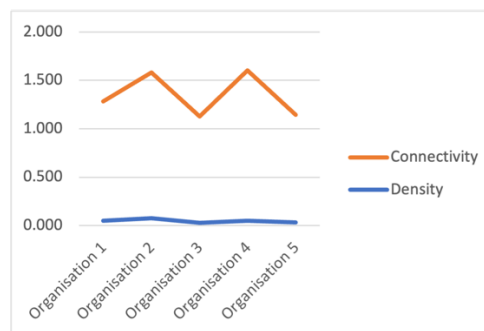


Figure 3: Density and Connectivity – (C&PD)

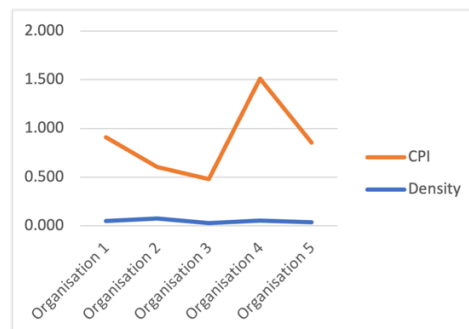


Figure 4: Density and CPI – (C&PD)

Several important insights can be derived in relation to Connectivity (Figure 3). Organisation 4 has the highest Connectivity score, which is closely followed by Organisation 2. As such, it appears that as the Density of a network increases so does Connectivity. Organisations 2 and 4 both are relatively densely connected compared to the other organisations. When comparing CPI scores, Organisation 2 has the densest and most centralized collaborative network but one of the lowest CPI scores (Figure 4). This is particularly interesting when compared

to Organisation 4 which has the highest CPI score, second densest, and the most well connected, collaborative network. Like previous networks, centrality appears to be play an important role in relation to CPI. For instance, Organisation 4 has a relatively low Centralization score compared to Organisation 2 and this points towards an inverse relationship between high Centralization scores and low CPI scores. As mentioned above, the importance of overlapping cliques is paramount for innovation, therefore a high Centralisation score and low clique participation might suggest that Organisation 2 is at a slight disadvantage in the long term and needs to consider reorganising and redesigning their organisational structure. By making sure that information, ideation and entrepreneurial thinking can spread across the whole organisation in a robust and flexible way, Organisation 2 can ensure a more agile and responsive approach in fostering innovation.

It was important to examine idea generation because of its significance within the innovation process. Analysing the network maps for Q2: *Who would you most likely go to in order to brainstorm and generate ideas?* it became clear that Density, Centralization and Connectivity of all networks increased as they became more focused on particular topics. It was also found that four of the organisations had very similar levels of Centralization. However, notably Organisation 2 had a significantly higher score (68%) suggesting that a few influential nodes (or central connectors) might be affecting the organisations' ability to operate in either positive or negative ways (Cross and Parker, 2004). Again, this is a similar finding to previous network maps analysed in relation to Organisation 2, where the centralised organisational structure is putting the organisation at a potential risk of not being able to innovate and exploit new business opportunities. According to Kilduff and Tsai (2003) "organisations with highly centralised information networks may tend to be more mechanistic in their functioning, whereas organisations with multiple centres may be more organic" (p. 32). In addition, CPI scores reveal something interesting in relation to Idea Generation. Organisations 4 and 5 have relatively high CPI scores, but not as high as their Professional Engagement network. Organisation 1 has the highest (around 1.1) indicating that it has a relatively high occurrence of clique participation compared to the other organisations. Overall, there appears to be a trend that when Density and Connectivity are high, CPI may also be high. However, this is not necessary the case for organisations that are highly centralized like Organisation 2, as optimal flow and creativity are dependent on the free flow of information and collaboration between nodes in the development of cross-fertilizing clique participation. Taking a closer look at Q4: *Who would you most likely engage with in the evaluation of project outcomes, impacts and benefits?*, an inverse relationship between increasing Density and decreasing Centralization was observed. This meant that there were more dispersed connections within the network displaying flatter hierarchical structures. Likewise, similar trends were noted in clique participation where all organisations had high scores with the exception of Organisation 2, again highlighting the lack of overlapping cliques. This suggests that the highly centralised structure of Organisation 2 is likely to prevent it from performing effective and collaborative evaluations of project outcomes, impacts and benefits, which subsequently could have a negative effect on the learning and development of the organisation, although further analysis needs to be undertaken.

5. Discussion and conclusion

This research has created some interesting findings in terms of the network characteristics that drive arts organisations' business activities and innovation potential. All the arts organisations examined are characterised by extended networks that have notably low-Density, and Connectivity compared to organisations in different sectors. A major finding of this research is that the networks created and sustained by arts organisations are uniquely vulnerable. In other words, key nodes in arts organisations play bridging roles (also known as boundary spanners) across a range of domains that are not interconnected to other organisational employees (Marrone 2010; Birkinshaw, Ambos, and Bouquet 2017). In cases of such vulnerability, the loss of any key member of staff (i.e., resignation or sickness) would likely result in the loss of connections to a significant number of nodes within and across the network, resulting in missed business opportunities and lower innovation capabilities. This observation is, in part, a result of the nature of the restricted investigation. A decision was made to investigate the wider context in which arts organisations exist (i.e., their lifeblood in terms of business performance), as well as concentrating on the internal dynamics of organisational structures, which would be naturally much denser and more robust due to their smaller size. The size and complexity of these networks beyond the internal organisation meant that it was unmanageable to administer the survey and questionnaire to all nodes identified in the network. Thus, a deeper exploration of the internal structure of organisations (reciprocal relationships) as well as employees' outgoing connections were captured. However, the incoming connections of the external networks were limited in this study. No doubt these circumstances have affected the results, but the overarching goal was to inform the development of the Art API tool. In addition, the data gathered only covered a short

timescale, as to ask participants to enter all their professional contacts and partners would take a considerable amount of time and make the survey unwieldy. As such, participants were asked to enter contacts they had made connections with over the period of one month. As a result of this limited timescale, it meant that this study would be limited across time and space. Nonetheless, another interesting finding that emerged through the investigation was the relationship between Centralization Index measures and CPI measures. The data revealed a possible link between increasing Centralization and decreasing CPI. It makes sense that organisations which are decentralised, highly connected and uninhibited from hierarchical power structures, are the ones capable of forming numerous collaborative sub-groups with both internal and external stakeholders, which fosters innovation activity. These organisations can therefore reach optimal flow and potentially higher levels of creativity exhibited by higher CPI scores. This concurs with earlier work by Mazzoni (2014) where CPI is a strong indicator of collective creativity. Indeed, Organisations 1 and 4 exhibited such network characteristics and to a degree provide a business model for other arts organisations to consider in terms of future design and development. Hence, all art organisations should consider ways in which they can strengthen connectivity within their networks to increase robustness and improve resilience. This helps to overcome vulnerability with the loss of key staff in the workplace, as this more than Centralization, is potentially the greatest threat to their longevity. Undoubtedly, extending the length of the study to examine the network activity of the arts organisation on an on-going basis would allow the highs and lows in business activity to be explored, enabling organisations to recognise pressures and opportunities in real time and adapt current business models accordingly. The following key learning insights can be derived from this research:

- Arts and cultural organisations need to be agile and flexible in the way in which they operate to tap into ad hoc business opportunities, funding sources and foster innovation activity. This study suggests that this can be best achieved by decentralising network structures and nurturing collaborative environments, which in turn result in overlapping cliques of both internal and external project partners and other relevant stakeholders.
- Similarly, arts organisations need to perpetually improve creative output to sustain their daily business activities. Therefore, they require optimal information flow within their network, which, as data suggests, can also be best achieved through decentralised clique participation.
- Arts organisations generally find it difficult to scale up, which leaves them in a constant state of vulnerability. They should consider mitigating this risk by strengthening connections that already exist in their network and distributing key business responsibilities across their employees to eliminate single point of failure across the organisation.
- Arts organisations need to constantly navigate the predicament of maintaining many “shallow” but robust relationships in order to maximise awareness of new business opportunities, however, these weak network connections may result in missed opportunities to learn, grow and innovate.

The findings of this research have helped develop the Arts API web-based tool as a proof of concept. It enabled the research team to examine networks and hidden value in email data across several arts organisations. With further time and funding, the following should be considered:

- Extending the length of the study to examine the network activity of the arts organisation on an on-going basis. This would allow the organisations to explore the highs and lows in business activity, enabling them to recognise pressures and opportunities to adapt current business models accordingly.
- Expanding the SNA capabilities of the Arts API tool by incorporating other network measures like Connectivity and Clique Participation Index as reported in this paper.
- Developing a more interactive and customisable user interface for the Arts API tool to allow deeper manipulation of the data. Ideally moving to more real time manipulation and filtering of sectors.
- Broadening the capabilities of the tool to enable engagement with other sectors beyond the arts (e.g., design, new venture creation and innovation management). The tool has unlimited potential to enable the modelling of organisational networks in these sectors as well as the Arts.

Further research is currently being undertaken and will be presented in future publications.

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