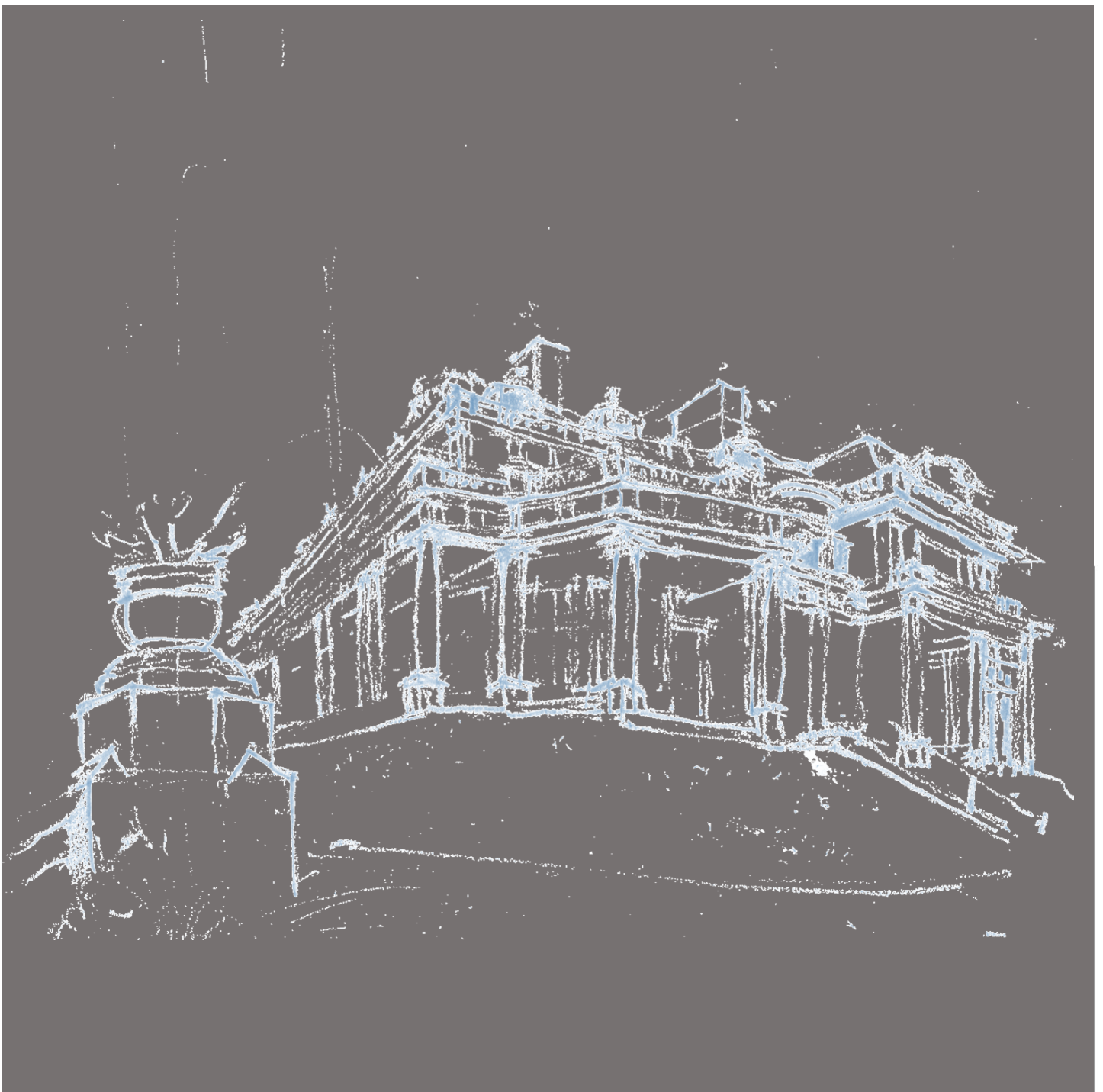# CONFERENCE PROCEEDINGS

Research Student Conference 2018
Faculty of Technology, Design and Environment
Oxford Brookes University

# CONTENTS

# Introduction to the Conference Proceedings

The papers presented in this publication are drawn from the Annual Conference for Research Students in the Faculty of Technology, Design and Environment. They showcase the excellent and varied research being carried out in our faculty; our students may be from different Schools - Architecture, Art, Built Environment and Computing Engineering and Mathematics - but they share an enthusiasm for research and an ability to communicate their results to an interdisciplinary audience. The fact that the conference and these proceedings have been organised and produced by a group of volunteer students is also testament to their abilities.

This is the first year we have published proceedings and I hope it will be the first of many so we can continue to bring our students work to a wider audience. As Chair of the Faculty's Doctoral Training Programme, I would also like to highlight how the conference and this publication demonstrate the Faculty's ongoing commitment to provide support and training for all our PhD students.

Thanks to all who have contributed to make the conference and this publication such a success.

**Dr. Sue Brownill**
Chair of the Doctoral Training Programme

# Acknowledgments

# 'Do I Know You' – A Social Sculpture as an Awareness Generator

Katrin Hattenhauer

## Abstract

This article explores why, how, and when people transition from ignorance and prejudice against others towards awareness and understanding of others. In doing so, the paper draws on the discipline of social sculpture and the installation 'Do I Know You'. Specifically, I examine how socially engaged art, like 'Do I Know You', can trigger the aforementioned process of change. Examining and understanding this process of courage and compassion development is important because of the degree of injustice that exists within our world.

Simple examples illustrate this point clearly. According to the charity, "Shelter" more than 300.000 people are homeless in the UK and each year around 70 homeless people are dying on the streets.
Data collected by the United Nations show that there are 65 million displaced people worldwide, matching the population of the UK. The numbers are expected to rise steadily in the coming years. 51% of these refugees are children.

Our existence very much depends on our capacity to coexist with others and with nature. It is crucial that we transform - beginning with ourselves - from a culture and society of competition and performance towards a society of compassion and solidarity. That is the art of social sculpture. Therefore, the form of art is a way of understanding the dynamic process of personal and societal change as well as a tool for triggering said change.

## Introduction

The artist Joseph Beuys coined the term social sculpture in the 1960s. He described it as an expanded concept of art with the potential to transform society (Beuys 2007). It is the understanding of social sculpture that everyone is an artist in the sense of a creator in whatever aspect of human existence.

We live in a time of transition where traditional concepts like nation and religion do not seem to work in the same way they have in the past. Religions have fewer and fewer believers while people are searching for alternative ways to explore spirituality. The nation state struggles in the 21th century, in which increased globalisation shows the arbitrary character of borders. Consequently, we need to adapt, to create new concepts for living together. This starts with curiosity and openness for each other and the recognition that we are sharing a future as well as its problems. We are the makers of our gravest problems, such as climate change, but we can also be the makers of a solution if we work together and see our differences as a strength rather than a weakness.

Facilitating this change of perspective is about imagining ourselves in someone else's shoes, so we can understand that person better. That is what 'Do I Know You' is about. Understanding others and being understood by others is vital for us in the face of the challenges that everyone of us must master every day and the conceptual and political challenges in a globalised world with mass migration and climate change.

For the sculpture, I have collected two things from every participant – their story and a pair of their shoes. At present, the sculpture consists of more than 60 pairs of shoes from people from more than 20 different nations. Each story is presented in a short video online (www.do-i-

know-you.com). The shoes and their stories travel Europe and in each country they go they are joined by new shoes, new stories. No pair of shoes, no one and no story remains isolated. Rather, they make a whole together with each perspective influencing our understanding of others and ourselves.



'Do I Know You', St. Michaels and All Angels, Oxford, 2016



Exhibition poster, Oxford, 2016

## Materials and Methods

There is a saying in almost every language that urges us to imagine ourselves in someone else's shoes to understand another person's perspective based on their biography and their way of life. Hence, working with shoes as a story medium almost invariably evokes a sense of understanding for the aim of the project.

I chose to film each dialogue in order to preserve the magic, directness and presence of each person as tangible and alive as the conversation I had with them. Each participant can share her or his story and relate to the same questions, adding to the coherence of the project. I asked fifteen questions that utilized the image of shoes in different ways but dealt with the way we go through life, the pain and the beauty of our lives - where we feel at home, what traces we want to leave and how we want to be understood by others.

The questions I asked in the interview were carefully developed and discussed with friends and colleagues as well as with the first participants. This was necessary since I wanted to ask in a way that would reveal a genuine piece of each person, but still allowed them to feel in control at every step of the process. Each interview took time for building fundamental trust and developing joy for the idea of the project, while also trying to make the participants lose sight of the camera. In fact, the interviews were more of a conversation in which I myself opened up to the same questions. An average interview took between two and three hours. Every interview was a mutual encounter because with each new person something new is

asked from yourself. Everything that I wrote about the project I have experienced myself. I experienced a change in the relationship with my participants over time. Many of them became my friends and we became part of each other's lives. For example, I got to know whether they have experienced a form of grave change in their lives, like moving away from their home, getting married, having children or being seriously ill.

I did not know most of the participants before the start of the project. They had either been recommended to me as potential participants by friends and colleagues or I asked them directly upon meeting them by chance. One of my participants was introduced to me by a friend of a friend and then he became a passionate ambassador of the project, asking friends as well as strangers, he considered to be interesting, if they wanted to participate in 'a journey to get to know yourself'. This ignited a snowball effect and I got many participants I would have never met if it were not for him.

Before meeting for the interview, I informed every participant about the idea of the project and its current development. Understanding the project is a crucial precondition for their informed consent, as well as their decisions about what information they are willing to share with others. Participants decide what happens to the recording of our conversation, if they do not feel comfortable in the situation with what they have said or how it has been shown, I will instantly change the relevant element and even delete the film. The shoes are the guiding image on the website. No participant can be found by his or her whole name. I want to show that each stranger has a story to tell that is worth listening to.

DO I KNOW YOU

Home    About    People

GET TO KNOW
Conor

GET TO KNOW
Ica

GET TO KNOW
Nick

GET TO KNOW
Bruce

GET TO KNOW
Alex

GET TO KNOW
Br.Toby

GET TO KNOW
Jonathan

GET TO KNOW
Maria

GET TO KNOW
Abdullah
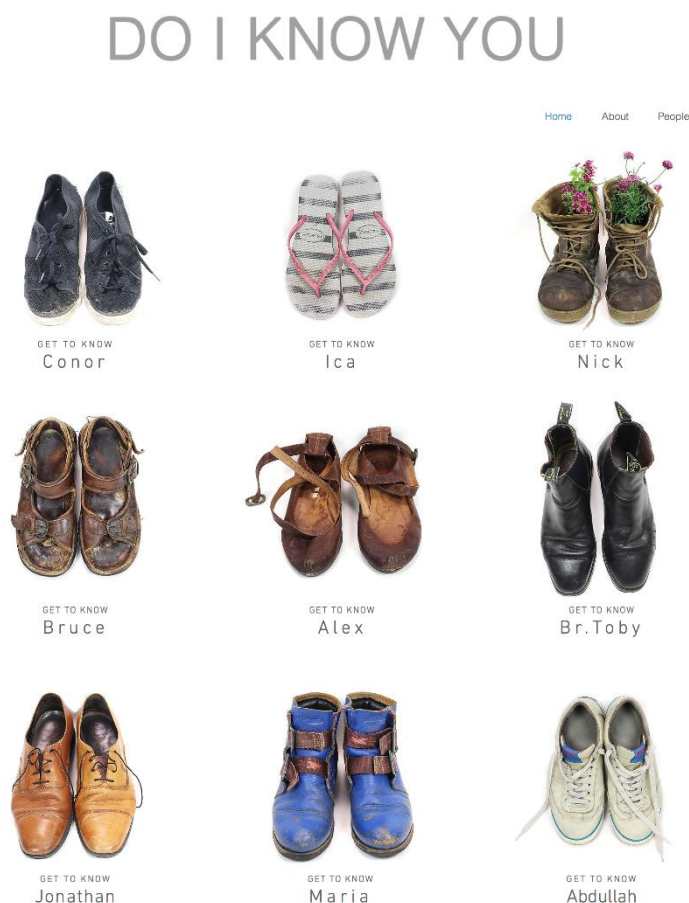
Screenshot, website 'Do I Know You'

## Discussion

The participants and audience alike described their impressions of the sculpture 'Do I Know You' as an experience similar to falling in love with another person and I believe there is something true about this feeling. Since each story leads us to discover each other – we feel reminded of the starting point of love when we get to know someone for the very first time.

My participants are normal people who have never given an interview before, but suddenly their memories, beliefs and opinions are exposed. They receive feedback and feel that their thoughts matter. That is the starting point of love just as much as of society – the revelation that somebody else's thoughts and feelings matter to you. The recognition of this revelation is the beginning of the joint work – how we want to live together. I accompany every station of 'Do I Know You' personally. Hence, at each stop of the project in one place or another, every viewer can become part of the installation. In Leipzig, for example, where the project was part of the big reformation celebrations last year, a few people decided to join the project on the spot. I recorded the interview in a quiet room next to the exhibition and they brought back their shoes on the following day.

Every participant carries the substance of 'Do I Know You' into her or his world and everyday life situations and conversations. One of my participants – a refugee – is asking in his interview: why am I born on this planet when there is no place for me? Especially the section in each interview where I ask what someone else truly should understand about the participant was revealing and touching for participants and audience alike. These rare and intense moments capture a person in front of you becoming aware about an important side of him or herself. This then translates to the audience that visits the exhibition and starts to understand another person without having met him or her personally. The realisation about how each word we say or do not say makes a huge difference to someone else's life is fascinating.



'Do I Know You', Leipzig, congress centre, 2017

## Conclusion

Future generations might not understand why we have had the means to stop war, hunger, exploitation and inequality but simply did not act. Our prosperity and our freedom to be agents of change are greater than ever before. Yet, it seems we are half-hearted and incapable of living together. But if we could truly step into someone else's shoes, we would have more understanding, express more compassion, and ultimately our world would be warmer, fairer, and a better place for all of us.

With each future place, each new language and culture 'Do I Know You' will go to, the sculpture will transform and expand. New questions will arise, and some questions will get a myriad of answers. There will be no end, no totality to those questions and this will hopefully be understood as *the beauty of it*.

'Do I Know You' aims to give an audience the experience of beauty and power that lays in the diversity of human existence and discovering that creating new concepts of society can be something worth living for.

In this spirit, the sculpture asks - Do I know you? Do you know me? What kind of world do we want to create together?

## Bibliography

Arendt, H. (1958) *The Human Condition,* The University Chicago Press, Chicago.

Beuys, J. and Harlan, V. (2007) *What is Art? Conversation with Joseph Beuys.* Forest Row: Clairview Books.

Hattenhauer, K. (2016), 'Do I Know You', www.do-i-know-you.com.

Elliott, D.J., Silverman, M., Bowman, W.D. (2016) *Artistic Citizenship, Artistry, Social Responsibility, and Ethical Praxis,* Oxford University Press.

Harris, A. M. (2017) *Video as Method,* Oxford University Press.

Malzacher, F. (Ed.) (2014) *Truth is Concrete, A Handbook for Artistic Strategies in Real Politics,* Sternberg Press

# Review of green spaces provision approaches in Cairo, Egypt

Merham Mohamed Hosny Anwar Keleg

## Abstract

Quality of life in Egypt, and especially in Cairo, has recently become one of the main priorities of the country. The provision of the public and green open spaces is one of the priorities in this regard. Cairo suffers from acute shortage of green space provision which is negatively affecting the main urban area and the quality of life. There have been numerous efforts regarding green spaces provision in Cairo lately, from governmental, non-governmental bodies, as well as the private sector. In addition to Governmental efforts, there are now a growing number of initiatives and NGOs calling for greening Cairo to improve the quality of life for the residents and helping in reducing pollution rates, either through better aesthetics or for economic revenues such as urban agriculture. These calls depend on small scale interventions and incremental change. On the other hand, the private sector is now supplying several green spaces as well.

In this regard, the paper aims at mapping out the different approaches of green spaces provision in Cairo, their motives and aims as well as the kind of commodities that they provide, especially in terms of their social impact. This shall be achieved through literature review, mapping out the different efforts in addition to interviews with the different stakeholders.

## Introduction

Cities nowadays are facing several complex challenges especially in the face of the rapid urbanization and continuous increase of urban populations. Thus there are many debates about the current commodities and quality of life that cities provide to their residents, as well as the ways of providing it through civic engagement in addition to governmental efforts. Urban Greening is one of the strategies that cities strive to achieve in order to enhance its livability and quality of life. Urban greening has been an aspire since Howard's green city movement and the following paradigms especially with cities of higher densities.

Urban green spaces provide many benefits to the cities, communities, and the individuals. Environmentally, urban green spaces help in alleviating climate change, and reducing heat island effects (Manggol, 2015; Oliveira, et al., 2011; Cavan & Kazmierczak, 2011; Gunawardenaa, et al., 2017; Al-Gretawee, et al., 2016), in addition to decreasing air and water pollution (WHO, 2017; Zupancic, et al., 2015), providing places for biodiversity in cities (LEPCZYK, et al., 2017 ). While socially lots of research have been developed linking urban green spaces to improving the health of communities and decreasing the rates of numerous diseases spread, increased physical activity and better mental health and well being (Tzoulas, et al., 2007; Braubach, et al., 2017; WHO, 2017; Warber, et al., 2014). Furthermore, urban green spaces provide great opportunities for recreation, sociability of communities and livability of cities and opportunities for connection to nature (WHO, 2017). Economically, numerous research also links urban green spaces to higher revenues for the surrounding real estates (Haq, 2011).

Urban green spaces thus affect all life aspects in urban areas which highlights their importance as a tool for improving the experiences of urban areas and for sustainable development (Idem, 2011). There are numerous typologies of urban green spaces, however this research is based on the interdisciplinary agreed on definition of urban green spaces as 'public and private open spaces in urban areas, primarily covered by vegetation, which are directly (e.g. active or passive recreation) or indirectly (e.g. positive influence on the urban environment) available for the users' (Idem, 2011, p. 601).

To attain the wide range of multi scalar continuously growing benefits and needs of urban green spaces in modern cities, green spaces strategies are being valued for their importance for green spaces delivery and management. Generally, a strategy is a policy for achieving specific objectives, where it embraces main approach or method suitable for attaining goals and resolving specific issues (The GreenKeys Project Team, 2008). In case of green spaces, for their wide range aspects, strategies should address various policies and objectives; environmental, social, and economic policies as well as sustainable development goals (ibid).

Singapore adopts a more holistic and inclusive approach in which it encourages other stakeholders to integrate green features in their developments as well as the community such that green infrastructure is developed and cherished for its recreational and educational purposes as well as environmental value (Ranja, 2016). Singapore regards buildings, roads and concrete as potential sites for landscaping in addition to the green spaces between buildings, aiming at building a 'city in a garden' where green spaces and biodiversity are at the doorsteps, while national parks that are at the heart of the political agenda as well (Newman, 2014). The great success and achievement that Singapore has attained is attributed to their planning regulations and strategies in addition to government incentives and R&D that constitute a mix for innovative change enabling and political leadership (Newman, 2014).

Melbourne is emphasizing the role of the public bodies to ensure the withstanding of the green spaces in the face of the rapid urbanization and densification. The city of Melbourne launched an open space strategy that acknowledges the importance of the green spaces for their contribution to the mental and physical health and well-being of the citizens especially the children, in addition to the practical benefits for alleviating climate change effects especially in the hotter months and providing a habitat for flora, fauna and bird life (Denman, 2015). On the other hand, Paris is increasing its green spaces to counteract the effects of the urban heat island as a result of the climate change effects facing the city and is relying in a great deal on the local communities to achieve this goal, in addition to governmental efforts. In accordance, Paris passed a new law in 2016 that allows citizens to plant urban gardens in the city. In line to the mayor's goal to create 100 hectare of living walls and green roofs by 2020, where agriculture shall constitute one third of this greenery (Cooke, 2016). The city is encouraging the citizens to adopt creative ways for growing plants, while the city will contribute a planting kit with seeds and topsoil (Idem, 2016).

**Case study – Cairo, Egypt:**
Green spaces issue is complex and problematic in the Egyptian context, as cities lack sufficient areas of green spaces. On the other hand, there is a great need for transforming the green spaces into attractive and livable places to contribute to the creation of sustainable communities (Kafafy & Betawi, n.d.). Cairo has always faced growing development urban pressures as a result of its phenomenal growth since the turn of the twentieth century. This has always affected the green spaces spread around the capital since then and most of the times threatened their survival and got transformed into urban areas, while in some cases leaving scattered parts of the past existent green spaces (Rabbat, 2004). Additionally, in the

recent decades of the 1980s and 1990s, many of these green spaces and the promenades along the river banks were given away to luxury hotels and 5 stars clubs and restaurants. Even the small patches of agricultural land spread on the left bank of the Nile have disappeared under the pressures of the ever-growing population and its insistent demands for more housing, roads, and shopping malls (Idem, 2004).

Nowadays, Cairo's share per capita of green spaces is much lower than the international norms and standards, and even when compared to more arid cities than Cairo like Dubai, it is still lower (Kafafy & Betawi, n.d.). Moreover, this share per capita is not evenly distributed among Cairo's population, as more than half of the city's population only have 0.5 m2/capita while 70% of the population experience less than the city average of 1.7 m2/capita (ibid).

## Materials & Methods

To understand the current status of urban greening in Cairo and to disentangle its complex setup, it is essential to map out the different approaches and acts of green spaces provision, their objectives as well as the kind of commodities that they deliver, especially in terms of their social impact. There are multiple stakeholders in Cairo who have role and show interest in providing or/and maintaining green spaces. Mapping the different acts is achieved through interviews with some of the stakeholders, mainly with officials of Governmental Bodies and NGOs, in addition to literature review and observations of the researcher of the other actors.

For a better understanding of the situation, the stakeholders who contribute to the green spaces in Cairo are classified into 4 main groups; Governmental Bodies, NGOs & CBOs, Private Sector, and spaces developed through collaborative efforts of different bodies. Each group has its own agenda and approach, which shall be investigated through the following section.

### Governmental bodies

There are numerous governmental bodies who are mandated with green spaces in Cairo, whether they are mandated with their creation, monitoring or maintenance. Each body works on a different level and has his own agenda and perspective on the issue of green spaces, as illustrated in Figure 1.

The stated governmental bodies can be seen through two levels according to their mandates and acts; policy level and executive level. Policy level bodies are the ones mandated to formulate green spaces specifications or monitor their presence. While on the executive level, are the bodies mandated with actually creating and maintaining the green spaces.
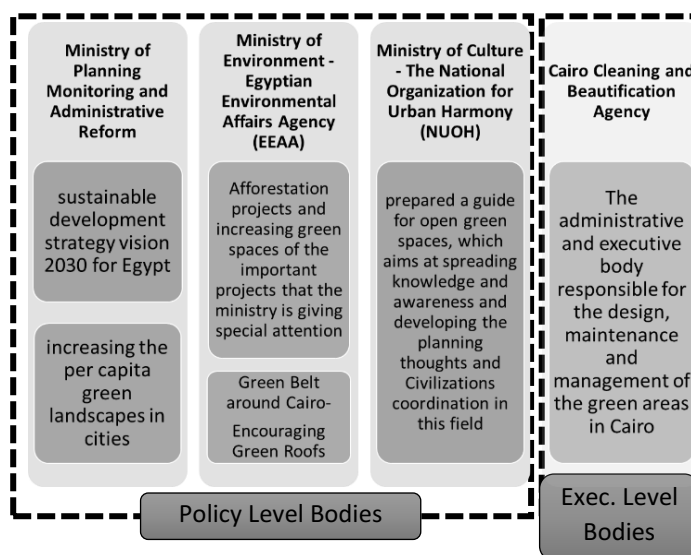


Figure 1 illustrated the main bodies in Cairo mandated with green spaces provision or monitoring. Source: The Author (gathered from different sources)

**NGOs and CBOs**

Lately in Egypt and specifically Cairo, numerous initiatives, NGOs, CBOs and private enterprises emerged with an interest in increasing environmental awareness and encouraging citizens to adopt environmental friendly consumptions routines as well as encouraging urban agriculture on the different scales. These movements do have great role in grass root changes and add to the green spaces areas in different ways in Cairo. However, most of these movements are not incorporated in the governmental strategies by the aspired degree if any. These acts highlight and prove the enthusiasm and potentials that local communities possess regarding urban agriculture and increasing the green spaces in their surroundings, whether they are of low income sector or high-end consumers.

**Private Sector**

The private sector also provides a share of the green spaces in Cairo, most of the times they turn to private spaces that do not welcome all community sectors. However they still constitute a share of the green spaces in Cairo. It is argued that two thirds of the green spaces areas in Cairo is provided by the private sector, while private sports clubs constitute around one third of the private green spaces in Cairo (Kafafy, 2010). These efforts/share can be divided into two main development projects; sporting clubs and gated residential compounds. Recently, a growing number of gated communities are being erected especially in the new extensions of Cairo and on the main regional roads. These compounds mainly target high income families promising safety, and better quality of life. They mainly depend on the presence of vast green areas in their master plans to promote their projects in contrast to the dense city of Cairo. Sporting Clubs are private recreational that offer green spaces to individuals but with annual memberships, they provide leisure environment for numerous residents of Cairo's middle and upper-class families (Idem, 2010).

**Mixed efforts**

There are other green spaces that appear in Cairo with different agendas, and they are being created through the collaboration of different entities. These green spaces usually compromise vast areas which add a great deal to the total area of greenery in Cairo. Most of them charge entry tickets, but as the stakeholders have different agendas and aims, the prices of the tickets vary a great deal, some are relatively affordable for a great percentage of the public while others charge expensive tickets. Despite their important role in adding to the total share of green spaces, they cannot be considered a reliable source for green spaces, as their stakeholders get triggered with different problems/issues/aims.
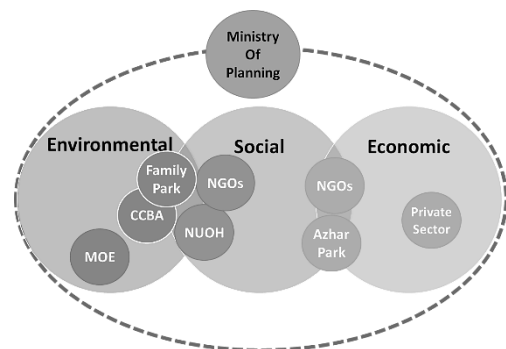


*Figure 2 illustrates the different entities and their relation to urban green spaces strategies' aims. Source: The Author*

## Discussion

There are multiple stakeholders in Cairo that are working on the supply of green spaces with different approaches. However the problem of green spaces shortage in Cairo is a collective action problem, where the mechanisms for organizing supply are less developed than they should be (Idem, 2010). The absence of green spaces strategies in the city, lack of policies and unawareness of the holistic importance of landscape to the surrounding built environment contribute to the current situation of green spaces supply in Cairo (Idem, 2010).

As argued before, urban green spaces have multiple benefits: social, environmental and economic, and to ensure a holistic impact and benefits, all aspects should be taken into consideration through holistic strategies. However if this to be reflected on Cairo, the different perspectives and fragmented practices of the different entities is clear, as shown in Figure . Each stakeholder work on a definite area or typology regardless of the holistic image of the relationships between these green spaces and their usability, and regardless of the relation to other efforts of the different stakeholders. As a result, only few of the green spaces in Cairo are usable and livable by people and not all of them are inclusive.

## Conclusion

There is a growing attention to green spaces shortage in Egypt. Many entities are working on green spaces for their great importance, but each entity has its own agenda and perspective of green spaces. It is obvious that the social aspect of green spaces is the most overlooked aspect which affects the livability and social image of Cairo. Green spaces strategy is still missed which is of great importance in the current situation that specifies the objectives as well as delivery and management plans.

Accordingly, formulating a green spaces strategy incorporating all the different efforts and guiding them to work towards a collective aim is of high importance. There is a great potential for NGOs and initiatives to change the current status of green spaces in Cairo, which should be considered within the strategy. Local Delivery plan should be properly communicated allowing different stakeholders to take part in different areas of expertise or interest, in which the coordinated efforts shall work on ensuring the delivery of green spaces with comprehensive benefits in mind which will add to the acute shortage of green spaces in Cairo, boost the livability of green spaces and trigger the collaboration and efforts of the different perspectives.

## References

Al-Gretawee, H., Rayburg, S. & Neave, M., (2016). The cooling effect of a medium sized park on an urban environment. *International Journal of GEOMATE,* 11(26), pp. 2541-2546.

Braubach, M. et al., (2017). Effects of Urban Green Space on Environmental Health, Equity and Resilience. In: N. Kabisch, K. H. Stadler & J. Bonn A., eds. *Nature-Based Solutions to Climate Change Adaptation in Urban Areas. Theory and Practice of Urban Sustainability Transitions. .* s.l.:Springer, Cham.

Cavan, G. & Kazmierczak, A., (2011). *Urban Greening to adapt urban areas to climate change: Oxford Road Corrdior Case Study,* Manchester: Eco Cities Project. University of Manchester.

Cooke, L., (2016). *Paris allows anyone to plant an urban garden | Inhabitat Green.* [Online] Available at:https://inhabitat.com/paris-allows-anyone-to-plant-an-urban-garden-anywhere/ [Accessed 24 May 2017].

Denman, S., (2015). *Melbourne's Open Space Strategy is a blooming great.* [Online] Available at: https://www.thenational.ae/arts-culture/melbourne-s-open-space-strategy-is-a-blooming-great-example-1.99680
[Accessed 22 March 2018].

Gunawardenaa, K., Wellsb, M. & Kershaw, T., (2017). Utilising green and bluespace to mitigate urban heat island intensity. *Science of the Total Environment ,* Volume 584–585 , p. 1040–1055.

Haq, S. M. A., (2011). Urban Green Spaces and an Integrative Approach to Sustainable Environment. *Journal of Environmental Protection,* Volume 2, pp. 601-608.

Kafafy, N. A.-A., (2010). *The dynamics of urban green space in an arid city; the case of Cairo-Egypt,* Cardiff: Cardiff University - PhD Study.

Kafafy, N. & Betawi, Y., n.d. *Urban Green Space Benefits and the Pivotal Role of Conservation, Cairo's Case - Egypt.* Available at https://eis.hu.edu.jo/deanshipfiles/conf110862020.pdf

LEPCZYK, C. A. et al., (2017) . Biodiversity in the City: Fundamental Questions for Understanding the Ecology of Urban Green Spaces for Biodiversity Conservation. *BioScience ,* 67 ( 9 ), pp. 799- 807.

Manggol, L. K., (2015). *An Understanding of Green Infrastructure In Urban Design Context,* Sydney: s.n.

Newman, P., (2014). Biophilic urbanism: a case study on Singapore. *Australian Planner,* 51(1), pp. 47-65.

Oliveira, S., Andrade, H. & Vaz, T., (2011). The cooling effect of green spaces as a contribution to the mitigation of urban heat: a case study in Lisbon.. *Building and Environment. ,* Volume 46, pp. 2186-2194.

Rabbat, N., (2004). "A Brief History of Green Spaces in Cairo". In: Stefano Bianca and Philip Jodidio, ed. *Cairo: Revitalising a Historic Metropolis. .* s.l.: Turin: Umberto Allemandi & C. for Aga Khan Trust for Culture, , pp. 43-53..

Ranja, (2016). *Green infrastructure: planning for sustainable and resilient urban environment,* s.l.: s.n.

The GreenKeys Project Team, 2008. *GREENKEYS @ YOUR CITY – A GUIDE FOR URBAN GREEN QUALITY.* [Online] Available at: http://greenkeys.org/manual.html [Accessed 7 May 2018].

Tzoulas, K. et al., (2007). 1.1 Promoting ecosystem and human health in urban areas using green infrastructure: A literature review. *Landscape and Urban Planning,* Volume 81, pp. 167-178.

Waldheim, C., (2016). *LANDSCAPE AS URBANISM: A GENERAL THEORY.* 1st ed. NEW JERSEY: PRINCETON UNIVERSITY PRESS. .

Warber, S., Irvine, K., Devine-Wright, P. & Gaston, K., (2014). Modelling Well-being and the Relationship Between Individuals and Their Environments . In: R. Coles & Z. Millman, eds. *Landscape, Well-being and Environment .* s.l.:Routledge, pp. 20-37.

Watson, G. B. & Kessler, L., (2013). Small Changes – Big Gains:Transforming the Public and Communal Open Spaces in Rundown Neighbourhoods,. *Journal of Urban Design,* 18(4), pp. 565-582.

WHO, T. W. H. O., (2017). *Urban green spaces: a brief for action,* Denmark: The World Health Organization.

Zupancic, T., Westmacott, C. & Bulthuis, M., (2015). *THE IMPACT OF GREEN SPACE ON HEAT AND AIR POLLUTION IN URBAN COMMUNITIES: A META-NARRATIVE SYSTEMATIC REVIEW,* Vancouver: davidsuzuki.org.

# The Typo-Morphology Analysis in relation to Socio-Spatial Transformations of Kampong Bharu, Malaysia

Mohd Iskandar Abd Malek

## Abstract

This paper presents the historical-morphological study through observation and typo-morphological analysis of the case study that lead to Kampong Bharu today. In the span of more than 117 years since its inception in 1900 by the Federated Malay States (FMS) on the 223 acres of land in the north part of Kuala Lumpur city, the village is part and parcel that carves the history of the formation of Malay settlement in Malaysia. It also significantly becomes one of the villages with cultural landscapes in the city with a robust Malay flavour due to the singular community that inhabits the area. By implementing the fieldwork methodologies for analysing locally appropriate typology and morphology, the distinctive characteristics of the Kampong Bharu's urban forms can be identified as the foundation for consequent analyses for socio-spatial transformation. Therefore, this paper aims to analyse the case study's socio-spatial patterns to be used for interrogating local urban form and to identify the distinctive typo-morphological pattern of low rise, medium-rise and high-rise built-form in the case study area.

***Keywords****: Typo-morphology, Social-spatial, locally appropriate typology, Kampong Bharu.*

## Introduction

During the early 1900s, the forename of Kampong Bharu begins to appear based on the historical information from The Malay Agricultural Settlement (MAS), Kampong Bharu. The Kampong Bharu was formed on January 12, 1900, by the Federated Malay States (FMS) on the 223 acres land consisted of seven small villages (*Kampong Atas A, Kampong Atas B, Kampong Masjid, Kampong Periuk, Kampong Paya, Kampong Hujung Pasir and Kampong Pindah)* and administered by the Malay Agriculture Settlement (MAS) Board of Management. The His Royal Highness the DYMM Sultan Abdul Samad, the Prince of Selangor, awarded the land to the Malays from the Malay Archipelago, who held Islam as their official religion, converse in Malay and adopting the Malay culture. The purpose of the settlement formation was to encourage agriculture among the Malays, to take part in administrating the settlement, and to involve in the business sector. In order to carry out the above intentions, allotments of land were approved to Malay persons with certain conditions such as having to plant crops. Also, schools and amenities including roads and even irrigation water wheels were built in the area (Hands, 1941).

From a farming village of only 12 recognised landholdings just before 1900. However, between 1929 to 1935, the individual allotments were more adequately planned by the authorities wherein more than 750 lots were given ownership recognition (Hands, 1941). By and large, the settlement served its agricultural purpose for a time although rice field planting in itself proved to be unsuccessful in the longer term, as the area was too prone to flooding, and the agriculture element likewise decamped (Gullick, 1983; Mohamed, 1999). This was where it is architecturally proven that the Malay tradition of building houses on stilts was a simple yet ingenious solution that kept the residents minimally affected no matter how any nearby river behaved as shown in figure 1 and 2.
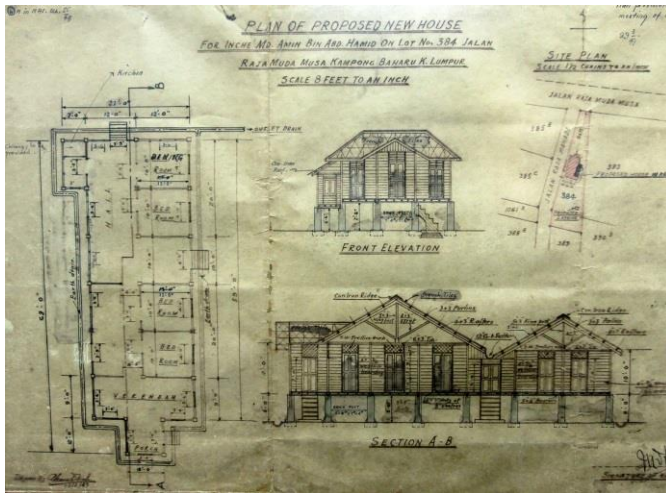
(*Source: MAS Archive, 2016*)

**Figure 1: The development of traditional Malay house during early formation of Kampong Bharu has been record by Board of Management Malay Agriculture Settlement (MAS) in 1945**.



(*Source: Author, 2016*)

**Figure 2: One of the traditional Kampong house built on stilt which exist until today at Kampong Bharu surrounded with modern high-rise building.**

Over time, however, the growth of population pressures and transportation improvements whereby agriculture was no longer needed to be practised in the city, resulted in the settlement outgrowing its agricultural aspect but retained some of the physical characteristics as a Malay enclave near the centre of the town. Kampong Bharu, besides having intangible ethnic cultures, also contains several tangible cultural elements such as architecture (typology and its socio-cultural features), natural landscape, urban setting and skylines. However, tangible element in Kampong Bharu has been undergoing a massive transformation, and it is struggling to keep its traditional elements where the obvious some of the traditional houses are dilapidated in the complex and multi-layered morphological socio-spatial patterns that changed over time surrounded by the development pressure.

## Methods and materials

Study of urban forms is part of the case study approach which provides a platform to examine local issues and problems in a case study area (Yin,2017). A morphological analysis methods were implemented, which is the study of the urban forms through its transformation and analysing a case study's constitute elements developed through time (Conzen, 1969; Moudon, 1997; Whitehand, 2001; Butina Watson and Bentley, 2007; Kropf, 2009; Carr and Whitehand 2014; Oliveira, 2016). The proposed fieldwork methodology includes urban form analysis by tracing the historical background of the settlements to investigate distinctive form patterns and socio-spatial transformation (Conzen, 1969; Moudon, 1997; Whitehand, 2001; Kropf, 2017). Further, observation techniques (Walliman, 2005; Bernard, 2006) and a concept of environment-behaviour study (Rapoport, 1982; Zeisel, 2006) are also incorporated to examine the traditional built form and to define how people use and shape local urban forms in Kampong Bharu.

Multiple sources comprising primary and secondary data were collected (Creswell, 1998; Silverman, 2005) to understand historical, planning, and other frameworks that have contributed to the kampong Bharu's socio-spatial transformation. Archival maps, documentary, written data and government documents have been accessed through the City Hall Kuala Lumpur (CHKL) and Planning Department archives. Semi-structured interviews with the key players (Arksey and Knight, 1999) will allow developing ideas and speaking more widely on factor underpinning at the local level. Interviews with the key players identify the real problems at the local level and to understand the urban planning policies that influence the urban planning framework that leads to urban transformations in the case study area.

## Discussions

Kampong Bharu is best described as an urban diversity village defined by a mix of users and income, social classes, social spaces and socio-spatial systems. In many respects, it is one of the most multifaceted areas with various built forms and land use patterns locally shaped over time. These historical-morphologies were locally shaped in relation to socio-economic cycles in which three periods of change are determined from the neighbourhood experience. They are a sub-urban phase, urban phase and urban transformation phases of in relation to Kampong Bharu's spatial development. Crucially, this timeline is utilised as a platform to analyse the social-spatial pattern and urban form in Kampong Bharu with the neighbourhood of low, medium and high rise typo-morphology characteristic which also influenced the construction of morphological districts (The kampong-based, mixed block-quarter, and tower-block morphology) as shown in figure 3.

Kampong-based morphology is the horizontal spatial pattern influenced by the agriculture land and economic activity as the Malay settlement. This morphological layer was locally constructed by implementing the traditional Malay neighbourhood system and boundary arrangement. Most of the local peoples perceived as a local identity of Kampong Bharu and the most preferred socio-spatial morphology pattern. Therefore, this morphological with distinctiveness characters has to be protected by retaining, preserving, and upgrading the village environment and traditional neighbourhood built forms in Kampong Bharu.

Mixed-block quarters morphology was perceived as a distinctive modern built form of low to medium rise typo-morphology pattern which consolidated in the traditional neighbourhood; give a sense of locality inside their neighbourhood area. Due to its location close to the Kuala Lumpur city centre, the housing demand and facilities were extremely high within the neighbourhood area, and numerous traditional Malay houses have been replaced with the larger building block typologies which built vertically to accommodate the local demand. Most of these typologies constructed using a new material such as concrete and bricks which had transformed the morphology character by creating a new block-quarters typology in the neighbourhood that corresponded with the transition of the age, the era and the demand from local people in Kampong Bharu. Crucially, a diverse group of people with various income area were found and should be encouraged and protected for mixed-block quarters morphology.

During the urban transformation phase, it involves form-production and form-adaptation as numerous urban morphology changes occur with the emergence of medium to high-rise residential typology in Kampong Bharu. The emergence of this typology due to the real estate and housing demand, the growth in population density, and the development of the local linkage which reflected a significant and major positive change in the structure of a place that supports social progress and equality which establishing the tower-block morphology.

The intermixed neighbourhoods as kampong-base and mixed-block quarter morphology had been settled as traditional settlements; these socio-spatial structures seemed not to be erased but rather integrated with the superimposition of the tower-block morphology. In other words, rather than there being a process of deconstructing and re-constructing new forms in their places, a diverse pattern is reconciled whereby a variety of social classes and groups locate as distinctive morphological patterns.

**Sub-Urban Phase (1890s-1940s)**
**Kampong-Based Morphology**

Influenced by the relocation of Malay settlement from Kampong Rawa and Kampong Malacca to section 41, forming Kampong Bharu as a Malay reserved land which consist of seven small traditional villages. Most of the villagers' houses (traditional vernacular Malay house) were concentrated at main Arterial Street in the inner part of kampong Bharu and spread to another local streets and the formation of kampong is based on traditional Malay neighbourhood and boundary.



**Urban Phase (1950s-1970s)**
**Mixed Block-Quarter Morphology**
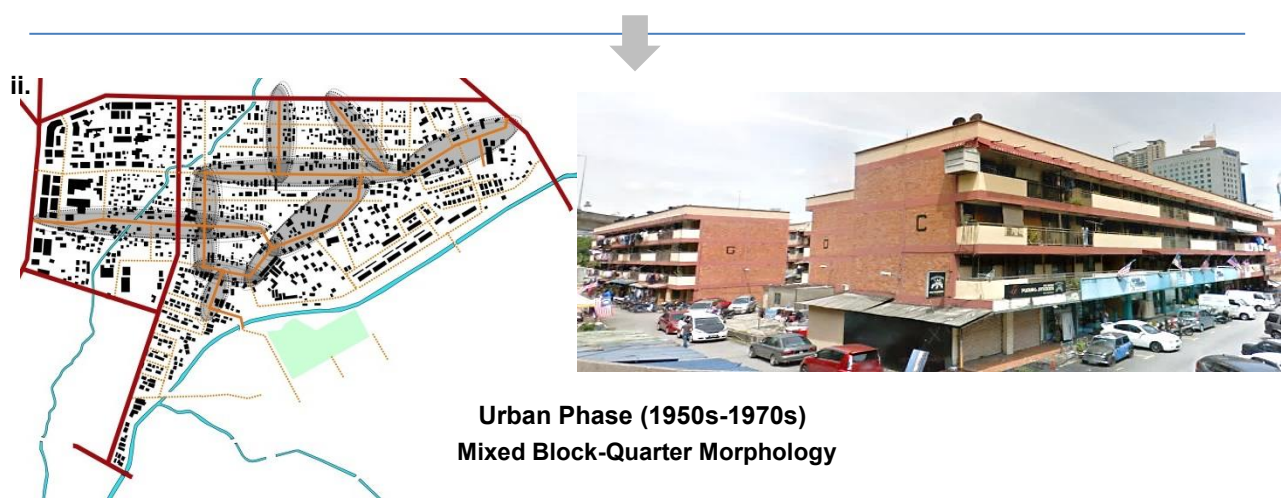
Several neighbourhoods are located in kampong Bharu after the Klang River straightened by the local Government. They are riverine neighbourhoods and mixed income neighbourhoods flourished in the inner part of case study area (bungalow housing, modern townhouses, low-cost flats, and shophouses). Although they are different in terms of plot arrangement and building pattern, they shared the same *lorong* (the local street), forming the intermixed communities as the horizontal branching morphological pattern of Kampong Bharu.



**Urban transformation phase (1980s-2018)**
**Tower Block Morphology**

The integration of modern mixed socio-spatial patterns upon the Kampong-base and mixed block-quarter morphology is enabled by the amalgamation of plots and the accumulations of large footprint buildings are fundamental. Including the commercial and residential use, the modern districts located along the arterial street overwrite and encompass the previous morphology as a parameter-like pattern at the edge of case study area. Crucially, this becomes the recent morphological frame which superimposes on the previous morphologies.

**Figure 3: Kampong Bharu's multifaceted morphological patterns.**
(*Source: Author constructed from interviews, fieldwork observation and National Archive of Malaysia,2017*)

# Conclusion

The urban form patterns of Kampong Bharu area were analysed to identify socio-spatial transformation. By choosing Kampong Bharu as the case study area, a set of outlines defining socio-spatial patterns and the socio-economic cycle was investigated, as well as the process of change over times.

The key conclusions are that Kampong Bharu is one of the Malay reserved urban village's Kuala Lumpur inner areas that are socially and locally constructed complexly. The modification of socio-economics and socio-spatial structures has been undertaken through several phases of land development transformation: suburban, urban and urban transformation phase. Crucially, the traces of complex, multifaceted morphological components still keep on-going. A series of morphological layers patterns were found as follows:

**1. The Kampong-Based Morphology during Sub-Urban Phase.**
Influenced by the agriculture land and economic activity as the Malay settlement were locally constructed the social-spatial morphology pattern, forming the kampong environment based on the traditional Malay neighbourhood system and boundary arrangement.

**2. The Mixed Block-Quarter Morphology during Urban Phase.**
The morphological pattern established where the traditional intermixed neighbourhoods were located by sharing the same *lorong (*the local daily streets)  as horizontal branching expansions of socio-spatial patterns.

**3. The Tower-Block Morphology during Urban Transformation Phase.**
The superimposition of highly mixed activities and patterns of modern commercial and residential districts consolidated along the arterial road strips and potential local linkages, which overwrites and encompasses the traditional neighbourhoods as a parameter-like pattern development.

Although each morphological layer has unity in respect of its physical form and social construction, it does not exist as separate entities. On the other hand, these three morphological layers are socially and locally constructed and reconstructed to accommodate other changes. Crucially, they interrelated regarding the layout and configuration of physical forms and spaces and overlap in the case of social spaces and systems. The complexity of forms in this sense is influenced by the socio-economic progressions and the process of local adaptation with the changes which driving the transformation and subsequent modifications of forms in Kampong Bharu.

# Bibliography

Arksey, H and Knight, P. (1999*). Interviewing for social scientists*. London: SAGE.

Bernard, H.R. (2006). *Research Methods in Antroplogy: Qualitative and Quantitative Approaches*.    4th [ed]. Lanham: AltaMira.

Butina-Watson, G. and I. Bentley (2007). *Identity by Design*, Taylor & Francis.

Carr, C.M.H. and Whitehand, J.W.R., (2014). *Twentieth-century suburbs: a morphological approach*. Routledge.

Creswell, J. W. (1998). *Qualitative Inquiry and Research Design: Choosing among Five Traditions*. London: SAGE.

Conzen, M. R. G.. (1969). *Alnwick, Northumberland: a study in town-plan analysis*. London, Institute of British Geographers.

Gullick, J. M. (1983). *The story of Kuala Lumpur, 1857-1939*, Eastern Universities Press (M).

Hands, J. (1941). *The History of the Malay Agricultural Settlement in Kuala Lumpur: Compilation of Minute Books from January 1899 to October 1941* , Kuala Lumpur: Malaysia Agricultural Settlement Office.

Kropf, K. (2009). Aspects of urban form. *Urban Morphology*, *13*(2), p.105.

Kropf, K. (2017). *The handbook of urban morphology*. Chichester, West Sussex, John Wiley & Sons Ltd.

Mohamed, S. and U. K. M. J. P. Melayu (999). *Transformasi sosial Melayu Bandar: satu kajian kes di Kampung Bahru*, Jabatan Persuratan Melayu, Universiti Kebangsaan Malaysia.

Moudon, A. V. (1997). Urban Morphology as an Emerging Interdisciplinary Field. *Urban Morphology*, 1, 3-10.

Oliveira, V. (2016). *Urban Morphology: An Introduction to the Study of the Physical Form of Cities*, Springer       International Publishing.

Rapoport,A. (1982). *The meaning of the Built Environment*. Beverly Hill:SAGE.

Silverman, D (2005). *Doing Qualitative Research*. *2nd ed*. London: SAGE.

Walliman, N. (2005). *Your Research Project. 2nd ed*. London: SAGE.

Whitehand, J.W., (2001). British urban morphology: the Conzenion tradition. *Urban morphology*, *5*(2), pp.103- 109.

Yin, R. K. (2017). *Case Study Research and Applications*: Design and Methods, SAGE Publications.

Zeisel, J., (2006). *Inquiry by design: Environment/behavior/neuroscience in architecture, interiors, landscape, and planning*. WW Norton & Co.

# Towards achieving interoperability between BIM and Asset Management: Conceptual Framework

Karim Ibrahim

## Abstract

Nowadays, the capabilities of collecting different sets of data from different sources (Building Information Modelling (BIM), GIS, Sensors, Assets database) for asset management (AM) use have availed opportunities to provide benefits for project's owners and facility managers. Meanwhile, there has been a focus on asset management and the connection to effective documentation through BIM. However, this data integration came along with new issues and obstacles in terms of an effective process to extract, store, manage, integrate, and distribute this data to ensure interoperability. In addition to the foregoing, the issue is not only the interoperability, it is also about the decision regarding what data is relevant and what would provide value to asset owners. This paper explores the different aspects of interoperability affecting the implementation of BIM in Asset Management. A combination of research methods consisting of literature review, face-to-face and focus group interviews was conducted in this study. This culminated in the development of a conceptual framework which help BIM professionals identify and recognise the required aspects to be overcome for improving AM practices.

## Introduction

Asset management is defined as systematic organized process of maintaining, operating and upgrading physical assets efficiently and economically (McElroy, 1999). Appropriate and reliable asset information; such as asset location, specifications, warranties and maintenance schedules, is essential for supporting effective decision making during asset operation and management stage (Love et al., 2015a). However, the main challenge in asset management, rather than the technical barriers of implementing AM, lies on the human error in data collection, entry and analysis which leads to missing and inadequate data (Woodhouse, 1997). Due to the inadequate interoperability, 10.6 million dollar loss occurred during operation and maintenance (O&M) (Gallaher et al., 2004). Consequently, AM requires an information system that captures, stores and integrate data required automatically to support better decisions making across diverse mentioned requirements.

Building Information Modelling is defined as 'a shared digital representation founded on open standards for interoperability' (NBIMS 2007, 2012) and can enable information from all project phases to be stored in a single digital model (Love et al., 2015b). In other words, BIM has been argued to provide the required information system for solving asset management challenges. A BIM model works as a shared knowledge resource forming a reliable basis for decisions during the facility lifecycle. The UK Government Soft Landing (GSL) policy stated that BIM can provide a valuable dataset for Computer-Aided Facility Management (CAFM) systems; however, this dataset has to be maintained through the facility lifecycle. The required information for AM has to be extracted from the BIM model and linked to a relevant database that stores all information related to the built asset in order to form an Asset Information Model (AIM) (Kivits and Furneaux, 2013). Asset Information Modelling provides the underlying foundation to AM improvement.

Despite BIM capabilities and promises for improving AM practice, the implementation of BIM in Facilities Management (FM) generally and in AM particularly filled with obstacles (Eadie et al., 2015). The six main challenges are perception of BIM, fundamental difference between project and life-cycle management, contractual and legal frameworks, training, roles and responsibilities, cost and interoperability (Ibrahim et al., 2016). The interoperability challenge is the key barrier to overcome first as the entire theoretical

framework of BIM data being used for FM is predicated on the assumption that data can be exchanged between software programs (Kensek, 2015).

Interoperability is the ability to exchange data between applications to facilitate automation and avoidance of data re-entry. Conceptual interoperability consists of six levels namely technical, syntactic, semantic, pragmatic, dynamic and conceptual (Wang et al., 2009). Most of available works concentrated on developing technology driven functions and applications to overcome the syntactic interoperability barrier rather than developing computable information requirements for better semantic interoperability (Cavka et al., 2017). Available syntactic interoperability approaches include the Industry Foundation Classes (IFC), Construction Operation Building Information Exchange (COBie) and proprietary middleware (such as: Ecodomus). Even with of these approaches, syntactic interoperability solutions alone cannot ensure that the integration of BIM-AM could achieve the required expected benefits and results. Pärn et al. (2017) critiqued that level 3 'semantic interoperability' is the single most important interoperability challenge to overcome in the integration of BIM data with other systems such as AM platforms. Love et al. (2014) criticized that emerging handover standards such as model view definitions (MVD) for AM provide only the structure of how information can be extracted and collected over the facility lifecycle; however, they do not support the owner with a list of the required information for AM.

Notwithstanding all the available researches and the integration promises, there are still gaps to be filled and challenges to be solved between the integration potential and its realization in the asset management fields. Accordingly, this research aims to contribute in filling the interoperability gap by developing a conceptual framework which covers all the different aspects of interoperability affecting the implementation of BIM in Asset Management.

## Materials and methods

Different research methods are utilized and interconnected such as peer literature review, semi-structured interviews and focus groups. Firstly, a literature review, including academic papers, project documents, case studies, international reports and practice guidelines and standards, has been carried out focusing on the different barriers and challenges of implementing BIM in AM. Subsequently, semi structured interviews were conducted with facility manager and information manager involved in the decision making to adopt BIM in their companies. The interviewees were guided by the main questions; however they were free to elaborate on asset management challenges as experienced in their projects. The interviews were aimed at confirming and clarifying the different aspects found in the literature. Based on findings from literature and semi structured interviews, an analysis was carried out to develop the conceptual framework. A focus group with eight BIM experts was conducted to evaluate and validate the developed conceptual framework.

## Discussion

The data collected by the mentioned research methods were the foundation for the development of a new conceptual framework for the different aspects of interoperability between BIM and AM. The framework can still be updated and adapted to cover all the building operable assets. The four main key aspects can be classified according to two dimensions (see Figure 1). The first dimension (y-axis) is referred to as endogenous/exogenous dimension. This dimension concerns aspects related and/or inclined in the BIM environment or not. The second dimension (x-axis) is referred to as theoretical/practical dimension. This dimension concerns aspects which are more theoretical and the development of conceptual constructs or more practical and the development of prototype and add-ins. Using the above-mentioned two dimensions classification, the ACE-IM framework consists of the following four main aspects:

A Linked data generation for all the different standards and classification engaged in the AEC and O&M domains.
An ontology for the required data for each asset.
A model for extracting the required data with appropriate classification for each asset.
A well-structured MVD for storing and integrating BIM data with external assets data.
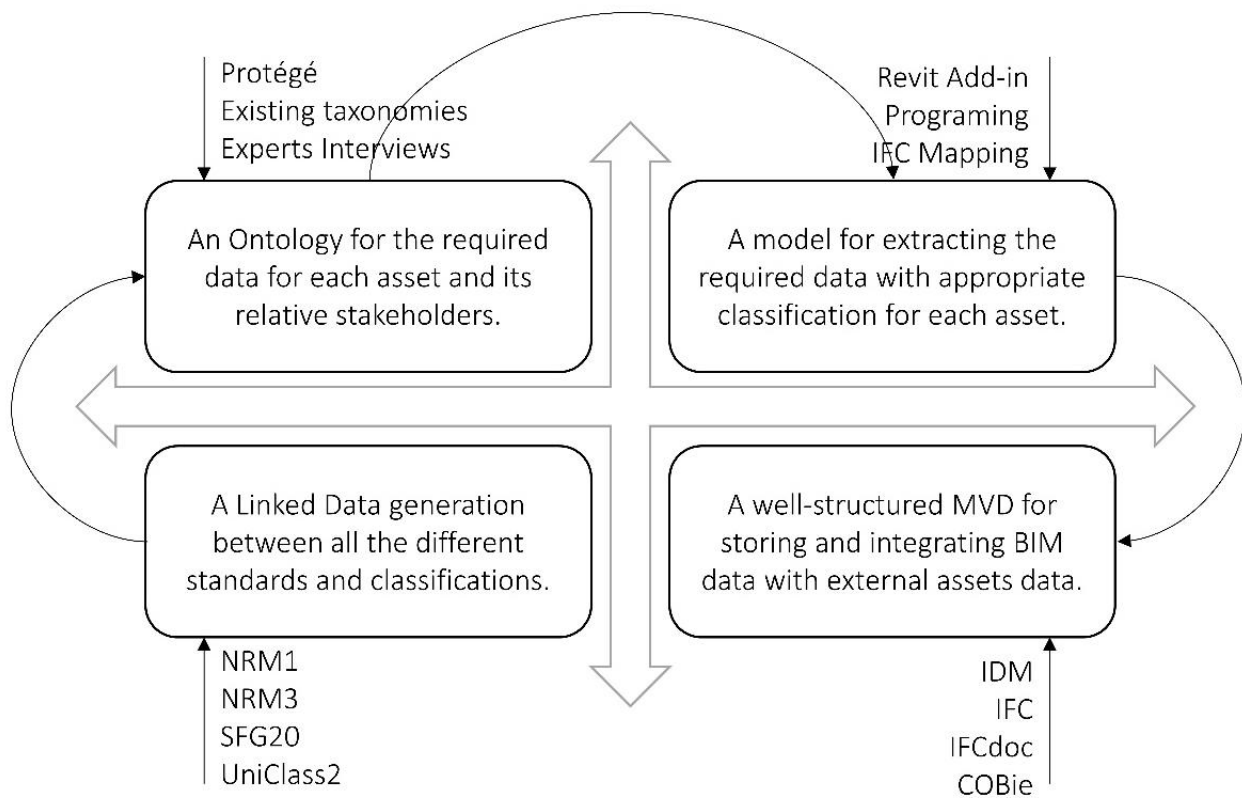
Figure 1: ACE-IM Framework (Source: Author)

## Conclusion

The effective management of asset data is crucial for the delivery, operation, and maintenance of any built facility. The identification of different aspects to improve interoperability between BIM and AM is subject to both academic and professional investigation. In the UK alone, there are currently two major projects aiming to develop standard product data parameters and structures for improving BIM implementation in facility management. In an attempt to cover the knowledge gap, this paper presents a conceptual framework that has been developed to facilitate the successful implementation of BIM in AM. The research was based on a literature review, semi-structured interviews, and a focus group. The conceptual framework was drawn to benchmark the best practice from other domains while abiding to existing standards. This research is part of an ongoing research which aims to provide an integrated solution for improving the interoperability between BIM and AM systems. Further work will involve providing solution for each aspect mentioned in the developed conceptual framework.

# Bibliography

CAVKA, H. B., STAUB-FRENCH, S. & POIRIER, E. A. 2017. Developing owner information requirements for BIM-enabled project delivery and asset management. *Automation in Construction,* 83**,** 169-183.

EADIE, R., BROWNE, M., ODEYINKA, H., MCKEOWN, C. & MCNIFF, S. 2015. A survey of current status of and perceived changes required for BIM adoption in the UK. *Built Environment Project and Asset Management,* 5**,** 4-21.

GALLAHER, M., O'CONNOR, A., DETTBARN, J. & GILDAY, L. 2004. Cost analysis of inadequate interoperability in the US capital facilities industry, NIST Publication GCR 04-867.

IBRAHIM, K. F., ABANDA, F. H., VIDALAKIS, C. & WOODS, G. BIM for FM: Input versus Output data. Proc. of the 33rd CIB W78 Conference 2016, 2016 Brisbane, Australia.

KENSEK, K. 2015. BIM Guidelines Inform Facilities Management Databases: A Case Study over Time. *Buildings,* 5**,** 899-916.

KIVITS, R. A. & FURNEAUX, C. 2013. BIM: Enabling Sustainability and Asset Management through Knowledge Management. *The Scientific World Journal,* 2013**,** 14.

LOVE, P. E., MATTHEWS, J. & LOCKLEY, S. 2015a. BIM for built asset management. *Built Environment Project and Asset Management,* 5.

LOVE, P. E., MATTHEWS, J., SIMPSON, I., HILL, A. & OLATUNJI, O. A. 2014. A benefits realization management building information modeling framework for asset owners. *Automation in construction,* 37**,** 1-10.

LOVE, P. E., ZHOU, J., MATTHEWS, J., SING, C.-P. & CAREY, B. 2015b. A systems information model for managing electrical, control, and instrumentation assets. *Built Environment Project and Asset Management,* 5**,** 278-289.

MCELROY, R. S. Update on national asset management initiatives: facilitating investment decision-making. Innovations in Urban Infrastructure Seminar of the APWA International Public Works Congress, 1999. Citeseer, 1-10.

NBIMS 2007, N. I. O. B. S. 2012. National Building Information Modeling Standard. National Institute of Building Science.

PÄRN, E., EDWARDS, D. & SING, M. 2017. The building information modelling trajectory in facilities management: A review. *Automation in Construction,* 75**,** 45-55.

WANG, W., TOLK, A. & WANG, W. The levels of conceptual interoperability model: applying systems engineering principles to M&S. Proceedings of the 2009 Spring Simulation Multiconference, 2009. Society for Computer Simulation International, 168.

WOODHOUSE, J. 1997. What is asset management? *Maintenance and Asset Management,* 12**,** 26-28.

# Defining and restoring the cultural landscape and place-identity of historic cities: the case of Mérida, Yucatán, México

Sheila Isabel Irigoyen Zozaya

## Abstract

The city of Mérida, Yucatan, is a typical example of Mexican cities where new settlements coexist with heritage areas. In the past, the Solar Maya as a basic plot unit within the Maya tradition in Yucatan was the symbol of sustainable design and identity that shaped the development of the cultural landscapes for centuries. Even though the Mayan cultural landscape was transformed, key heritage values have remained, evolved and mixed with new cultural trends that enriched the local cultural landscape until the first half of the twentieth century. Today nevertheless, unsustainable solutions in architecture and urban design are being produced that lead to the homogenization of the urban space in Mérida. This erosion is a major concern for the residents and various professional groups, who are seeking new ways to preserve their heritage in order to rediscover their identity and to achieve sustainable solutions at the urban level.

This paper discusses the evolution and current situation of cultural landscapes worldwide and their importance among Mexican cities particularly in the case study of Mérida, Yucatan.

**Keywords:** *cultural landscapes, place-identity, heritage, key values, Mexico, Mérida*

## Introduction

Cultural landscapes are historically intertwined in the urban development of many cities. They provide a sense of identity and help explain the relationship between natural and human processes through time (Radović, 2009; Plieninger and Bieling, 2012). In the past, traditional cultural landscapes were characterized by their symbiotic connection with local communities and their ability to adapt to the environment (Adam, 2011; Brislin, 2012). However, nowadays many of them have experienced fundamental transformations with severe impact on the ecosystem of human settlements (Butina Watson and Bentley, 2007; Plieninger and Bieling, 2012; Hopkins, 2015). Non-efficient solutions in architecture and urban design, as well as the homogenization of cultural landscapes are becoming common phenomena affecting the local place-identity of cities (Borja and Castells, 2000; Brislin, 2012). In consequence, societies worldwide have been concerned with these transformations and are searching for ways to understand who they are and to be distinguished from others in order to provide an equilibrium between rootedness and alienation, and also to achieve sustainable solutions (Butina Watson and Bentley, 2007; Adam, 2011; Brislin, 2012).

### The importance of Cultural landscapes and place-identity in Mexican Cities

It is a known fact the importance of Latin-American cities in terms of heritage. In the particular case of Mexican cities, the variety and vast number of monuments and heritage sites offer a testimony of the great cultural richness of the country, as well as it portraits the multiple faces of the national identity. In this regard, Mexico has been a global forerunner in the protection of heritage. Some regulations related to the protection of heritage can be traced since the XIX century (SAPM, 2011).

Mexico has 34 sites inscribed on the World Heritage List, of which 6 are natural, 27 are cultural and 1 mixed. The left Image corresponds to the Historic Centre of Zacatecas and the right image to the Central Campus of the University. National Autonomous University of Mexico (UNAM). Source: http://www.unesco.org/new/es/mexico/work-areas/culture/world-heritage/ (Accessed: 25 June 2018)

Nevertheless, with the arrival of the Mexican revolution of 1910 priorities changed, and later on, the introduction of functionalist ideas in the national context launched important changes in urbanism and architecture. Despite few successful attempts, functionalism in Mexico produced irreparable changes in the cultural heritage (Peraza, 2001; Diaz-Berrio, 2008). Consequently and following international efforts during the seventies, the research, preservation and dissemination of the heritage are now main policies in the country. Laws, treats, regulations, government plans and programs have been developed and applied through different instances (Federal government, State and Local Councils). Much of these efforts have their roots in the Academia (Díaz-Berrio, 2008) and amongst some private and social organizations (BANAMEX cultural foundation; cultural landscapes foundation).

Nowadays, despite all these efforts to protect the cultural heritage, urban regulations are weakly executed (Bolio, 2012). They also need to be revised and updated in order to adapt to local needs. At the same time, more diffusion and education is needed from early ages. The link between cultural landscape-identity needs to be addressed, as theoretical concepts and methodologies need to be defined to develop proposals to revert their current situation.

For many years until the second half of XX century, key heritage values wisely merge with new proposals, producing coherent cities where the creation or preservation of cultural landscapes and place-identity were an essential part of the urban design of cities (Tello, 2011). With the exception of few successful cases, new proposals have lost the right path. Nowadays, in most Mexican cities with heritage areas, the cultural landscapes and place-identity are endangerment and a disintegrated urban morphology is observed.

## The case of Mérida, Yucatan, Mexico

The city of Mérida is a representative case. Mérida is the capital of the Yucatan state, which concentrates the political, economic and cultural power in the region. Its particular natural conditions, the long Mayan heritage and the relative isolation from the country until the first half of twentieth century amalgamated creating a distinctive urban space from the rest of Mexican cities (Peraza, 2014). For many years, these enticements and its geographic location have attracted changes in the urban scenery.



Figure 1. A traditional Mayan house in Yucatan.
Watercolour. Source: A painting made by the author, 2014

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From the sixteenth to the first half of the twentieth century, new trends transformed the Mayan cultural landscape and place-identity of Mérida; yet, key heritage values endured and evolved thanks to their effectiveness and resilience (Peraza, 2008).

In recent years, these values have been forgotten and the city is becoming an anonymous entity, poorly defined and insensible to the value of environment. New developments usually imitate international consumer trends uncritically forgetting the lessons from the past (Chico, 2002; Román, 2002; Espadas, 2003; Peraza, 2008; Adam, 2011). Moreover, weak planning strategies, regulatory framework and governance processes foster the rise of incompatible land uses, affecting negatively on the continuity of traditional cultural landscapes (Alonso 2003; Bolio, 2012).
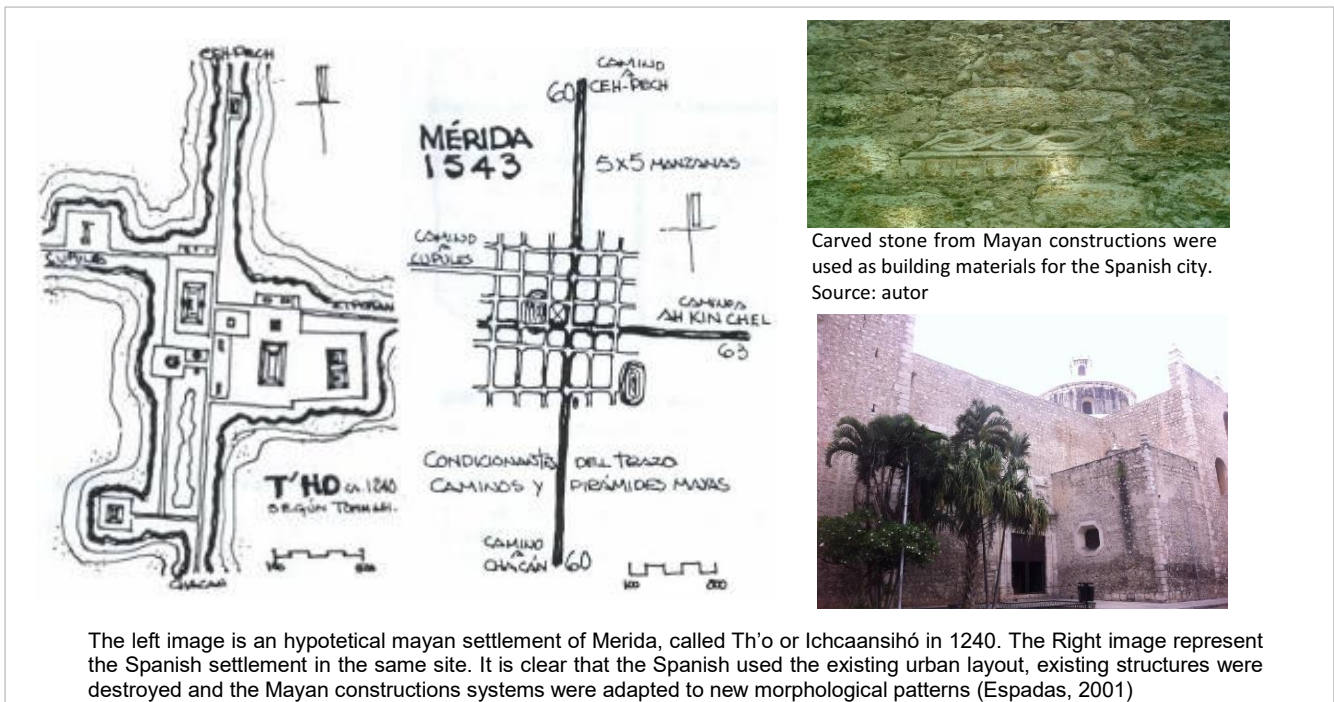
## Materials and methods

Cultural landscapes are holistic concepts. Therefore, primary and secondary data were collected using multiple sources of evidence. This will address a broader range of information, exploring in-depth perspectives and behaviours that will nurture holistic explanations (Yin 2014) in order to understand the evolution, development and mediating factors that have contributed to shape the cultural landscapes and place-identity of Mérida. The case studies were used as a research method to analyse their behaviour in the real local context of Mérida. Data types and collection techniques are described as follows:

**1. Morphological data:** Typo-morphological analysis was implemented by studying the physical components of the cultural landscapes and by tracing the historical background of different stages of Mérida. Its purpose is to understand how the historical urban transformations at different scales of the city lead into different urban morphological patterns (Punter,1997; Butina Watson and Bentley, 2007). The sources of information were collected through the regulatory framework and policies available in the area, historic maps, master plans, photographs, urban and planning proposals, documents, relevant local research, archival records, physical artifacts and media. Additionally direct observations in the site were used as a source of evidence to analyse the urban form. These observations were carried out by using field notes, hand drawings and photographs of public spaces, which may contain people (Zeizel, 2006; Bryman, 2012; Yin, 2014).

**2. Local perception of people:** Its purpose is to gain greater insight into the views and experiences of key actors when they use local cultural landscapes and to find out the values attached to the urban form. It also allows understanding in more depth the factors underpinning transformations at the local level.

## Discussion

Mérida is a city with a long history. It was founded on the 6 of January of 1542 over the ruins of the Maya settlement called Ichcaansihó or Th'o in the cacicazgo de ChaKán, which was already abandoned when the Spanish conquerors arrived (Peraza, 2008). Several authors (Peraza, 2008; Espadas, 2001; Bolio, 2012) established that Spanish used the pre-existing Mayan layout urban configurations, destroyed the existing assemblies to use them as building materials for shaping the new Spanish settlement. Furthermore, the foundation of Mérida was not an isolated phenomena, but was part of the establishment of a system of colonial cities of the sixteenth century. Thus San Francisco de Campeche, Mérida, Valladolid and Salamanca de Bacalar supported each other to survive in the Colonial period (Peraza, 2008).

The left image is an hypotetical mayan settlement of Merida, called Th'o or Ichcaansihó in 1240. The Right image represent the Spanish settlement in the same site. It is clear that the Spanish used the existing urban layout, existing structures were destroyed and the Mayan constructions systems were adapted to new morphological patterns (Espadas, 2001)

Mérida was not the first Spanish City founded in the Yucatan Peninsula, nor have the mining appeal like other parts of the country. However, since the beginning Mérida had an abundance of indigenous labour (Espadas, 2003). It also had a privileged location, due to its influence on other areas, its proximity to the sea and the supply routes (Peraza, 2008).

For four centuries the slow development of Mérida, offered people the opportunity to adapt new trends into the urban space. Nevertheless, at the end of the first half of the twentieth century, the conclusion of the henequen boom, which is a special type of agave native of Yucatan, caused a massive rural migration to the city of Mérida which caused a drastic growth mainly in the south (Peraza, 2014; Bolio, 2012).

From the second half of the twentieth century, Mexican cities radically changed their development pattern influenced by new models of European and American functionalism Zooning breaking with the traditional polycentric model. In Mérida, the absence of an adequate planning and social circumstances, allow the rapid urbanization which began in the 1970s (Bolio, 2012; Peraza 2014).

During the last decades of the twentieth century, the rapid changes in the urban development in Mérida have affected the cultural landscapes and place identity. Three important stages can been identified: a) the immigration of people from the centre of the country after the earthquakes 1985 and 1986; b) the Globalization have caused major changes in spaciousness of Mérida at an accelerated pace and the neo-liberal economic policies of the North American Free Trade Agreement in 1994 and; c) the Agrarian Law reform in 1992 during the Presidency of Carlos Salinas de Gortari. This fact, allowed a massive privatization policy and deep changes in regulations, which explains the uncontrollable urbanization over the last two decades. (Alonzo, 2003; Peraza, 2008; Bolio, 2012).

## Conclusion

Mérida has traces inherited from the past that still survive and are indispensable in its urban development (Peraza, 2008). Key heritage values such as the reuse of previous settlements; construction systems adapted to new spatial configurations; clear morphological patterns; good connectivity and respect for the natural characteristics of the site, have remained thanks to their proven effectiveness and resilience. They also represent the local culture and more friendly sustainable practices in urban design (Chico, 2002; Román, 2002; Espadas, 2003; Peraza, 2008).

The lure for the past prevails in the mind-set among the Mexican people, but current challenges require new proactive attitudes and solutions. Therefore, there is a need to develop an integral body of theory and methodology for re-evaluating and integrating the key heritage values into the contemporary urban practice. This will benefit the local community to preserve and revitalize their cultural landscapes and place-identity; and to add value to the urban development encouraging a sustainable design in Mérida.

# References

Adam, R. (2011). 'The globalization of a place', in McDonald, F., Rudlin, D., Urbanism, A.o. & Evans, B.M. (eds.) Urban identity: learning from place. London: Routledge.

Alonzo, A. (2003). Estrategias de desarrollo urbano-ambiental en Yucatán. Hacia una visión crítica. In: A. Alonzo and L. Tello, ed., Evolución y estrategias del desarrollo urbano ambiental en la Península de Yucatán, 1st ed. Mérida, Yucatán: Universidad Autónoma de Yucatán, pp.11-20.

Bolio, E. (2012). Urban transformations and place-identity: the case of Mérida, Mexico. Oxford: Oxford Brookes University.

Brislin, P. (2012). Human Experience and Place: Sustaining Identity, Architectural Design. John Wiley and Son.

Bryman, A. (2012). Social research methods. 4rd ed. Oxford; New York: Oxford University Press.

Butina Watson.G and Bentley.I, (2007). Identity by Design, Elsevier Ltd, Oxford.

Chico, P. (2002). Las formas de la Identidad Cultural y el papel del patrimonio cultural urbano arquitectónico en su permanente reconfiguración. Cuadernos de Arquitectura de Yucatán, (15), Facultad de Arquitectura, Universidad Autónoma de Yucatán, p. 67-72.

Díaz-Berrio (2008), Protección y rehabilitación del patrimonio cultural urbano. México: UAM Xochimilco.

Espadas, A. (2003). Génesis y Vorágine del Primer Contrapunto de la Centralidad Urbana emeritense y su disputa. De la Permanencia física y simbólica maya a la selva e símbolos del modernismo. In: A. Alonzo and L. Tello, ed., Evolución y estrategias del desarrollo urbano ambiental en la Península de Yucatán, 1st ed. Mérida, Yucatán: Universidad Autónoma de Yucatán, pp.55-98.

Hopkins, W. (2015). Nature in View, Nature in Design: Reconnecting People with Nature through Design. [Online] Available at: http://goo.gl/oLph8k [Accessed 6 May 2015].

Patrimonio Mundial (2017). Available at: http://www.unesco.org/new/es/mexico/work-areas/culture/world-heritage/ (Accessed: 25 June 2018)

Peraza, M. (2008). Los procesos urbanos, la identidad y la globalización en la Mérida Contemporánea. Diseño en Síntesis, (39), año 19, segunda época. Universidad Autónoma Metropolitana, Campus Xochimilco, México .D.F, p. 50-61. Available at: http://goo.gl/M9SZIU

Peraza, M. (2014). Los inicios de la modernización en Mérida, Yucatán. Revista de la Universidad Autónoma de Yucatán, (264), enero/junio. Universidad, Autónoma de Yucatán, p. 38-49. Available at: http://www.cirsociales.uady.mx/revUADY/pdf/264/ru2644.pdf.

Plieninger, T., & Bieling, C. (2012). Resilience and the cultural landscape: Understanding and managing change in human-shaped environments. Cambridge: Cambridge University Press.

Punter, J. V. (2007). Developing Urban Design as Public policy: Best Practice Principles for Design Review and Development Management. Journal of Urban Design 12(2), pp. 167-202. (10.1080/13574800701306195).

Radović, D. (2009). Eco-urbanity: towards well-mannered built environments. London: Routledge.

Román, A. (2002). La Tecnología Constructiva de las Edificaciones Históricas como componente de Identidad Regional en Yucatán. Cuadernos de Arquitectura de Yucatán, (15), Facultad de Arquitectura, Universidad Autónoma de Yucatán, p. 113-120.

SAPM (2011). Carta Mexicana del Paisaje. Available at: https://paisajesculturales.files.wordpress.com/2013/03/cmp_final.pdf (Accessed: 25 June 2018)

Tello, L. (2011). Emplazamiento y Estructuración Urbana de la Arquitectura Religiosa en la Ciudad de Mérida, siglos XVIIXIII. Un recorrido Imaginario. In: P. Chico and A. Román, ed., Procesos de conformación espacial y constructiva de los establecimientos religiosos. La construcción de una Utopía en Yucatán y en otras regiones novohispanas, 1st ed. Mérida, Yucatán: CONACYT, pp.33-42.

Yin, R. (2014). Case study research : Design and methods. 5th edn. Thousands Oaks, Los Angeles, CA: Sage.

Zeisel,J (2006). Inquiry By design: Environmental/ Behaviour/Neuroscience in Architecture, Interiors, Landscape and Planning ( Revised Edition).W.W.Norton and Company.

# Social capital, networks and intangible resources

Oscar Natividad Puig

## Abstract

This paper traces the concept of social capital over the last decades. It provides a brief overview on the evolution of the concept, the nuances added over the years, and some debates around the scope of it. The paper then follows with a short discussion around the components, causes, and effects of social capital that have led to a loose and confusing use of the term. To conclude, I propose to pursue other streams of theory to avoid the traps that come with the concept of social capital in favour of more targeted and productive research.

## A Brief Overview of Social Capital

The concept of social capital has been highly theorized in the social sciences and has quickly spread to multiple disciplines. Social capital aims at highlighting the relevance of social interactions, channels of communication and collaboration, levels of trust of even civic engagement among members of a community (see Bourdieu, 1986; Portes, 1998; and Putnam, 2001). The term can be traced back to 1916, when school superintendent Hanifax used it to refer to an accumulation of resources out of the interaction between neighbours that could improve their lives (as discussed by Putnam, 2001, p.19). In the following decades, even before the popularisation of the term social capital, the idea of neighbours' interactions was explored by several authors, including the analysis of "public identity" by urbanist Jane Jacobs (1961) to refer to the small networks and connections created out of daily routines that define the character of a place and the behaviour of the society that inhabits it.

The first attempts to compile an extensive definition of what is entailed by social capital were undertaken by Bourdieu (1986) and Coleman (1988). Both their studies focus on the role of close connections with families and neighbours for accessing economic resources. Bourdieu expands on three forms of capital: economic, cultural and social, and the likelihood of each to be converted into economic capital and, ultimately, monetised. In order to do so, he presents two opposing views: economism and semiotism. The former assumes that all forms of capital can be reduced to economic capital, while the latter only focuses on the phenomena of social interaction. Coleman centres his analysis on the interaction between human capital and social capital. While both Bourdieu and Coleman developed a compelling argument in favour of close and tight connections, an opposing view was emerging following with the work of Granovetter (1977), who argued that acquaintances from external groups often provide better opportunities for economic development, as they broaden an individual's access to information and employment. These opposing views have something in common: whether it is through close family and community bonds, or through broader, more superficial acquaintances, they define social capital as the means for individual's to ultimately access different forms of social capital, hence feeding to the economic theory and terminology of capital itself. Both approaches share the assumption that, as Bourdieu (1986, p.252) puts it, "economic capital is at the root of all the other types of capital".

It would not be for another decade that Putnam would explore social capital as a collective resource, aiming at expanding on the non-economic aspects of social capital within society. First, with the analysis of civic engagement in Italy, Putnam et al. (1994, p.167) define social capital as "trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions". A couple years later, exploring the decline of civic engagement in the context of the United States, Putnam (2001, p.19) expands by saying that "the core idea of social capital theory is that social networks have value [...] social capital refers to connections among individuals - social networks and the norms of reciprocity and trustworthiness that arise from them"

Putnam's influential work popularized the use of the term, and fed a debate across multiple fields about whether social capital should be analysed as an individual or a collective resource. Urban planning and development more specifically adopted the perspective of social capital as a collective resource that is, at the same time, scalable to different urban units. Rydin and Holman (2004) explored the potential of social capital to inform policies for sustainable urban development, while Blokland and Savage (2008) developed the idea of "networked urbanism", linking social capital and urban theory to better understand the processes of urban segregation and inequality. More recently, Aldrich (2012) took a step further in his work, exploring social capital as a key resource for communities to survive in the aftermath of a disaster.

## Characteristics, Causes, Effects and Dimensions of Social Capital

With the adoption and transformation of the concept of social capital throughout different disciplines, a general thread seems to remain constant: the idea of resources and benefits acquired through networks. However, the popularization of the term inevitably results in a loose, all-purpose concept that requires constant re-examination and specification. During the adoption of social capital as a collective resource by the field of urban planning and development Rydin and Holman (2004), for instance, define the following elements as measurable, relevant components of social capital: the nature of the network involved, the role of norms and values, the definition of its boundaries, the role of place and territory, the scale at which social capital operates, the horizontal or vertical linkages involved, and the sectors it involves (state, economy, civil society). Radnitz et al. (2009), meanwhile, propose to disaggregate the term of social capital to three core elements: norms, trust, and networking, with the latter element referring more specifically to social exchanges in both formal and informal settings. Efforts to identify characteristics of social capital often end up listing a series of intangible qualities that are collectively owned. However, the analysis of these characteristics would benefit from a closer dialogue with urban theorists exploring the intangible values in communities without necessarily adopting the term of social capital, i.e. the idea of "public identity" presented in the previous section (Jacobs, 1961), or the concept of "people as infrastructure" to highlight levels of trust, social dynamics and informal trading processes as key elements of local economies (Simone, 2004). However, portraying social capital as a loose overarching concept that encompasses all multiple independent but interconnected intangibles leads to confusing analysis, assessing some intangibles as simultaneously the cause and the effects of social capital (Portes, 1998).

Parallel to the theorization of characteristics, causes and effects of social capital, the compelling idea of "weak ties" developed in Granovetter's work in 1977 fuelled the growth of social network analysis. Network analysis provides a way out of the causality dilemma, focusing instead on assessing and measuring the root structures of social interactions and how these may correlate with the acquisition of specific intangibles. Theorists interested in the collective aspects of social capital, in dialogue with the social network analysis efforts, ended up differentiating between multiple dimensions of social capital in order to account for both temporary and long-lasting networks occurring within and across socio-urban units. Gittell and Vidal (1998) -building on Putnam et al. (1994)- differentiate between bonding social capital, as networks, connections and interactions within the boundaries of a defined community, from bridging social capital, including any other connections across such boundaries. Some years later, the definition of linking social capital was developed by Szreter and Woolcock (2004) to exclusively refer to networks and relationships within and across institutionalized forms of power. While Rydin and Holman (2004) argued for the use of bracing social capital in order to provide strategies promoting bounded temporal networks between groups that would otherwise not have access to each other.

The thrive of social network analysis may had added confusion to what actually constitutes social capital: is it the resources flowing through the social networks? or is the network structures themselves? (Aldrich, 2012). However, it has also provided an opening for two separate streams of targeted theory: social networks and intangible resources. By focusing on the different dimensions of social capital, it becomes possible to trace the structural spine of social capital, the platform through which the intangible resources or benefits can be acquired, created or even destroyed. Therefore, I would argue for two distinctive approaches for the field of urban studies in substitution of the loose definition of social capital. On the

one hand, analysis should map the network structures through which social exchanges, collaboration, support and/or segregation occurs, targeting specific dimensions that can be enhanced in different contexts. On the other hand, scholars should define the history and role of intangibles within a bounded territory, identifying qualitative metrics to trace its changes and its correlation with different network structures.

## Conclusions

The term social capital originally served the purpose of highlighting the importance of resources not accounted for in economic theories. By reducing social capital to the means for advancing individuals' economic growth, however, theorists remained within the biased limitations offered by capitalist theory. Putnam's treatment of social capital as a collective resource may be considered the first attempt to detach the concept from economic transactions and associate it with a broader idea of sociocultural and civic development. At the same time, this broader concept can result in vague descriptions of what it entails, nurturing loose arguments that are easily targeted by economic theory.

Therefore, I suggest releasing the planning discipline from the restrictions attached to the concept of social capital, and pursue research on two related but more focused ideas learned through the journey of social capital: (1) networks as structures of coordination to achieve and promote social resources, (2) intangibles as valuable resources even when they cannot be transform into economic capital.

## Bibliography

Aldrich, D. P. (2012). *Building resilience: Social capital in post-disaster recovery*. University of Chicago Press

Blokland, T., & Savage, M. (2008). Social capital and networked urbanism. *Networked urbanism: Social capital in the city*, 1-22

Bourdieu, P. (1986). "The forms of capital". Pp. 241-258 in *Handbook of theory and research for the sociology of education*, edited by J.G. Richardson. New York: Greenwood Press.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American journal of sociology*, *94*, S95-S120

Gittell, R., & Vidal, A. (1998). *Community organizing: Building social capital as a development strategy*. Sage publications

Granovetter, M. S. (1977). The strength of weak ties. In *Social networks* (pp. 347-367).

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual review of sociology*, *24*(1), 1-24

Jacobs, J. (1961). *The death and life of American cities*.

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual review of sociology*, *24*(1), 1-24

Putnam, R. D., Leonardi, R., & Nanetti, R. Y. (1994). *Making democracy work: Civic traditions in modern Italy*. Princeton university press

Putnam, R. D. (2001). *Bowling alone: The collapse and revival of American community*. Simon and Schuster.

# Discovering the Hidden Treasures of Historical Film Distribution Through Oral History

Nektaria McWilliams

## Abstract

As part of my research project, I interviewed a film distributor in Melbourne Australia earlier this year, who told me about his life in the film industry and how he had to break the law so new laws could be made. My project, Diaspora, Identity and Cinematic Memory in Rural Australia, is on post-war Greek migrants in rural Australia and their memories of watching Greek films there in the 1950s, 60s and 70s.

Peter Yiannoudes, was the film distributor who made watching Greek film possible in Australia at the time. In January, he invited me into his home to tell me all about what went on behind the scenes. There were stories about meeting glamourous actors and famous directors, visiting film sets, going to parties and attending film festivals all around the world. Much of what I had expected to hear from someone in his position. But what I was most surprised about hearing, was his involvement in lobbying government to change Australian law so that films could be screened on Sundays, and that strict censorship laws were relaxed. The paper's ultimate aim is to consider new contributions to current knowledge through Yiannoudes' oral testimony, and to reflect on the significance of oral history as a methodological tool.

## Introduction

As part of my research project, I interviewed a film distributor in Melbourne Australia, earlier this year, who told me about his life in the film industry, and how he had to break the law, so new laws could be made. My project, Diaspora, Identity and Cinematic Memory in Rural Australia, is on post-war Greek migrants in rural Australia and their memories of watching Greek films there in the 1950s, 60s and 70s. Peter Yiannoudes, was the film distributor who made watching Greek film possible in Australia at the time. In January, he invited me into his home to tell me all about what went on behind the scenes. There were stories about meeting glamourous actors and famous directors, visiting film sets, going to parties and attending film festivals all around the world. Much of what I had expected to hear from someone in his position.

What surprised me the most, was hearing about his involvement in lobbying government to change Australian law so that films could be screened on Sundays, and that strict censorship laws were relaxed. It was also surprising to hear about a time when phone calls to Greece had to be booked 2 days in advance, it took 22 days for films to arrive by ship and 6 weeks for them to clear censorship and customs, and an average 35mm film reel was highly flammable and weighed around 30kg/5 stone. All this seems inconceivable now that films are instant, online, and we can watch them on our phones for free.

## Discussion

Mr Yiannoudes talked me through the 35 years of establishing a long-running film circuit, securing a monopoly market, and tactics that were used to bring audiences back after the introduction of colour television. But from what I could tell, two of his greatest achievements are the creation of wonderful memories for audiences through film, and his efforts in lobbying government to change film screening laws. Both these achievements are still visible today through reformed law and surviving audience members.

Yiannoudes' enduring career was motivated by his great love of cinema which began in Limassol, Cyprus, where he was born. At age 15 he worked after-school in a movie theatre as a ticket seller and assistant projectionist. Here he vividly remembers the first film he fell in love with. *Blood and Sand*, a 1941 drama, starring Tyrone Power and Rita Hayworth.

He also vividly remembers the first film that made people fall in love with him. *Golfo*, a 1955 romance starring Antigoni Valakou and Georgos Glinos, a well-known theatrical play whose storyline was familiar to Greek audiences. Yiannoudes first began screening *Golfo* in larger cities in 35mm. After seeing the film's box office success, he wanted to take it to audiences in country towns where he knew there were many Greeks. So, he decided to convert the film from 35 to 16mm for easier transportation, and estimates that around half a million people saw the film in over 150 locations in rural Australia and in Fiji.

At this point, a short video clip from our interview was shown. Please refer to transcript 1 in the appendix.

On his journey around Australia, Yiannoudes discovered that certain areas were more populated at different times of the year because of seasonal work. Fruit picking attracted large numbers of Greek workers who moved itinerantly around the country working in fields to collect fruit. Yiannoudes made note of where they went and at what time, and used this information to devise a map, which followed their movements around the country. This carefully planned film-circuit was a strategic decision that would safeguard his company's success, as it proved to be a very profitable, secure way of exhibiting film.

Mildura a rural town in Victoria known for its grape production, was particularly fruitful for Mr Yiannoudes. He explains, "During the picking season in Mildura, there were 2-3,000 Greek people picking. I used to go there to provide entertainment for 2 to 3 weeks and would make more money there than in the city!"

This reference to money, fruit pickers and Mildura reminded me of an article I had read by film historian Kate Bowles (2009). It is interesting to cross-reference her findings of film exhibition in Mildura with Yiannoudes's experiences, as they could not have been more different. She points to climate conditions as a factor that affected cinema attendance greatly in rural areas,| when referring to "the inland fruit-growing region around Mildura, as suffering from drought" (Bowles, 2009, p. 88). This resulted in decreased fruit crops, which meant less demand for itinerant workers, but also had a knock-on effect for cinema owners as they struggled to meet their expenses. As one cinema owner put it "The Wonderland manages to screen five nights a week and although the receipts are about half the usual, the overhead remains the same" (*Everyones*, 1 February 1928: 37, cited in Bowles, 2009).

These same overheads that affected cinema owners at a time of drought, were not an issue for Yiannoudes with his portable projector and no cinema expenses. For him, Mildura was not only a place where he could "make more money than the city', but it was also where, after screening *Golfo* for the first time, was able to cover the cost of the film's conversion and make a profitable return.

He also discovered that Sunday nights were particularly good nights for entertainment. But they were also problematic as Australian law prohibited Sunday film screenings. Yiannoudes had negotiated this law for many years in rural areas where he operated outside the cinema. But after buying several cinemas of his own in Melbourne and knowing that people wanted entertaining on a Sunday, Yiannoudes

together with a handful of independent cinema owners, decided to open their doors on a Sunday, and to break the law, despite being aware of the £500 fine that would follow.

At this point a short video clip from our interview is shown. Please refer to transcript 2 in appendix.

In order for a law to be amended in the city, it had to be broken first. For many years Yiannoudes had screened films on Sunday evenings in rural towns. This was possible for three main reasons: the spaces he used (town halls, churches, and RSL clubs), film size (16 mm), and the fact that the ticket money was collected at a different location from the screening venues. I had first read about prohibited Sunday screenings in Dylan Walker's article on rural cinema in South Australia (2007) and couldn't help but think of the contributions Yiannoudes' oral testimony made to this.

But this section of the interview makes further contributions to, and is also significant in terms of identity, diaspora and migration studies. Yiannoudes makes several indications towards an 'us and them' power dynamic and recalls a time when Greek migrants were just beginning to gain voting rights in Australia. These comments, which appear at various points throughout the interview, reveal what Bridget Anderson (2013) calls the dangerous distinction between migrant, and citizen (Anderson, 2013), a politics of inclusion and exclusion which is often disregarded in multicultural societies, like Australia. But perhaps what is most striking about Yiannoudes' us and them dichotomy, is that it provides answers to questions that were not explicitly asked. This is a defining feature of oral history methods and one that distinguishes it from others. As Alessandro Portelli points out, oral sources offer a reflective approach as they tell us not just what people did, but what they wanted to do, what they believed they were doing, and what they now think they did (Portelli, 1998).

## Conclusion

Listening back to the interview provides an opportunity to uncover many other answers to questions that were not intended. In fact, some of richest material comes not from carefully crafted questions, but is more a result of unintended coincidence in how the conversation unfolded, and the natural progressions it took.

This qualitative oral history approach lends itself to a bottom up methodology of historical enquiry, where the data presents itself rather than a hypothesis being tested. I was very fortunate that Mr Yiannoudes agreed to an interview, for without his oral testimony, insights into strategically mapped film circuits might not have been possible. Nor would understandings of how Sunday night screening laws were changed. These new contributions to current literature are taken from a 10 minute portion of a 6 hour interview, so I very much look forward to discovering more hidden treasures along the way.

## Bibliography

Anderson, B. (2013) *Us and Them? The Dangerous Politics of Immigration Controls*, Oxford University Press. Oxford.

Bowles, K. (2009) 'Limit of Maps? Locality and Cinema-Going in Australia', *Media International Australia,* vol. 131, no. 1, pp. 83-94.

Portelli, A. (1998) 'What Makes Oral History Different', in R.Perks and A. Thompson (eds) The Oral History Reader, pp. 63-77, Routledge, London.

Walker, D. (2007) 'Rural Cinema in South Australia in the 1930s', *Studies in Australasian Cinema,* vol. 1, no. 3, pp. 353-375.

Yiannoudes, Peter (2018) Interviewed by Nektaria McWilliams, Wednesday 17th January, Melbourne Australia.

# Appendix

**Transcript 1**
Peter Yiannoudes: This is my first projector, 16mm, Bent and Howell, model 601. So, originally I hired this one from a shop in Melbourne, to screen the film in small country places, in Geelong, Ballarat and Bendigo. And then after a couple of months, I bought it in those days was a £100, so it was a lot of money, but I didn't mind, so this projector went around Australia many many times, not once, many many times screening Greek films, and sometimes Italian and Yugoslav films. So, this is like my baby. So really always I keep an eye on her, on this, so I have it always in my home, not in the office. So really I can keep it, clean it, and speak to it sometimes, remembering the beautiful times we had in various place, even in a cattle station in Alice Springs. So really, this is my love. Except my wife and children, this is my second love.

**Transcript 2**
Peter Yiannoudes: But we the Greeks, the Italians and some independent theatres, we decided to break the law, because we said that it was unfair. Because they said the Catholics, they have mass, but I don't care if you have the Catholics or the Protestants. We the Greeks, we have day time, so why don't screen? They said, "but this is the law." "Okay, it's the law, but we must change the law." We tried, they said "no, no", they always the churches, they deny to give permit to screen films on Sunday. Then when we decided that, when we break the law, we make for 3-4 weeks, and then after, I can't remember now....but bear in mind, those days, Greeks they started voting, so they had voting power. [When did this happen?] 1964/65. So, then, they started some Greeks to be part of political parties or something like that, so they said "look at these Greeks!" So, we I mean, we accused the government those days, Menzies, the Liberal party. We said "look the Liberals they done that, they done that!", so what we have done then, they saw that is something wrong here, and they, the churches then decided, I mean the Catholic Church decided, to give their permissions, but to start the film 8:30, but it's too late. Alright, but we accept that. We accept that, and emm we started 8:30, sometimes we start 8 o'clock something like that, but when we saw that it was a big success on Sunday, it took us about another 2 or 3 years, and we pushed to political, then I was involved with political parties and all these things, errr with other and I remember 2 other Australians, and we push it, and they give us permit to open anytime we want. [So, you helped to change the law?] OK yes, yes the law yes, because otherwise we couldn't. Losing one of the best days of the week – why?

# Utilizing Photographic Sources for the Visualization of Lost Architectural Heritage

Serkan Günay

## Abstract

Photographic historic documents are one of the main sources of information when investigating lost architectural and urban heritage. Within heritage studies, technological developments in digital technologies in virtual reconstruction make it possible to construct the urban fabric of disappeared societies and their architecture in the virtual environment.

This paper aims to discuss the challenges of collecting photographic and cartographic information about lost architectural heritage for virtual reconstruction. It also aims to provide a brief discussion regarding the reliability and the authenticity of the sources of information in contested heritage studies.

## Introduction

Disappeared civilizations, forgotten cities and lost architecture have always attracted researchers to learn more about the unknown and forgotten past. The attraction of uncovering the truth about displaced and perished societies appealed to many scholars to do research about these lost heritages. (Novitski, 1998). As attractive as it may be to do research about these invisible subjects, it is challenging to gather documents and historic data as the first stage of such research.

Visualization of lost or unbuilt architecture has been an area of study for a number of decades (Novitski, 1998). The outcome of such studies ranges from the virtually realistic digital reconstruction of ancient buildings to 3D modelling of certain important historic buildings of the past. One of the earliest examples of such studies in the UK is the virtual reconstruction of a 10th century Norman Cathedral in Winchester based on the drawings and documentations of an excavation project from the 1960s (Kjolbye-Biddle, 1986). Over the years, with the help of technological developments and advances in digital reconstruction, similar projects have been prepared for various other lost buildings and sites. Another recent project is the 'Oxford Friars' project for the virtual reconstruction of mendicant architecture in medieval Oxford from the 13th and 16th centuries (Knowles, 2015). In both examples, traces of lost architecture and archaeological remains were the main sources of information used to virtually reconstruct the lost architecture. Hence, there is a need to look into the challenges of the digital reconstruction of lost architectural heritage when there are no detailed architectural drawings or archaeological remains.

## Methods

Izmir in Turkey and Thessaloniki in Greece are the two case studies for this research. (Figure – 1). The social and economic importance of these selected case studies can be identified through the existing historic buildings as well as the lost architectural heritage. In many parts of the Balkans, Anatolia and the Middle East, populations, borders and urban settlements significantly changed during the 20th century because of wars, civil conflicts and economic developments (Karpat, 1997). The population exchange which took place in 1922 and 1923 between Turkish and Greek populations is one of the most significant examples of such shifts.

Therefore, two case studies were selected from these countries, to provide a comparative analysis of the changes that occurred in the region.
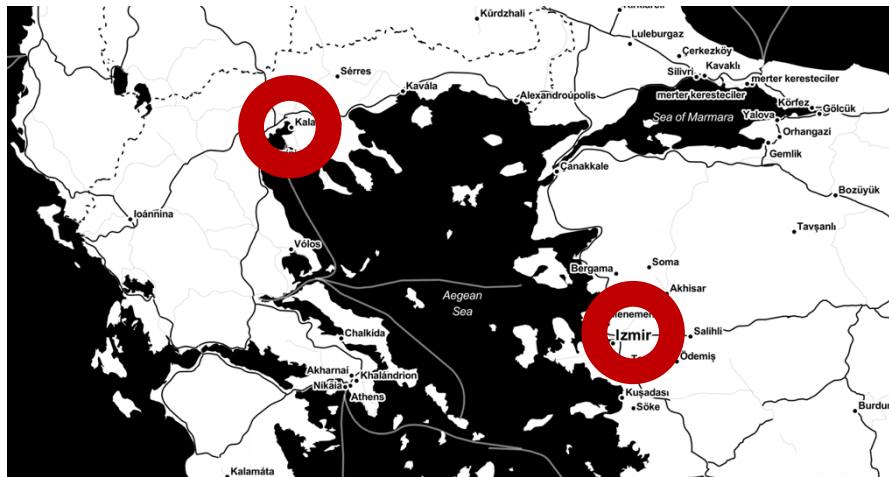


Figure – 1 Izmir and Thessaloniki in Aegean Region

Izmir is a historic port city on the Aegean coast of Turkey and has been an important trading point since antiquity, attracting different ethnic and religious communities to settle there. Thessaloniki is also an important port city on the Greek side of the Aegean Sea and had many settlers from different ethnic and religious backgrounds. In the early 1900s, communities in both settlements were from Turkish, Greek, Armenian, Jewish and European backgrounds. Due to war, conflict and urban development, the majority of both cities' architectural heritage was lost between the 1920s and 1950s. Even though we can see a diversity of a different kind of origin in Izmir and Thessaloniki today, it is no longer possible to capture these earlier communities and their architecture in both cities. In addition to the loss of tangible heritage samples, intangible heritage also disappeared due to the migration of these populations from Izmir and Thessaloniki (Papastathis & Hekimoglou, 2010).

Today Izmir and Thessaloniki's historic city centres consist of very limited historic buildings. The majority of the central areas of the cities was built after the second half of the 20th century due to economic and urban growth. Although monumental or residential historic buildings still exist in both cities, the amount of lost architectural heritage due to war, fire and urban development is extensive. In the case of Izmir, for instance, the 1922 fire destroyed approximately 25,000 buildings. (Bilsel, 1997). Similarly Thessaloniki lost more than 10,000 buildings in a fire in 1917 (Papastathis & Hekimoglou, 2010), including three byzantine churches, ten mosques and sixteen synagogues (Yerolympos, 1996).

## Materials

Apart from the surviving buildings and the current urban fabric of both cities, cartographic and photographic archives are the only resources that provide information about Izmir and Thessaloniki from the early 1900s. Because of the commercial importance of both cities, insurance maps commissioned by insurance companies are good sources of information for the pre-fire urban structure. The Charles E. Goad Map of 1905 for Izmir (Figure – 2) and the Wernieski Map of 1880 for Thessaloniki (Figure – 3) give information about both cities' commercial and residential neighbourhoods as well as information about their major religious and monumental buildings.
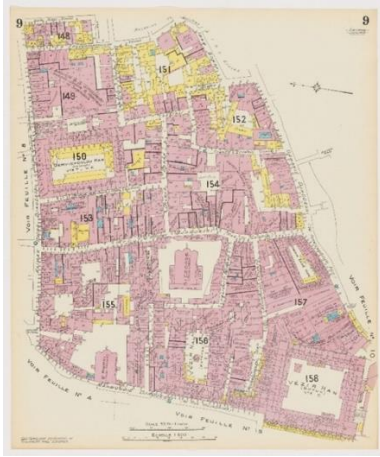
Figure – 2 Charles E. Goad Map 1905, Izmir.
Retrieved June 14, 2018, from
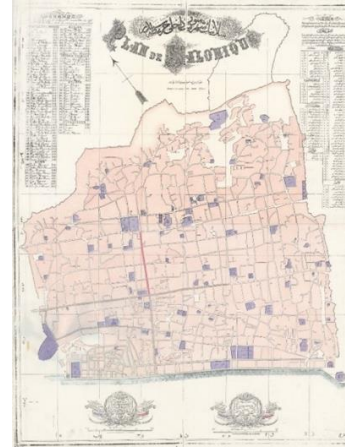http://archnet.org/publications/10377



Figure – 3 Wernieski Map 1880, Thessaloniki.
(Yerolympos, 2

The lost architectural heritage in both cities is the subject of the historic research and 3D models of the buildings have been reconstructed with digital technologies by using old photos and historic maps (Figure – 4 & 5). Historic photos (Beyru, 2000, Yilmaz Yetkin, 2003, Colonas, 2005, Unlu, 2006, Copsidas, 1992) provided information to virtually create the 3D models of these lost architectural heritages. Information brought through from the photos mainly related to the proportions, dimensions and identification of certain materials. Due to the fact that the majority of these photos were black & white, the information regarding the materials was also limited.

For the next stage of the research, the generated 3D models will be transferred to a GIS environment for further data storage and analysis purposes. The stored data will then be visualized providing more information about both cities' architectural and urban heritage before the fires of the early 1900s.
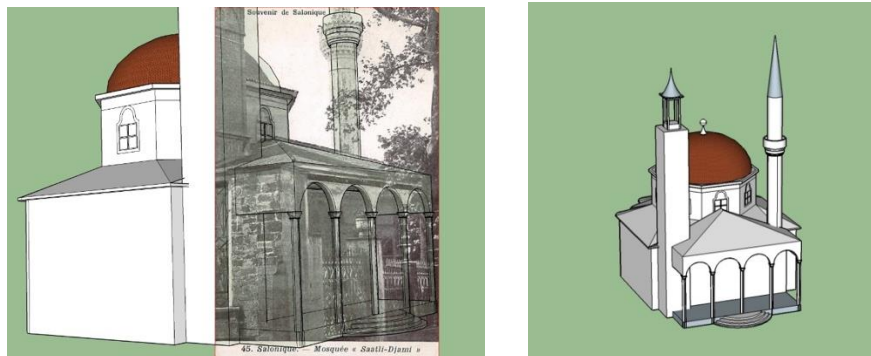


Figure – 4 Virtual reconstruction of Saatli Mosque – Thessaloniki



Figure – 5 Virtual reconstruction of St Photini Church Tower – Izmir

## Reliability and Authenticity of Photographic Sources

One of the main difficulties of collecting documents comes from the fact that there are limited and problematic documents capturing these lost heritages. Although both lost architectural samples from Izmir and Thessaloniki disappeared less than 100 years ago, there is not much photographic evidence of the lost architectural heritage of these cities.

Additionally, contestation of architectural heritage also might create further problems regarding the authenticity of the documents for such a research. Architectural heritage can become the subject of political and cultural debates as a proof of legitimacy or a cultural symbol. Therefore, another challenge collecting documents about lost architecture comes from the reliability of the sources. Bevan (2006) defines the architectural heritage in conflict areas as having a totemic quality, which might lead to contested architectural heritage practices. In a previously diverse society where the ownership of architectural heritage is contested, it is important to find resources that look back at history from an objective point of view.

Another unreliable source of information could be based on the governmental narrative of historic events. In the case of Izmir and Thessaloniki, various authors discuss the governments' approach to the history of both cities. The Turkish author Eldem (2014) defines Thessaloniki of the 1900s as a complex city in an already complex Ottoman empire. He highlights the Jewish heritage of the city by referring to it as a predominantly Jewish Ottoman city and mentions the Turkish perspective as an attempt to reinvent the past and the Greek perspective as redesigning its future. He adds that the present situation is a city that is lost to the Greeks from a Turkish perspective. Similarly, we can see a corresponding point of view for the city of Izmir from a Greek perspective (Kitromilides & Alexandris, 1986).

The Balkan region, like many other multi-ethnic and religious territories in the world, has been inhabited and ruled by several ethnic groups and civilizations. Evidently, it is still possible to locate different ethnic and religious groups within today's nation states which are based on the territorial states defined with the Berlin Treaty of 1878. Karpat (1997) argues the creation of nation states and nationalism in the Balkans was an affect that was built on false premises yet it is a powerful doctrine that changed the course of human history in the region. Therefore, it is crucial to identify sources that discuss the historical events and happenings from a comprehensive and objective point of view.

## Conclusion

It is important to highlight the challenges that occur when research is dealing with lost architectural and urban heritage in a contested area. In addition to the challenges of collecting reliable information in order to create accurate 3D representations of these lost architectural heritage, another issue is the authenticity of the created 3D visuals. Since the photographic evidence could be limited in terms of the information gathered, it could be the case that the outcome might include reconstructions based on assumptions. This also provides a discussion point where accuracy as an important factor while creating 3D visuals using old photos. For this reason, the overall approach to such a project should be built on reliable sources, such as archival documents that can be verified by multiple references, since there is no evidence that can be collected from the site of these lost buildings. It is also important to highlight the purposes of such a study in order to create usable knowledge for possible future studies.

## Bibliography

Ashworth, G. J., Larkham, P. J. (1994). Building a New Heritage. London: Routledge

Beyru, R. (2000). 19. Yuzyilda Izmir'de Yasam (Life in 19th Century Izmir). Istanbul: Literatur Yayincilik.

Bryman, A. (2012). Social Research Methods 4th ed. Oxford: Oxford University Press

Bevan, R. (2006). The Destruction of Memory, Architecture at War. Bath: Bath Press

Copsidas, C. (1992). The Jews of Thessaloniki Through the Postcards of 1886-1917, Thessaloniki: Costis Copsidas.

Colonas, V. (2005). Greek Architects in the Ottoman Empire. Athens: Olkos Publishers

FeildenN B. M., Jokiletho J., (1998). Management Guidelines for World Cultural Heritage Sites. Rome: ICCROM.

Forsyth, M. (2007). Understanding Historic Building Conservation. Oxford: Blackwell Publishing.

Galaty M. (2010). Blood of our Ancestors: Cultural Heritage Management in the Balkans. London: Springer.

Graeme E. (2003). Whose Heritage s it Anyway? Reconciling the 'National' and the Universal in Quebec City. British Journal of Canadian Studies.

Karpat K. (1972). The Transformation of the Ottoman State, 1789 – 1908. International Journal of Middle East Studies.

Karpat K. (1997). The Balkan National States and Nationalism: Image and Reality, Islamic Studies Vol. 36, No. 2/3, Special Issue: Islam in the Balkans, pp. 329-359.

Kitromilides, P. & Alexandris, A. (1986). Ethnic Survival, Nationalism and Forced Migration. 350-351. doi:http://dx.doi.org/10.12681/deltikms.116

Macdonald, S (2011). Contemporary Architecture in Historic Urban Environments. Conservation Perspectives: The GCI Newsletter 26, Getty

Novitski, B. J. (1998). Rendering Real and Imagined Buildings. Massachusetts: Rackport Publishers

Orbasli, A. (2017). Conservation Theory in the Twenty-first Century: Slow Evolution or a Paradigm Shift?. Journal of Architectural Conservation, 23:3. 157-170. doi:10.1080/13556207.2017.1368187.

Papastathis, K., Hekimoglou, E. A. (2010). The Great Fire if Thessaloniki (1917). Thessaloniki: Manos.

Ruskin (1849). The Seven Lamps of Architecture. New York: Wiley.

Turnbridge J. E., Ashworth G. J. (1996). Dissonant Heritage; the Management of the Past as a Resource in Conflict. West Sussex: Wiley.

Turnbridge J. E., Ashworth G. J. (1990). The Tourist-Historic City. London: Belhaven.

Silverman H. (2011). Contested Cultural Heritage. London: Springer.

Unlu, S. (2006). Yadigar-I Selanik. Ankara: Kultur ve Turizm Bakanligi Yayinlari.

Yin, R. (2003). Case Study Research; Design and Methods. London: Sage Publications.

Yerolympos, A. (1996). Urban Transformations in the Balkans (1820-1920). Thessaloniki: University Studio Press.

Yilmaz, F., Yetkin, S. (2003). Izmir Kartpostallari 1900 (Izmir Postcards 1900). Izmir: Izmir Municipality Publishing.

# Analysis of traffic dis-incentivisation policies using various Big Data sources

Sridhar Raman

## Abstract

Traffic dis-incentivisation policies have been implemented by policy planners through various means. At the core of each policy is the focus on discouraging private motorised vehicle usage and encouraging active mobility. The most common form of dis-incentivisation is through "traffic calming" - an infrastructure/policy instrument that enforces speed measures. Existing literature on such traffic calming measures and their effects, focus predominantly on traffic flow and sparsely on the incidental benefits to traffic and society, as a whole. Additionally, the setting up of case studies for individually analysing each traffic calming measure is a laborious process, and one that requires a pre and post analysis. With the availability of various Big Data sources, this analysis can be done more dynamically. By treating roads as a heterogeneous entity consisting of "micro-artifacts", one can identify patterns between traffic measures and traffic speeds; and this can be supplemented with additional environmental data to understand societal benefits better. This study looks at one such case study in Oxford and analyses the influence of traffic calming on Botley Road.

## Introduction

Urban mobility planning in most cities across the world, be it in developed or developing nations, primarily concentrates on tackling the problem of traffic congestion by increasing the supply to support the increased demand. This mode of planning is slowly transforming to a more comprehensive methodology - transportation demand management (TDM) (Litman, 2013), that favours accessibility over speed.

Additionally, car-centric mobility planning has a detrimental effect on the environment in terms of increased vehicle emissions, which in turn causes public health problems. In trying to understand, in more detail, the "transport share of environmental problem" (Marshall, 2001), one of the critical paths towards resolution lies in sustainable mobility. Traffic dis-incentivisation policies play a huge part in this shift from car-centric private mobility towards active travel and sustainable mobility.

Various dis-incentivising measures are available, and can be classified under two categories: economic or regulatory (Beutel, et al., 2015), some examples of which are listed in Table 1.

| ECONOMIC (Li and Hensher, 2012) | REGULATORY |
|---|---|
| Congestion pricing | Closure of city centres for individual car traffic |
| Bottleneck passage | Decreasing speed limits |
| Kilometre charge differentiated by vehicle type | Reduced parking space |
| Kilometre charge with different charge levels and different revenue use | Increased parking charges |
| | Bus priority corridors |
| | Dedicated bicycle lanes |
| | Traffic calming, i.e. reduced lane-widths |

Table 1. Categories of Traffic Dis-incentivisation Policies

The best way of analysing traffic policies is through a case study approach (Crowe, et al., 2011) where one looks at the road (or stretch of road) through various lenses and maps the equation between the influencing variable and the expected output. This analysis requires pre-facto and post-facto data to determine, with reasonable confidence, the actual effect of a policy or measure. Unfortunately, in many scenarios, there is a severe paucity of data across all the relevant time-windows. This study attempts to perform the discussed analysis for a particular case study by collating various Big Data sources and slicing the road under study into "micro-artifacts" to help identify differences in patterns within the same road network.

With the advent of smartphones and internet connectivity, data related to mobility is available through various channels (Necula, 2015). Some of these data-sets are openly available for the community to use freely, while some are available through special partnerships with governing bodies. Table 2 summarises the data-sets related to traffic, transport, and mobility that are available within the United Kingdom (and Oxford, in particular). This list is not exhaustive and there is a large variance on the resolution and availability of these data-sets within regions in the United Kingdom.

| TRAFFIC | | ENVIRONMENTAL | |
|---|---|---|---|
| Speed | Google | Noise | Extrium |
| | Waze | Air Quality | Defra |
| Flow | Google | | |
| Volume | Google | | |
| Accidents | Waze | | |
| | Traffic Police | | |
| | Highways England | | |

Table 2. Summary of Mobility-related Data-sets

## Materials and Methods

The initial phase focusses on understanding the resolutions of the different Big Data sources and identifying the data-sets that would be useful for this study. Since the primary focus is to analyse a stretch of road split into micro-artifacts and understand how traffic speeds changes through the road, the datasets related to traffic speed are the most important. Through partnerships with the Oxfordshire County Council, there is access to Google's traffic data and Waze's congestion data.

The data from Google is part of the Better Cities project, an initiative to share aggregated, historical traffic statistics including traffic speeds, volumes, turn fractions and origin-via-destination travel patterns derived from Location History data pro-actively shared by Google users. As part of this project with the Oxfordshire County Council, Google provided access to the aggregated traffic speed data for the months of January and February 2016.

The speed data-set provides the average speed and flow-bucket per road-segment at 5-minute intervals. Average speed is the estimated mean speed of traffic (in metres per second) on the road segment, while flow-bucket is the relative flow level in the range from 0 to 10, with 0 being the lowest and 10 being the highest. Table 2 shows the sample of the Google speed data-set.

| place_id | start_interval_s | end_interval_s | flow_bucket | speed_mean |
|---|---|---|---|---|
| ChIJ8YgTkIM4cUgRmhG-QIKLonY | 1454899200 | 1454899500 | 1 | 3.3338926338280364 |
| ChIJg9aTuq2cdkgRKlHn9ePDQOE | 1454899200 | 1454899500 | 1 | 11.298081786571535 |
| ChIJQbJ3oLbUdkgRyD-DCvRML20 | 1454899200 | 1454899500 | 1 | 6.496755448255388 |
| ChIJlRDVbQyGdkgRYig__TQyjEE | 1454899200 | 1454899500 | 1 | 8.688129100583607 |
| ChIJi72XKB_ddkgRVjfbqO4w9ps | 1454899200 | 1454899500 | 1 | 3.6857489779354724 |

Table 2. Sample of Google speed data-set

The place_id column in the data-set refers to the unique Place ID used in the Google Places database and Google Maps (Google, 2018). In the traffic dataset each place_id generally refers to a segment of the road that lies between any two intersections. The main limitation of this dataset is that since it is based on location history of Google's Android users, there could be a bias towards certain demographics based on the usage and market share of the Android operating system. But, given the very high level of level of granularity that this data provides, it's useful on the roads being studied. Figure 1 highlights the level of detail of each road-segment whose data on traffic speed is provided by this data-set.
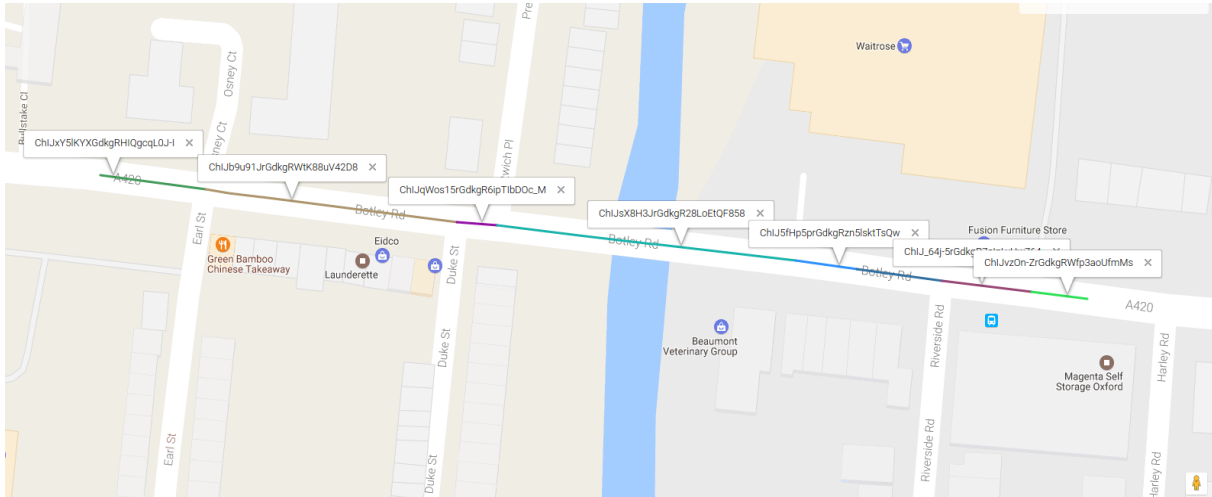


Figure 1. Road segments on Botley Road

Since this study is looking at "micro-artifacts" related to traffic calming on roads, the most useful data related to this is the Google Street View (Google, 2018) database. This is a feature in Google Maps that provides stitched panoramic images of streets. The 360-degree angle of each image provides sufficient vantage points to understand traffic infrastructure and policy measures. Road signages are also identifiable in these high-resolution images that provide additional context for the study.

## Discussion

Botley Road, the road under study, is an important road leading into and out of Oxford from the west. It sees traffic across all modalities. Around 20-25% of movements are through cycling, while there are approximately 25 bus movements per hour. There is a significant movement of pedestrians as well as high car traffic. It is an important corridor with intermittent bus lanes and bike lanes, though neither of these lanes run the whole stretch of the road. There are road crossings at frequent intervals interspersed with traffic signals.

All the above characteristics make it a suitable target for this study in understanding how the different types of traffic infrastructure impact speed and safety.

Multiple levels of pre-processing needs to be done on both the speed data-set and the street images before they can be used for any statistical analysis for the relevant case study. The primary processing of speed-data focusses on understanding Place IDs and building an automated way of parsing them geo-spatially into road-segments. The Snap to Roads (Google, 2018) functionality provided by the Google Maps Roads API is used to build a web-based utility that allows users to draw lines on the map to retrieve the segments and the respective Place Ids. This not only helps the case study under consideration, but can be utilised for future work on other roads and traffic projects.

In parallel, since the data is provided at five-minute intervals, an aggregation based on time-windows helps provide temporal insights per road segment. This data is filtered based on the roads being studied and a smaller data-set is generated, on which statistical analysis is done.

The major outcomes of the statistical analysis would be to indicate intersections on the road being studied that show the largest variance in vehicular speeds. The street images of these road intersections would be extracted to identify the infrastructure differences in them with respect to other segments within the same road.

Looking at the overall flow of traffic on a weekday through the entire Botley Road shows that there are certain inflection points in terms of traffic speed. Chart 1 shows this flow with the inflection points in green indicating road intersections where there is a significant (4-5 mph) decrease in average speed. The point in red indicates the highest speed on this road. Additionally, the variance of these speeds doesn't change much through the day; indicating that traffic flows at a similar distribution, but at higher speeds during non-peak hours.
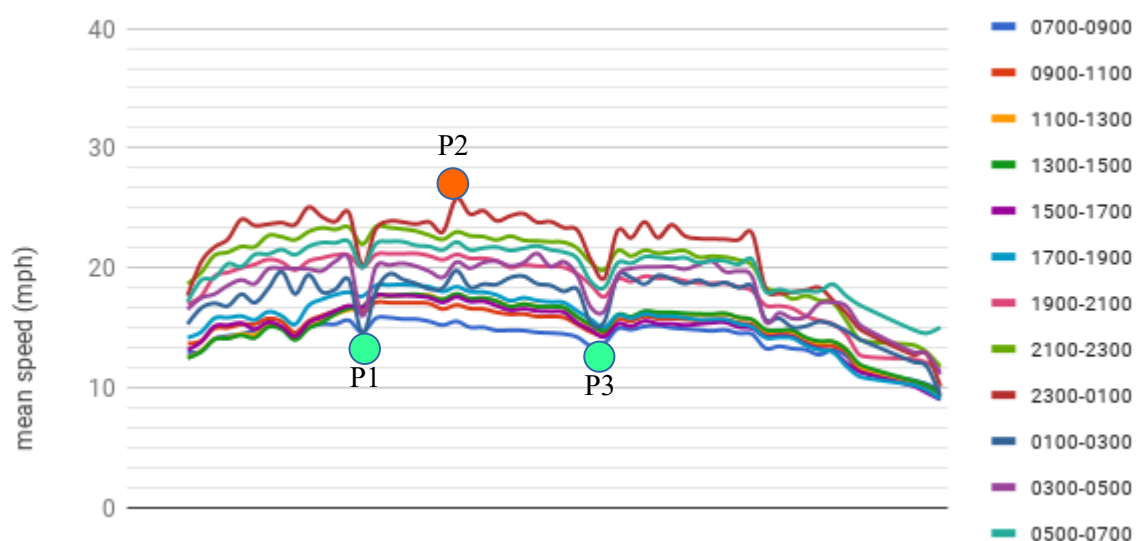


Chart 1. Traffic flow on Botley Road

On closer examination of the intersection P1 on the map, it is the intersection of Lamarsh Road and Botley Road. Though there are other similar intersections on Botley Road, this particular junction shows a sharp dip in traffic speeds, while the other similar intersections do not. To understand this, Google Street View image (Figure 2) of this particular intersection is helpful as it helps provide the additional context with respect to this study.



Figure 2. Google Street View of intersection of Lamarsh Road and Botley Road [Map data © 2018 Google]

Traffic calming measures come in various types of measures and policy instruments. Figure 5 helps identify two commonly used "micro-artifacts": cycle lanes and pedestrian crossing. The intended purpose of the cycle lanes is to facilitate smooth flow of cycles while providing safety and protection from heavier motor vehicles. The change in average vehicular speeds from 24.65 mph to 20.03 mph indicates that these cycle lanes in conjunction with the pedestrian crossing help in traffic calming. Also, average speeds of 21-24 mph in other parts of the road that have the cycle lanes with no pedestrian crossing confirm the observation.

Analysing the street view image (Figure 3) of the point P2 in Chart 1 shows that it's the beginning of the bus lane on Botley Road. Interestingly, the speed of traffic after the bus lane until the next set of traffic calming measures gradually reduces. This indicates that traffic calming measures such as bus lanes increase people mobility, by transporting more people per space occupied, and also help provide a gradual flow of traffic, thereby reducing the risk of accidents.

Figure 3. Google Street View of Botley Road at Duke St. and Prestwich Pl. [Map data © 2018 Google]

## Conclusion

Despite the presence of different types of traffic calming infrastructure on Botley Road, analysis of Big Data sources on traffic speeds indicates that solitary micro-artifacts, that is, individual calming measures, do not work as well as combinations of two or more. Some measures, such as bus lanes, are more effective in gradually calming vehicular speeds, apart from aiding transportation of more people. This study provides a method of complementing different types of Big Data, statistical and visual, and uses a geo-spatial layer of maps to identify the effects of traffic calming measures. Since the data-sets are huge, micro-analysis of very particular case studies can be simplified by using this method. Future work on this study involves comparing vehicular speed data with accident incidence ratios and determining the pattern between speed, accidents and traffic calming.

## Bibliography

Litman, T. (2013). The new transportation planning paradigm. Institute of Transportation Engineers. ITE Journal, 83(6), 20.

Marshall, S. (2001). 9 The Challenge of Sustainable Transport. Planning for a sustainable future, 131.

Beutel, M. C., Addicks, S., Zaunbrecher, B. S., Himmel, S., Krempels, K. H., & Ziefle, M. (2015). Agent-based Transportation Demand Management.

Li, Z., & Hensher, D. A. (2012). Congestion charging and car use: A review of stated preference and opinion studies and market monitoring evidence. Transport Policy, 20, 47-61.

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A. and Sheikh, A., 2011. The case study approach. BMC medical research methodology, 11(1), p.100.

Necula, E., 2015. Analyzing traffic patterns on street segments based on GPS data using R. Transportation Research Procedia, 10, pp.276-285.

Google, 2018. Place IDs. [online] Available: <https://developers.google.com/places/place-id> [Accessed 30 May 2018]

Google, 2018. Street View. [online] Available: <https://www.google.com/streetview/>
[Accessed 15 June 2018]

Google, 2018. Snap to Roads, Roads API, Google Developers Tool. [online] Availble:
<https://developers.google.com/maps/documentation/roads/snap> [Accessed 15 June 2018]

# Criticality Control of Insulin-Release

Mireya Munoz-Balbontin

## Abstract

One of the most important challenges faced when modelling the glucose-insulin release system is to maintain the dynamic components that characterize it. The discovery of oscillations in said system supports the approach of non-linear local dynamic states contributing to a globally stable glucose function. This paper discusses the implementation of this approach. The modelling methodology focuses on representing this behaviour using a network of coupled oscillators, where the connectivity strength is varied to observe the response in terms of local and global stability of the system.

## Introduction

Regulation of glucose in the pancreas is a complex process dependant on the release of two regulatory hormones, insulin and glucagon. The state where a stable concentration of glucose is present, which ranges from 70 – 180 mg/dl, is known as normoglycemia. There are two negative feedback mechanisms that are in charge of maintaining these blood glucose levels. When blood glucose drops below 70 mg/dl of glucose, the body enters the state of hypoglycemia, alpha cells in the pancreas will release glucagon, which triggers the release of glucose from the liver and back into the blood flow, bringing it back to a stable concentration. On the contrary, when blood glucose rises above 180 mg/dl, the body enters hyperglycemia, beta cells in the pancreas will release insulin, which will trigger the uptake of glucose by fatty tissue, thus bringing the level of glucose back to normal.

Disruptions in these mechanisms can lead to the development of the pathological state known as Diabetes, which is typically classified into two types. Diabetes type 1 is known for being autoimmune, where the body attacks the cells in the pancreas and disables them from producing insulin. Diabetes type 2 is the state were the pancreas is capable of producing insulin, but it either does not produce enough to meet its demand, or the tissues become resistant to it. Patients with type 1 diabetes are dependent on exogenous insulin, and can manage their condition with devices such as blood glucose monitors and insulin pumps. Patients with type 2 diabetes manage their condition with lifestyle changes, and medication depending on their specific circumstances.

The study of diabetes, and the regulatory system of insulin release has been going on for more than 6 decades, this is known as the artificial pancreas project. The technologies for managing the condition have come a long way, and more discoveries are made each day. It has however, been observed that there still remains much work to be done regarding the modelling of insulin release at a molecular level. This finding motivated the development of this research project, and the research question: Can we simulate the relationship between glucose and insulin secretion at cellular level by developing a biologically inspired phenomenological model? To answer this question, we will study the phenomenon of insulin release at molecular level to develop the modeling methodology.

## Materials and Methods

The first step towards developing the modelling methodology was to study the state of the art in physiological modelling of the system. To achieve this, a systematic review of the most notorious models was carried out. The most important finding of this review was that the

studied models, although useful at collecting relevant information on the behaviour of the system, still contain a few limitations. Given the complexity of the system, it can only be considered as highly nonlinear and dynamic in mathematical terms. However, a pattern of reduction of this mathematical complexity was observed, where important dynamical components of the system are discarded, and/or linearized. In some of the models insulin is assumed exogenous, which tailors the model to the behaviour of a type 1 diabetic patient. It was also found that the tendency in physiological modelling of this system is to follow a top-down approach, where it is fitted from average data. After observing these limitations, it was decided to study further the properties of the system, and focus on building a bottom-up approach.

Oscillations are present in the insulin-release system, this has been studied more and more over the past decade. Two different modes of oscillations have been observed: high frequency, and low frequency. High frequency oscillations are characterized as pulsatile variations of glycaemia and insulinemia, with intervals of about 5-15 min. Low frequency oscillations are known as ultradian oscillations and can be associated with the circadian rhythm, their frequency varies between 50-150 min. Behaviour of the secretory units, or beta cells, was also studied. It has been observed that the cells react to the circulating level of glucose, and will release a packet of insulin when the cell's threshold is surpassed. This indicates the existence of at least three different states the cell can be in. A cell is active when it is releasing the packet of insulin, it enters a refractory state right after, which can be referred to as a recuperation period, and  after this state it enters a state of latency, where it is ready to release insulin but is waiting for the appropriate conditions to be met in order to enter an active state again.

With these findings, the modelling methodology was developed, and will adhere to the following characteristics:

- The system is represented as a network of coupled oscillators that exhibit criticality: this will allow modelling the control of the nonlinear local dynamic states that contribute to a globally stable glucose function.
- The coupling strength of the network acts as local feedback and has an effect on the global stability of the system: this makes up the communication among the cells and the clusters.
- The system will need to be evaluated under real-world conditions such as meal and exercise, this is necessary in order to keep the system as accurate as possible, and close to the actual behaviour of a human being.
- The units are recruited in accordance with the surrounding concentration of glucose: this is to take into account the threshold of the cells and clusters, which are not assumed to be the same throughout the pancreas.
- Insulin secretion propagates as a wave function: meaning that the cluster is in communication with its neighbours and alerts them when they are needed, and thus spreads the communication.

Having these characteristics, a second systematic review was conducted, in order to determine which models/systems would be the most appropriate to represent the desired behaviour. Three different models are being considered as candidates to establish the base for the system.

*Lengyel-Epstein system*

Developed by Lengyel and Epstein in 1991, this is a model for the photosensitive chlorine dioxide-iodine-malonic acid reaction (CDIMA). It has proven useful for investigating the

continuous effect of external influence on Turing pattern formation. The model is comprised of two differential equations and parameters a, b, and σ as follows:

$$\frac{du}{dt} = a - u - \frac{4uv}{1 + u^2} - \Phi + \nabla^2 u$$

$$\frac{dv}{dt} = \sigma[b(u - \frac{uv}{1 + u^2} + \Phi) + e\nabla^2 v]$$

*Brusselator autocatalytic model.*

This model was developed by Prigogine et. al. in the late 1960's in order to prove Turing's theory, and show that Turing patterns which follow the rules of chemical kinetics exist. This model represents the interaction between a reactor and an inhibitor, and is considered one of the simplest reaction-diffusion systems capable of generating complex spatial patterns (Wang et. al. 2014). The proposed activator-inhibitor interaction is a well-known principle to explain pattern formation in chemical, ecological, physical, and biological systems. The model is comprised of two differential equations, including two rate constants and two diffusion coefficients:

$$\frac{dx}{dy} = a - (b + 1)x + x^2y + D_x\nabla^2 x$$

$$\frac{dy}{dt} = bx - x^2y + D_y\nabla^2 y$$

*Berry model*

This model, detailed further in (Berry, 2003), describes the generation, and degradation of proteins in the extracellular matrix. The latter is a collection of molecules on the outside of cells, whose function is to give support structurally, and biochemically. The equations for this model are shown below, and contain a wider range of parameters and variables in comparison to the previous models. Some of these are *m*, which represents the matrix created at constant rate $r_{im}$, and *p* and *g* represent enzymes, whose production is due to the presence of fragments *f*.

$$\frac{dm}{dt} = kg\frac{fg}{K_G + f} - \frac{mp}{1 + m} + r_{im}$$

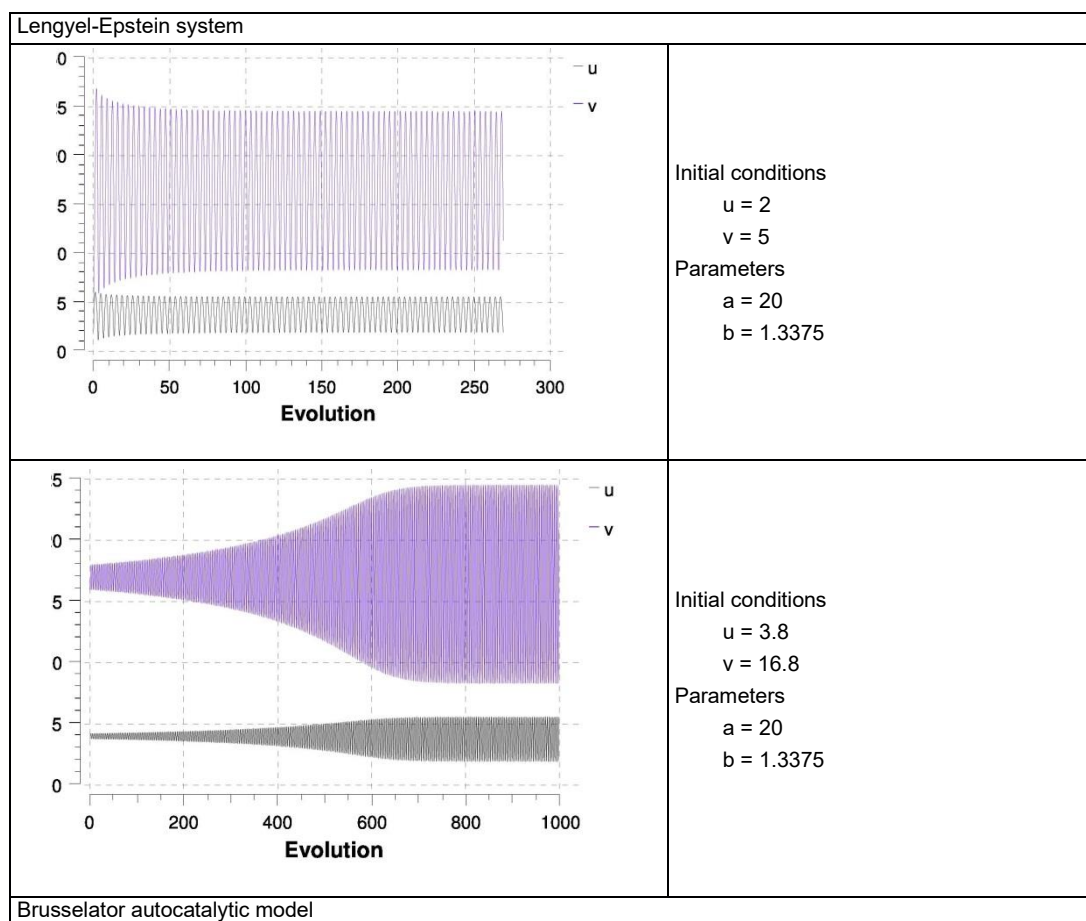$$\frac{df}{dt} = -kg\frac{fg}{K_G + f} + \frac{mp}{1 + m} - \frac{fp}{1 + f}$$

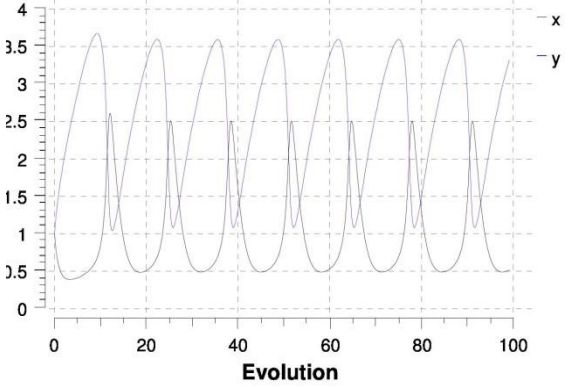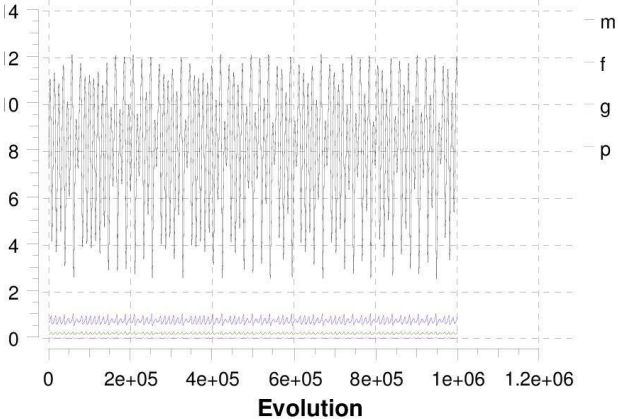$$\frac{dp}{dt} = \alpha\frac{f^n}{K_R{}^n + f^n} - k_ap^2$$

$$\frac{dg}{dt} = \beta\frac{f^l}{K_S{}^l + f^l} - k_{deg}\frac{gp}{K_{deg} + g}$$

50

## Discussion

For each one of the models, a stability analysis was conducted. Regularly, the aim of said analysis is to find the set of parameters that allow the system to reach stability. Given the dynamical properties of the system, our analysis focused on determining the parameters that would result in oscillating behaviour. The parameters and desired behaviour can be seen in Table 1. The Lengyel-Epstein system gives us two sets of initial conditions that can achieve it, in both cases the system evolves into stable oscillations of similar morphology. The selected parameters for the Brusselator also render the desired behaviour, the action of the activator and the inhibitor can be distinguished clearly. The oscillations in the berry model differ greatly from the other two models, which could be beneficial as the oscillations in our system are not symmetric; it also provides a wider range of parameters which allow tuning the system with more flexibility.

These models are currently being simulated as the network of oscillators described in previous sections. Some further tuning needs to be done in order to determine which one is of higher biological relevance, meaning it is capable of representing the system more accurately.



Lengyel-Epstein system

Initial conditions
    u = 2
    v = 5
Parameters
    a = 20
    b = 1.3375

Initial conditions
    u = 3.8
    v = 16.8
Parameters
    a = 20
    b = 1.3375

Brusselator autocatalytic model

|  | Initial conditions |  |
|---|---|---|
|  | x = 1 | |
|  | y = 1 | |
|  | Parameters | |
|  | a = 1 | |
|  | b = 2.5 | |

Berry model



| | Initial conditions | |
|---|---|---|
| | m = 7.26 | |
| | p = 1.016 | |
| | f = 0.665 | |
| | g = 0.177 | |
| | Parameters | |
| | Kg = 0.1 | kg = 0.05 |
| | ka = 0.0455 | Ks = 1 |
| | Kd = 1.1 | kd = 0.05 |
| | Kr = 4.5 | α = 0.026 |
| | β = 0.00075 | n = 4 |
| | l = 4 | rim = 0.0098 |

Table 1. Stability analysis of base models for comparison. Left: evolution graph. Right: Initial conditions and parameters

## Conclusions

The need for a novel computational model of insulin release is discussed in this paper. The modelling methodology was developed taking the dynamical aspects of the system into consideration. The model is under development, three base models are being considered to build its foundation. In the current stage of development, the appropriate parameters and initial conditions of the system are being determined. This will assist in determining which model/system is of higher biological relevance and can represent the desired behaviour adequately. So far, the results show it is possible to represent the desired physiological state whilst maintaining the dynamical properties of the system.

In following stages, the dynamic model will be developed, where a system of micro-models communicate or interact with each other to release the appropriate amount of insulin. Each micro model can be thought as an agent that interacts with surrounding models to decide whether it is required or not. The model will be simulated and validated using data from a healthy subject. It is desired to collect data from various sources, such as: continuous glucose monitors, activity trackers, and food intake. After the model is validated, it is intended to use the model to monitor and predict the behaviour of a patient with diabetes, and assist them in the management of their condition. The system should allow customization to a specific patient and on-line detection of anomalies.

# Bibliography

[1] Berry, H. (2003) Chaos in a byenzimatic cyclic model with two autocatalytic loops. *Chaos, Solitons and fractals* 18, 1001-1014.

[2] Ji, L, and Li, QS (2004), Effect of local feedback on Turing pattern formation, *Chemical Physics Letters* 391(1-3): 176-180.

[3] olde Scheper, T. V. (2017). Biologically Inspired Rate Control of Chaos. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, *27*(10). Available at: https://doi.org/10.1063/1.5008892

[4] olde Scheper T. (2008). Why metabolic systems are rarely chaotic. *BioSystems* 94 (1-2), 145-152.

[5] Simon, C, and Brandenberger, G. (2002). Ultradian oscillations of insulin secretion in humans. *Diabetes* 51, 3-6.

[6] Wang K, Steyn-Ross, M. L., Steyn-Ross D. A. , Wilson M. T. , Sleigh J. W. , and Shiraishi Y. (2014), Simulations of pattern dynamics for reaction-diffusion systems via SIMULINK. *BMC Systems Biology*, vol. 8, no. 1, p. 45.

# Approaches to determine the constituent elements of discontinuous fibre-reinforced polymer composites

Karthik K. Kumar

## Abstract

Composite material properties and quality can be determined from knowledge of the constituent elements of the material, in particular, the fibre volume fraction and void content. The reliability of various destructive techniques to determine fibre volume fraction and void fraction of recycled carbon fibre/epoxy composite is discussed and the limitations of each approach are assessed. This study is concerned with the composition of discontinuous fibre reinforced composites. It was found that optical microscopy provides the most accurate and reliable method to evaluate fibre volume fraction and void content.

Notation and symbols used:

| Symbols | Description |
|---|---|
| $A_w$ | Average areal weight of the laminate (g/m$^2$) |
| $M_1$ | Mass of the composite before resin burn off (g) |
| $M_2$ | Mass of the fibres left behind after resin burn off (g) |
| $M_a$ | Mass of the specimen in air (g) |
| $M_w$ | Mass of the specimen when immersed in distilled water (g) |
| $n$ | Number of plies used in the composite laminate |
| $t$ | Thickness of the composite laminate (m) |
| $V_f$ | Fibre volume fraction |
| $V_m$ | Matrix volume fraction |
| $\rho_{exp}$ | Experimental density of the composite (g/cm$^3$) |
| $\rho_f$ | Fibre density (g/cm$^3$) |
| $\rho_m$ | Density of resin (g/cm$^3$) |
| $\rho_{th}$ | Theoretical density of the composite (g/cm$^3$) |
| $\rho_w$ | Density of distilled water at 23°C (g/cm$^3$) |

## Introduction

The higher strength-to-weight ratio of composite materials with respect to conventional materials are well exploited by the aerospace and automotive industries as they continue to replace metallic components with composites with an aim to shed weight (Technotes, 2003). The desirable properties of composites are obtained by appropriately mixing two or more materials resulting in a material having a reinforcement phase and a matrix phase whose properties are better than its individual components (Campbell, 2010). However, defects can arise during the fabrication process of the composite, with voids being detrimental to its strength, acting as stress concentrators and reducing the quality of the composite (Saidpour and Tehranchi, 2001).

The introduction of new composite systems for structural applications demands an understanding of its response to such loads. The properties of composite material systems are generally defined by the properties of the constituent elements, i.e., fibres and resin, the distribution of the fibres in the resin matrix and the interaction among them. One of the first steps to study the material response for composite materials is to determine the proportion of fibres, matrix and possible defects and voids in the system. There are various destructive techniques to determine the constituent components of a composite and void content such as the Archimedes test (ASTM D2734-16, ASTM D792-13), resin burn-off, matrix digestion (ASTM D3171-15) and optical microscopy. Optical microscopy is a visual destructive technique which can give information regarding the structure, lay-up, presence of impurities besides information related to the volume fraction of fibres and voids and their distribution, shape and size (Little et al., 2012). The other destructive techniques rely on the accuracy of weighing the samples and on the information concerning the constituent material properties. Minute inaccuracies in these parameters can give rise to unrealistic results in fibre volume fraction and void

content and, in certain cases, even a theoretically impossible negative void percentage. Some of the non-destructive techniques found in the literature are X-ray Computed Tomography (Bossi et al., 1993) and ultrasonic pulse propagation (Stone and Clarke, 1975).

The objective of this study was to assess various destructive techniques to determine the constituent elements of recycled discontinuous carbon fibre/epoxy (rCF/epoxy) composite laminate. The material used for the characterisation was provided by ELG Carbon Fibre Ltd. The recycled fibres were randomly chopped to 80 - 90 mm in length and processed into a mechanically entangled non-woven mat. The laminate was made using a liquid compression moulding process.

## Methodology

The composition of a composite, i.e., the fibre volume fraction, resin volume fraction and void fraction were determined in this study using destructive techniques, namely resin burn-off method, acid digestion, Archimedes test and optical image analysis. A 3.4 mm thick, 6 ply recycled carbon fibre/epoxy composite laminate was used for the characterisation. The specimens were conditioned at $23 \pm 2°C$ and $50 \pm 10\%$ relative humidity for at least 48 hours before the experimental procedures.

## Archimedes test

This approach enables the determination of the void content in the composite with the knowledge of the constituent content of the composite in the composite processing stage. A section of the composite weighing between 1 to 5g is taken and its density is calculated by the Archimedes principle as per ASTM D792-13 (A). The specimen weight in air at 23°C is measured using an analytical balance following which the specimen is completely immersed in distilled water at 23°C in a beaker with the help of a sample holder as shown in Fig. (1). It must be ensured that bubbles do not appear on the surface of the composite when submerged. The specimen mass in distilled water is measured. This procedure is repeated for 5 different sections of (30 x 30) $mm^2$ of the composite laminate. All weight measurements are taken to a precision of 0.1 mg. The density of the specimen at 23°C is calculated from Eq. (1).
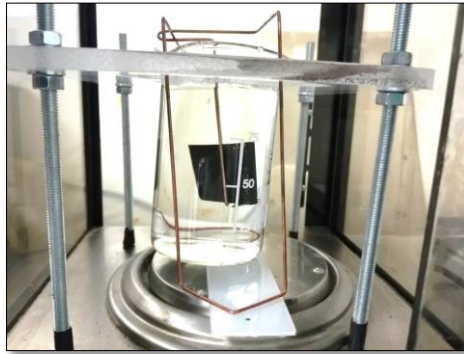


Figure 1: Archimedes apparatus

$$\rho_{exp} = \frac{M_a}{(M_a - M_w)} \times \rho_w \qquad 1$$

Theoretical density is calculated by the rule of mixtures equation (Eq. (2)) from the knowledge of the materials used in the manufacturing stage of the composite.

$$\rho_{th} = V_f \times \rho_f + (1 - V_f) \times \rho_m \qquad 2$$

The void content in the composite is given as the ratio of the difference in the theoretical and experimental values to that of the theoretical value from Eq. (3).

$$Void \% = \frac{\rho_{th} - \rho_{exp}}{\rho_{th}} \times 100 \qquad 3$$

## Resin Burn-off

The approach as described in ASTM D3171-15, determines the fibre volume content as well as the void content in the composite. Initially, the sample is weighed and the composite density is determined and calculated as per Eq. (1). The sample is placed in a furnace pre-heated at 500°C and the sample is allowed to burn at about 530°C so as to oxidize the matrix in the composite and leave behind the fibres. Once the matrix has completely burnt off, the reinforcement is cooled to room temperature and is weighed. This process is repeated for 5 different samples of size (30 x 30) mm$^2$ taken at different sections in the laminate. The fibre volume fraction, matrix volume fraction and composite void content are calculated with Eqs. (4) to (6).

$$V_f = \frac{M_2}{M_1} \times \frac{\rho_{exp}}{\rho_f} \qquad\qquad 4$$

$$V_m = \frac{M_1 - M_2}{M_1} \times \frac{\rho_{exp}}{\rho_m} \qquad\qquad 5$$

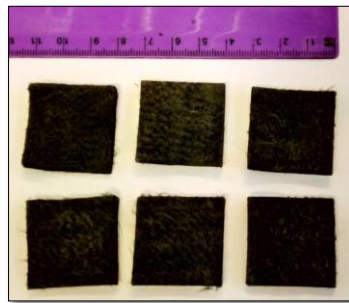$$Void\ \% = \left(1 - V_f - V_m\right) \times 100 \qquad\qquad 6$$



Figure 2: Sample placed in oven at 530C (left) and reinforcement left behind after burn-off (middle); Acid Digestion Set-up (right)

## Acid Digestion

This approach is similar to that of the resin burn off method in determining the void content and the volume fraction of a composite material. The matrix is removed from the composite sample with the help of nitric acid as per procedure A in ASTM D3171 in an experimental set-up as shown in Fig. (2). The sample is weighed and its density is calculated from Eq. (1). It is then transferred to a beaker containing 70% concentrated nitric acid. Once the resin has been completely digested, the fibres are washed with distilled water and acetone. The extracted fibres are then dried in an oven at 100°C and weighed once it has cooled down. The fibre volume fraction and the composite void content are calculated from Eqs. (4) to (6). Care must be taken in dealing with the chemicals and removing the fumes which are produced when the acid digests the resin.

## Optical Microscopy

Image analysis of composite samples gives a deep understanding of the structure of the composite and in determining the volume fraction and void content of the sample. Images are obtained from cross-sections of the composite samples which are encapsulated in a cold mounting medium such as acrylic resin. Acrylic medium is suitable as the resin has fast curing properties at room temperature and has limited shrinkage (Struers, 2018). The specimens have to be cleaned and dried before mounting to ensure good bonding of the composite sample with the resin. The objective of encapsulating the specimens in acrylic resin is to attain a well-polished cross-sectional surface to distinguish the constituents of the composite laminate through an optical microscope. Two part acrylic resin with the trade name Variset from MetPrep was used in this investigation. The specimens were encapsulated in the resin using a silicon rubber mould and were left to cure for 15 minutes.

The encapsulation of the samples is followed by initially grinding them with 320p grit size SiC paper to obtain a planar surface and then polishing with 9μm diamond abrasive and 0.3μm alumina on respective cloths. It is important to avoid any scratches falling on the viewing surfaces as they would be seen as voids in micrographs. These polishing steps should give a mirror-like finish onto the viewing surface of the sample.

Micrographs of the cross-sections of the laminates were obtained from an optical microscope, Olympus BX51 in bright field illumination mode and the images were captured using a JVC colour video camera. Generally, voids can be distinguished at low magnifications and the fibres are visible at higher magnifications. The principle of operation is reflected light microscopy where light reflected off the flat, polished surface is captured by the camera. Voids, micro cracks or indentations are seen in darker shades as light is reflected off the sample at an angle. These micrographs were analysed using the ImageJ software (Abramoff et al., 2004), which digitizes the micrograph into a binary image, creating a contrast between the constituents and counts the fibre ends or voids as an area fraction depending on the image magnification as shown in Figs. (3) and (4). About 150 cross-sectional images were taken in random sections of the samples for the calculation of fibre volume fraction and void content was measured out of 16 samples of cross sectional area of 68 mm$^2$, with the composite samples spread across various regions of the laminate.
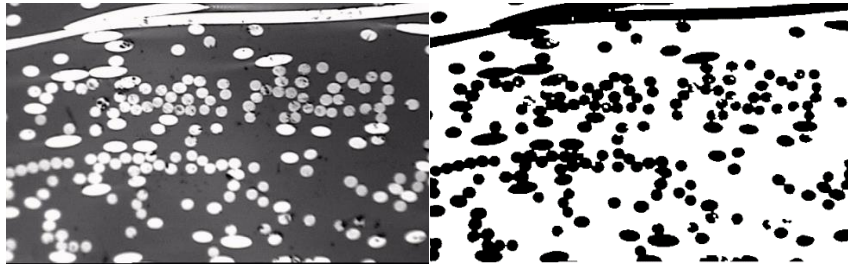


Figure 3: Micrograph obtained from the Optical Microscope at 50x (left) and the micrograph processed on ImageJ to calculate volume fraction (right)
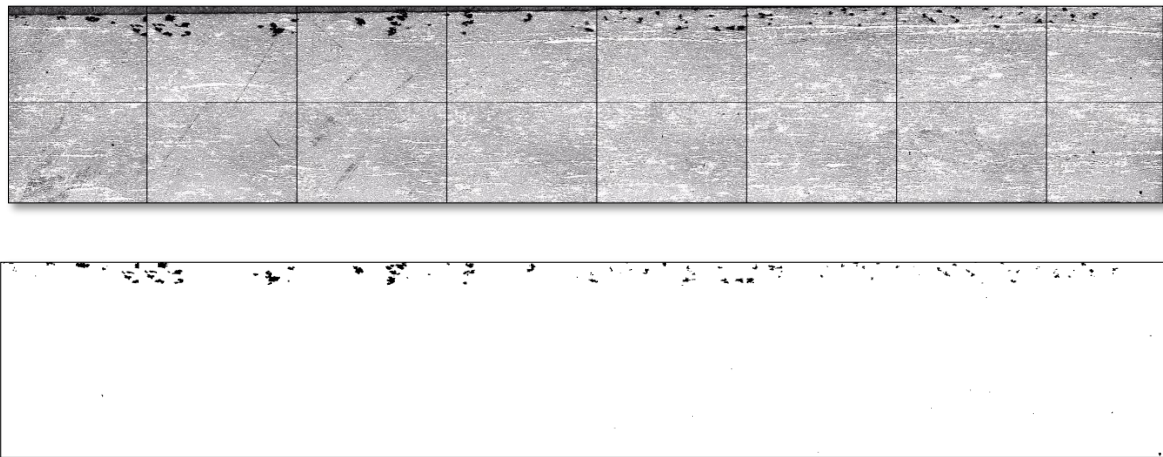


Figure 4: Micrograph obtained at 5x from the optical microscope (top) and its processed image isolating the voids in the cross section (bottom)

Fibre volume fraction of the composite can be calculated having prior knowledge of the fibre areal weight used in the composite processing stage from Eq. (7). The fibre volume fractions obtained from the above-mentioned approaches are compared with it.

$$V_f = \frac{n \times A_w}{t \times \rho_f} \qquad\qquad 7$$

## Results and Discussion

The volume fraction and the void fraction of the 3.4 mm thick rCF/epoxy laminate were determined using the approaches mentioned in the previous section and the results are summarised in table (1). The theoretical density of the composite calculated from Eq. (2) was 1.316 g/cm$^3$ and the expected $V_f$ of the laminate as calculated from Eq. (7) is 0.216 and the deviation of the fibre volume fraction of the experimental approaches from the expected value can be seen in table (1).

| Method | $V_f$ | Void % | Accuracy | Simplicity |
|---|---|---|---|---|
| Archimedes test | n/a | 0.541 | ●●○○○ | ●●●●● |
| Resin Burn-off | 0.213 | 1.100 | ●●●○○ | ●●●●○ |
| Acid Digestion | 0.257 | 1.342 | ●●○○○ | ●●○○○ |
| Optical Microscopy | 0.228 | 0.299 | ●●●●○ | ●●●○○ |

Table 1: Volume fraction and Void content of the composite sample

The temperature set for the resin burn-off approach is critical. At temperatures of around 550°C, despite the effective removal of the matrix from the composite with the reinforcement – carbon fibre, and ash remaining at the end of the process, it was observed that some amount of carbon fibres on the surface of the sample have been burnt off along with the resin. A 70% decrease in the fibre volume fraction from the expected value is observed due to the mass loss of the carbon fibre at this temperature in the resin burn-off process. At temperatures of 500°C, the matrix does not burn out completely. Through repeated trials, it is observed that the matrix effectively burns with least damage to the material at 530°C. The inaccuracies with the resin burn-off approach are the possible damage to the reinforcement, any unburnt matrix left behind in the composite and weight measurement of ash along with the reinforcement in calculations relating to the fibre volume fraction.

Acid digestion with nitric acid is slightly more difficult than resin burn-off due to the challenges faced in appropriate disposal of the toxic fumes and the chemicals left behind from the experimental process. It could be more convenient to use a less toxic acid than nitric acid which can effectively remove all the resin from the composite.

The Archimedes test, acid digestion and the resin burn-off approaches could give a negative void content value which is theoretically incorrect. This can be limited, but not avoided, by carefully following the experimental procedures and having a larger sample size for the experiment. The Archimedes test also depends on the accurate knowledge of the densities of the fibre, matrix and the mass fraction of the fibre and the matrix used to manufacture the composite. A 0.1% error in these parameters results in an error of 2.5% in the void content (Olster, 1972) and possibly generate a negative void fraction (Little et al., 2012). Similarly, any negative void fraction obtained from resin burn-off and acid digestion can be attributed to the errors in the density of the fibre and the matrix taken in the calculations besides the mass loss and damage to the reinforcement in burning the composite. Obtaining a reliable value from these approaches require them to completely take out the matrix without damaging the fibres.
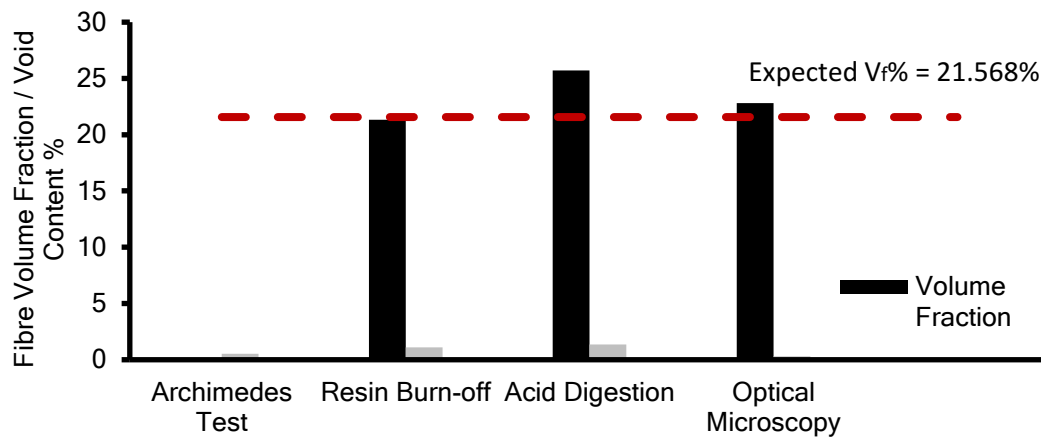
Figure 5: Fibre Volume content of various approaches in comparison with its theoretical estimate

A good agreement in the fibre volume fraction with the expected value was obtained by optical microscopy. The limitation with respect to the characterisation of the fibres and voids in optical microscopy lies in the sample preparation. Preparation of the sample wherein the fibres can be easily distinguished under an optical microscope and analysing micrographs through image processing softwares, can be quite tedious and time-consuming. It is also important to obtain micrographs from numerous samples to avoid bias and have an accurate value of the whole laminate. With this approach, we are also restricted to two-dimensional images of the voids. However the advantage of optical microscopy is that the location of such voids can be studied and the reasons as to why they exist can be analysed, thus providing scope to improve the quality of the material fabrication process. Optical microscopy is the most suitable approach with regards to volume fraction and void content calculation as there wouldn't be any factor of bias or assumptions, if the properties of constituent elements of the composite are unknown. This approach reduces the error by taking direct measurements whereas the other techniques continuously rely on calculations which exacerbate the errors inherent in the measurements leading to less reliable results. Additionally, micrographs provide information regarding the mechanical properties of the laminate and the quality of bonding between the matrix and the reinforcement fibres. These advantages are not possible with other techniques, some of which, namely the matrix removal techniques, can induce damage onto the fibres making optical microscopy relatively a more accurate technique.

## Conclusions

The accuracy and reliability of the common non-visual destructive techniques, i.e., resin burn-off, matrix digestion and the Archimedes test, are uncertain due to the errors in calculations. We have seen that any minor variations in the material properties result in volume fractions which are far from the expected values and errors in calculating void fraction either exceed the percentage of voids itself or may result with a negative value. Optical microscopy, although time-consuming, is a visual inspection method that can generate a more accurate and reliable reading of the fibre volume fraction and void content in the composite laminate.

## Acknowledgements

# References

Abramoff, M.D., Magalhaes, P.J., Ram, S.J. "Image Processing with ImageJ". Biophotonics International, volume 11, issue 7, pp. 36-42, 2004.

ASTM D792-13, 2013. Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement. West Conshohocken, PA: ASTM International.

ASTM D2734-16, 2016. Standard Test Methods for Void Content of Reinforced Plastics. West Conshohocken, PA: ASTM International.

ASTM D3171-15, 2015. Standard Test Methods for Constituent Content of Composite Materials. ASTM InternationalWest Conshohocken, PA.

Bossi, R. H., Georgeson, G. E. & Rempt, R. D. 1993. X-ray computed tomography for emerging aerospace materials and processes development. Boeing Defense And Space Group Seattle Wa.

Campbell, F. C. 2010. *Structural composite materials*, ASM international.

Little, J. E., Yuan, X. & Jones, M. I. 2012. Characterisation of voids in fibre reinforced composite materials. *NDT & E International,* 46**,** 122-127.

Olster, E. F. 1972. Effect of voids on graphite fiber reinforced composites. Avco Corp Lowell Ma Systems Div.

Saidpour, H. & Tehranchi, H. 2001. Determination of void content in filament wound composites.

Stone, D. E. W. & Clarke, B. 1975. Ultrasonic attenuation as a measure of void content in carbon-fibre reinforced plastics. *Non-Destructive Testing,* 8**,** 137-145.

Struers. How to cold mount. Retrieved April 10, 2018, from https://www.struers.com/en-GB/Knowledge/Mounting/Cold-mounting#application-specialists

Technotes, B. E. 2003. Composite Recycling and Disposal An Environmental R&D Issue. *Boeing Environmental Technotes,* 8**,** 1-4.

# Signals of Transcendence

Anna Yearwood

## Abstract

For my doctoral work, I am using an arts practice-based methodology to explore the theme of home; specifically, what it means to create or experience a sense of home. I have used a variety of methods thus far: observation and reflection, experimentation with materials, the use of scale and repetition, visual documentation of processes, and personal narrative. In this paper, I will analyze two artistic methods I have used in my research and will focus on my use of drawing and printmaking. My research questions primarily deal with the feeling of the transcendent in the experience and desire for home. My perspective and understanding of home has been shaped by my personal and academic interactions with Christian theology and I have included this in my research process. As my research has developed, I have discovered how a sense of home can be created through daily rhythms and rituals; I find similar uses of ritual reflected in my life of faith. As my research has progressed, my questions have expanded to reflect this discovery in my communication of home.

## Introduction

I am carrying out research through an arts practice-based methodology, using my creative practice in the studio as the basis for discovery. In Practice as Research, Bolt and Barrett describe this way of working as "philosophy in action"(Barrett, 1). This approach is dependent on the relationship between practice and theory and is creative and interdisciplinary in nature. Additional influences on this methodology include Donald A. Schoen's The Reflective Practitioner (1983), in which he examines the concept of knowledge developed through practice. He writes, "Our knowing is ordinarily tacit, implicit in our patterns of action and in our feel for the stuff with which we are dealing. It seems right to say our knowing is in our action"(Shoen, 49). Using this premise, I am exploring what a sense of home might be through my tangible actions in the studio.

The understanding of home as a point of connection between people as well as with the divine forms the basis of my research, as Michael Allan Fox notes in Home: A Very Short Introduction (2016), "Homes have always been gathering places"(Fox). 'Home' is a complicated notion with many different angles from which it can be addressed and through my studio practice I have come to realize that my interest in home is not an understanding of home as the physical structure of the house, but rather the feelings of wholeness, connection, belonging, participation, and identity.

## Materials and methods

My methodology for exploring how a sense of home is created includes using specific symbolic materials to convey meaning, interacting with specific places, reflective journaling on intellectual, emotional, and artistic discoveries, as well as an on-going dialogue with my personal faith and the implications that theological study has on my artistic practice. My research questions are primarily concerned with an understanding of home outside of the physical structure of the house and how the longing for home can point to a notion of the transcendent (Rouner). My questions explore the overlap of the themes of wholeness, intimacy, and connection found in my expressions and experiences of my faith and my sense of home.

## Discussion

In the early stages of research, I began by exploring images associated with my personal history and turned to drawing as a way of physically representing these internal thoughts. In the publication Drawing Ambiguity, members of the research group Tracey write of drawing as a method for organizing and making sense of our thoughts, our world: "There is a human need to make sense from the random confusion of the world, to process our perceptions as we experience them, and to structure them as best we can" (Sawdon, 1).

As I worked with images of home, I engaged with memories of the house where I grew up. In one work related to this, for example, I used short strokes and added little detail, creating merely the outline of the picture I could conjure in my mind. The process of making this drawing embodied the struggle of trying to remember something: to visualize it, to feel it.

The motions I used were loose and hesitant. I wrote at the bottom of the page trying to remember home as a way to remind myself what I was doing. Through creating this piece and receiving feedback from various course-mates, I noticed that by allowing the image to remain incomplete, my intention was to invite the viewer to participate in the creation of the image by completing it internally with images from their own personal histories. This piece conveys something of the desire for connection in my own sense of home.



Trying to Remember Home, graphite on paper

There was a point in my work when I began to shift away from creating more representational work to a more deliberate focus on the process of creation itself. Rather than working with a clear end in mind, I began to work from a point of discovering meaning within the material and process. My work moved from meaning conveyed through a completed image to meaning created within the activity and means of creation.

From this shift, I chose to engage once more with the image of my childhood home, only this time through a progression of etchings. I used the act of carving into a copper plate as a reflection of carving out my memories of that house and all of the familial experiences it contains. I did not have a completed image in mind when I began carving the plate, rather wanted to uncover a point of clarity through the process. When I started, I thought such a point would emerge and that there would be a stage at which the image in my mind and the image on the plate would match. However, as I repeatedly carved certain lines while I focused on my internal image, I began a process of destroying both the image and the plate. At one point in time, that space was the only definition of home I had. But over time and distance, it has ceased to be so and I have integrated other places into my understanding of home. I was able to identify this loss and recreation through the process of creating this piece.
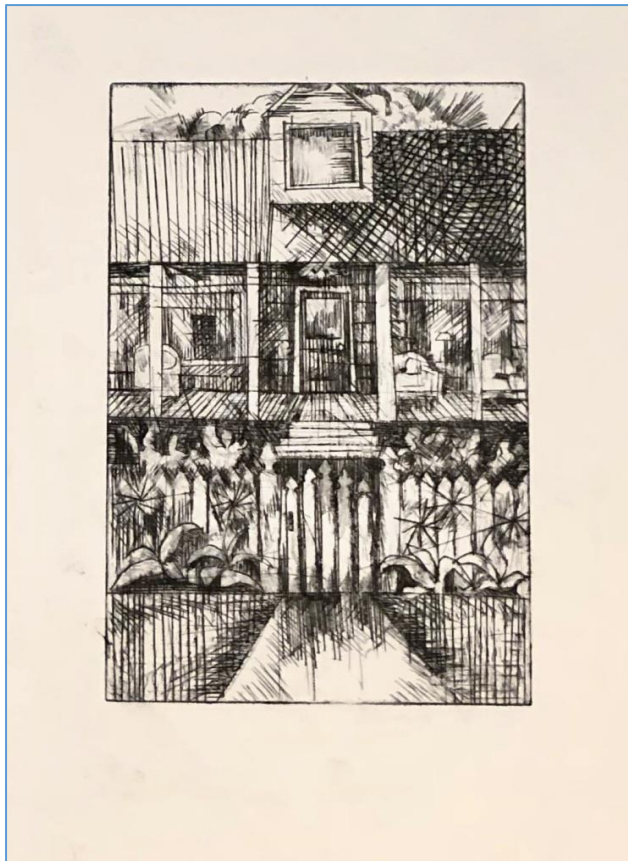
*Memory and Understanding*, etching

## Conclusion

In creating the etchings discussed above, I found in the repetitive nature of the process combined with the reflection on home being lost home in the creation of the work. As my research continues, I am deliberately engaging with the concept of home as something that is created intentionally through daily rituals, exploring how aspects of ritual and repetition are used both in my religious tradition as well as in my daily life and place of residence to create a sense of 'home', of wholeness.

I began my research with a preconceived idea of what home is based on my own upbringing; through engaging with the self-reflective nature of art as research, this original idea has shifted, and a clearer understanding is beginning to emerge. The importance of connection, symbolism, and ritual in both my art and in my faith, continues to propel my research forward.

## Bibliography

Barrett, Estelle and Barbara Bolt. (Ed.) Practice as Research: Approaches to Creative Arts Enquiry. I.B. Tauris London.2007

Fox, Michael Allen. Home: A Very Short Introduction, 2016.

Rouner, Leroy S. The Longing for Home. University of Notre Dame Press, 1996.

Sawdon Phil and Russell Marshal (Ed.) Drawing Ambiguity: Beside the Lines of Contemporary Art, London: I.B. Tauris, 2015.

Shoen, Donald A. (2016). The Reflective Practitioner: How Professionals Think in Action. 3rd ed. London: Routledge.