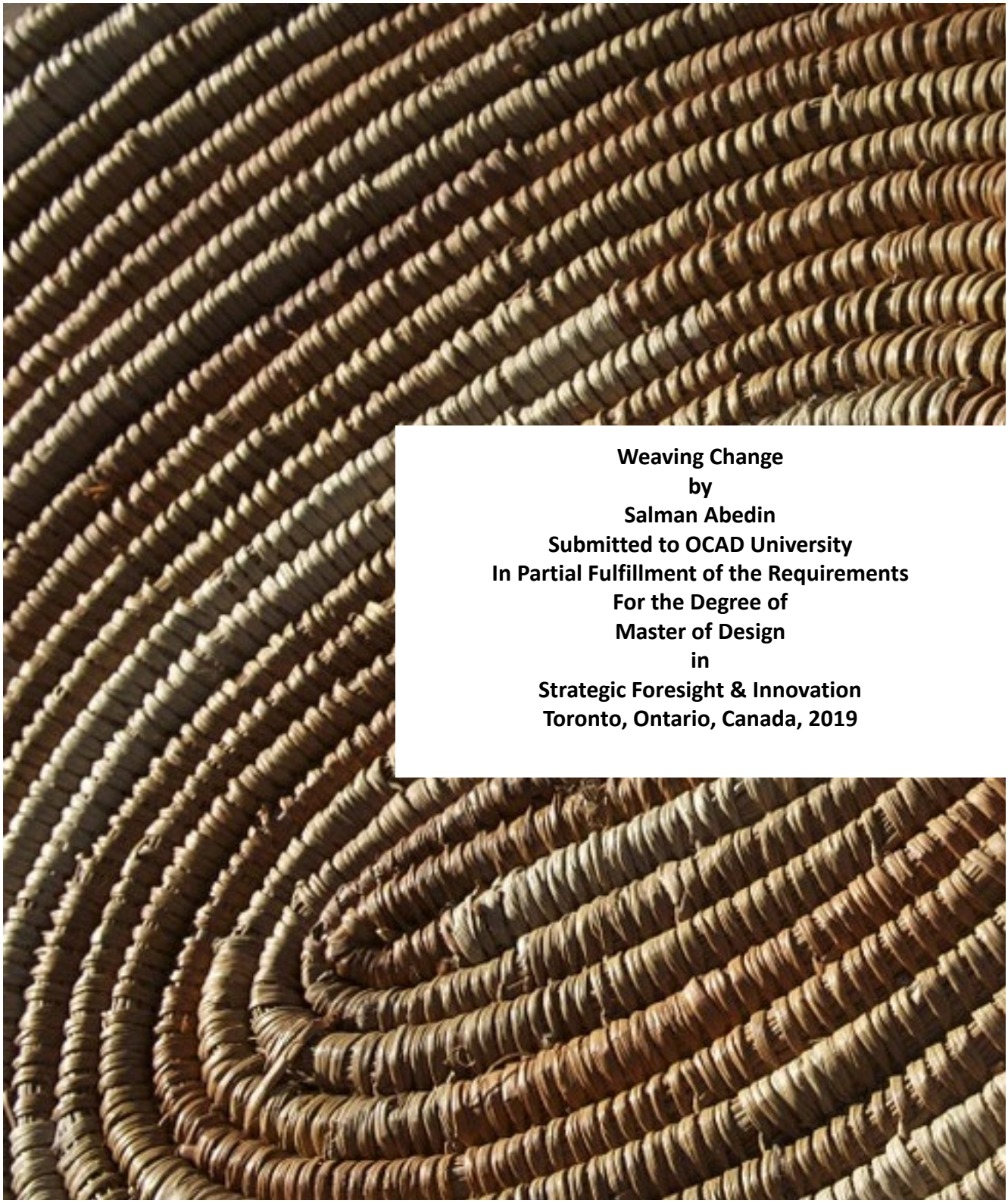

Weaving Change
by
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Submitted to OCAD University
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For the Degree of
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in
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Abstract

The purpose of undertaking this research project was to evaluate the likelihood of success of a Coalition of Graduate Programs in tackling issues of Sustainability. 63 Graduate Programs in Canada were analysed through the lens of 5C's: Creativity, Critique, Coalitions, Cases and Changemaking. Different configurations of schools and programs were developed and tested to see how they could work together. An action plan was put together comprised of student and faculty workshops in order to bring the idea into practice. There are challenges to executing an inter-disciplinary model including university and departmental funding challenges and politics. These can be overcome by creating a system of rewards and recognition and working with coalitions of the willing.

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"Weaving is both audacious in it's guiding vision of humanity's ability to ***co-create*** a thriving world that works for all and leaves nobody behind"*

Daniel Wahl

Image: https://witanddelight.com/2016/09/diy-wall-weaving/
*https://medium.com/age-of-awareness/what-does-it-mean-to-be-a-weaver-ba418b4311fe

Introduction

The research problem that I set out to learn more about was how could Graduate Programs in Canada come together to make a Coalitions that tackle and attempt to solve Global Sustainability Problems. The research process followed was a combination of desk research on graduate programs in Canada, and strategic play to design coalitions. The conclusion that I was able to draw from the research and strategy process, was that there are a number of coalitions of graduate programs in Canada in the areas of technology, business, design, public policy and environment sciences, that can be made including single discipline programs, and multi-discipline programs. Also, I was able to conclude that some programs do not have an incentive to participate (on paper), since they scored very high on the rating scale that was developed, and hence they will need to be incentivised to participate.

My intent with this project is to attempt to demonstrate how a coalition of masters degree programs can bring about change in the sustainability problem that faces the world. There are two kinds of change that I am talking about: One is the change making role that Universities have in society, which is the research that comes out of Universities plugs into knowledge as it exists, and then there is a gradual dissemination of knowledge from University to Society as a whole. That is the larger picture, but the more specific one is projects that can be demonstrated through experiments and then can be communicated quickly, rather than the long term dissemination process. It's a short term dissemination process of putting good ideas into the market place. The short-term dissemination process would be a communication piece or a prototype coming out of the exercises conducted through the collaboration of the departments.

There are different publics who would be the target of these communication pieces:
1. The students participating in the projects, to empower them with the idea that working in different networks or working with different networks, they can bring about change on a smaller or larger scale.
2. Governments or other entities who are looking to tackle the problem but may not have looked at specific change mechanisms that can be explored in an experimental setting.
3. The larger public by informing them of steps that they could take, or they could create networks to take, to bring about change from the bottom.
So some of it will be science driven, some of it will be policy driven and some of it will be very personal level shifts in, for example, consumer behaviour and personal behaviour that people can do.

Why are post secondary academic institutions the best vehicles for this kind of change making?

1. Masters Programs, graduate programs, post-graduate programs and research programs have access to research funding from governments and corporates. This is important because to undertake any experimentation there needs to be some funding available, in some form. That may be through personal donations, or people donating their time through informal networks (potentially). When you look at research funding that is available for science, for tackling the large questions that humanity faces now, the idea is to unlock this funding through this mechanism.

2. Students, whether we like it or not, are motivated by grades, by the search to finish, the search to complete their degrees and get good grades. Some people are extrinsically motivated along with being intrinsically motivated and we can get a lot of things done by people who are locked into the system and complete their degree requirements at the masters level, or PhD / postgrad levels. This is like a complimentary incentive structure. This has been discussed in the action plan component of this report, which is that when there is a semester structure, or a year structure, people do want to finish in that timeframe. The university incentivises them by giving them grades and there is a faculty looking at them, observing them and giving them a grade, so its not an open ended, free flowing research institute. It's a program which has a defined opening, beginning and an end. This helps to encapsulate things into a form which can be understood in the current paradigm of education.

3. The academic voice that institutes, departments have in society. Coming from my own experience of studying and teaching in Pakistan, where there was little impact of academic work on society; when I moved to Canada, I realised that academia is interconnected with society at large on a policy level, science research level, and even on management consulting projects that businesses want to get done from students as well. What I realised was that there is a voice that academics have, and this is a respected voice. It's a two way street, academics earn that reputation and then give it back to society by engaging at various levels. This academic voice can be leveraged to bring about systemic change rather than leave it in the ivory tower.

4. Larger change making role of universities, whether through training of manpower, changing of paradigms through writing of papers, doing academic and non-academic research. As an example a lot of the art and design work that gets done in universities, gets looked at by society at large. There is a lot to be learnt from design programs in terms of their impact on society, from architecture to graphic design has had a very large impact on the way society has developed. The impact is felt through the role of graduates or through any paradigmatic change that is felt in society, for example if inter-disciplinarity as a paradigm is possible in a university, can other organisations remove departmental barriers and create a new form of organisation? So maybe the university is the first place to experiment with this new structural paradigm. So, a lot of the things that the university does has relevance beyond what the graduates themselves go on to do. As an example, medical colleges that have hospitals and are innovating new processes and procedures which then gets converted into common practice in hospitals and then gets disseminated into wider medical practice.

The report is divided into 6 major sections. After this introduction, starting with the research framework, to the research process, and then moving on to the results, and the conclusions. The last section is an action plan for implementation of the framework. All the raw data has been compiled into Appendices at the end of the report.

Introduction

Background:

Throughout my study period at OCAD SFI, I have kept my eye on sustainability and environment issues, and always wanted to contribute towards building an understanding of the ways that I could contribute to "saving the world" The compelling need to save the planet and make it more livable for humans, as expressed in the sustainability goals of the UN, make for an emphasis on a value positive paradigm, that encourages change in the direction of sustainability or as Daniel Wahl puts it the designing of a regenerative culture[1]. This cannot be left to natural systems on their own, because the system may find a way to regenerate after the last human has gone.

As far as the overall paradigm that I am exploring is concerned, can be summed up in the work of Bruno Latour. Bruno Latour is a philosopher, anthropologist and sociologist who has written extensively on Actor Network Theory. ANT has been defined by Latour as "The attribution of human, unhuman, nonhuman, inhuman, characteristics; the distribution of properties among these entities; the connections established between them; the circulation entailed by these attributions, distributions and connections; the transformation of those attributions, distributions and connections, of the many elements that circulates and of the few ways through which they are sent."[2]

He has clarified about the theory that it is not an explanation of social networks, rather it extends the idea of a network to actors (human), non-human actors (machines, plants etc) and non-individual entities (natural systems as an example). This is shown in figure 1.

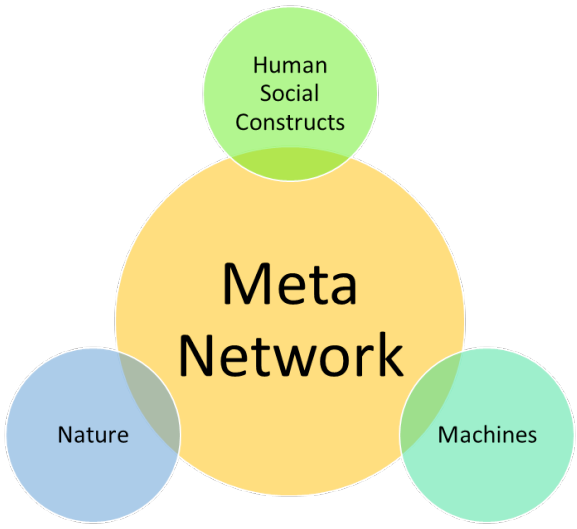

Figure1: Meta Network

1. Wahl, DC, Designing Regenerative Cultures, Triarchy Press, Axminster, England, 2016
2. 2. Latour, B. P7, On actor-network theory. A few clarifications plus more than a few complications. Bruno Latour CSI-Paris/Science Studies-San Diego in Finn Olsen (special issue of the Danish philosophy journal), " Om aktor-netvaerksteroi. Nogle faafklaringer og mere end nogle fa forviklinger" Philosophia, Vol. 25 N° 3 et 4, pp.47-64; (article écrit en article written in 1990]. version anglaise (English version) in Soziale Welt, vol. 47, pp. 369-381, 1996._-version anglaise sur le web web édition http://www.cours.fse.ulaval.ca/edc-65804/latourclarifications.pdf

I see the solution to the problems created by the Anthropocene age, as a Latourian Ideal Network, with all possible actors laid out in a network. “If we wish to understand the processes by which the sociotechnical world emerges we should not limit ourselves to one particular perspective (economics, politics, the social) but rather attempt to understand how all of these elements combine to create the phenomenon in question.[3]

In fact the non-material components of an ideal network will include human social constructs, nature and machines. This is the paradigm which encompasses technology, human behaviour and natural systems in one level, which will give us the required balance. Not one without the other, and not one at the expense of the other.

On the other hand, the traditional growth models, which have favoured economic growth over the natural world, accumulation of wealth over human values, work over leisure, and technology over ethics, have almost run their course, and new paradigms are being developed by business thinkers and economists alike. One such paradigm which I am going to be referring to repeatedly in my study has been developed in the World Economic Forum Whitepaper entitled: “Values, Ethics and Innovation. Rethinking Technological Development in the Fourth Industrial Revolution”. This paper lays the foundations for a more thoughtful technological design paradigm, one that focusses on the human and its needs. While coining the term Fourth Industrial Revolution, Schwab calls for leaders and citizens to “together shape a future that works for all by putting people first, empowering them and constantly reminding ourselves that all of these new technologies are first and foremost tools made by people for people.” [4]

3. Cressman, D. P.8, A Brief Overview of Actor-Network Theory: Punctualization, Heterogeneous Engineering & Translation, ACT Lab/Centre for Policy Research on Science & Technology (CPROST) School of Communication, Simon Fraser University. April 2009
4. Schwab, K. from https://www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab

Solving the problems created by the Anthropocene :

The Anthropocene is defined as the age of humans. Humans have changed the ecological and geological structure of the earth by their presence. The objects that humans have created, the machines, systems and ecological changes are all part of the Anthropocene. The timescale of the Anthropocene is shown in fig 2[5].

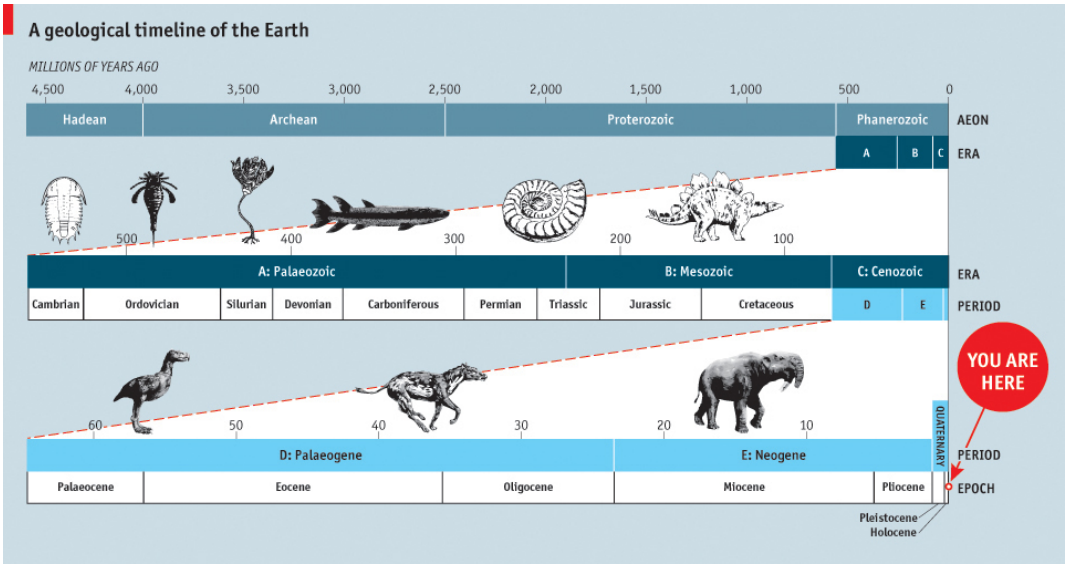

Figure2: Timescale leading upto the age of anthropocene

There are two paths possible for humans, as discussed in the economist briefing (economist, May 26th, 2011)[5]:

- Use the intelligence of humans and machines to craft a way forward while bringing fundamental changes to the natural order – this approach borrows from old-school capitalism but ads imaginative and "ethical" uses of tech to keep humans flourishing.
- Use a more holistic approach to living, by decreasing the impact that humans have on the planet, accepting that humans, nature and machines will co-exist in symbiosis.

Both approaches are possible as outcomes but both have different implications. The first approach is summed up in the World Economic Forum white paper entitled "Values, Ethics and Innovation: Rethinking Technological Development in the Fourth Industrial Revolution" [6], which takes a multi-stakeholder, human centered, "ethical" approach to solving issues raised by the Anthropocene. On the other hand, my approach is to solve the problems of the Anthropocene through de-centering the human subject and giving equal importance to nature, humans and machines and finding a new equilibrium. This method acknowledges nature and machines as intelligent actors alongwith humans, in a new understanding of earth systems.

5. The Anthropocene, A man-made world, Economist, Print edition, May 26th 2011, accessed at https://www.economist.com/briefing/2011/05/26/a-man-made-world, on 19 Feb, 2019 at 7:00pm EST
6. Philbeck, Davis & Larsen, Values, Ethics and Innovation: Rethinking Technological Development in the Fourth Industrial Revolution, World Economic Forum white paper, April 2018.

Universities and specifically programs that are action oriented (versus theory programs) are ideally placed to solve the problems of the Anthropocene. This stems from the understanding of a common world in which humans and non-humans are entwined and mutually constitute the environment in which they exist. Programs that can treat environment, not as a background condition, but as "context and content for spatial practice and socially engaged action"[7]

One such effort worth discussing is the recently formed Public Interest Technology University Network in the US. 21 universities have banded together to promote the ethical use of technology in their software, policy, civic leadership, and social justice programs. The main thrust is to develop, regulate and use technology for the public good. This multi-disciplinary, multi-institutional approach is being labelled "public interest technology". "If this new digital world, which is supposed to be so much better and supposed to help us all solve centuries-old challenges, actually compounds those problems, it will be in part because there's not enough people fighting for the public interest,"[8] Darren Walker, President of Ford Foundation rightly said, and in my view this central thesis can be easily expanded to include environmental and biological sciences also.

7. Rice, C. (2011). The inside of space: Some issues concerning heterogeneity, the interior and the weather. In M. Hensel, C. Hight, & A. Menges (Eds), Space Reader: Heterogenous Space in Architecture (pp 185-193). London, England: Wiley
8. Universities Join Cause: Technology for Public Good, New York Times, March 12, 2019. Accessed from: https://www.nytimes.com/2019/03/11/technology/universities-public-interest-technology.html?smtyp=cur&smid=tw-nytimesbits

System View of Area of Study:

The framework that I am using as a starting point of my journey, revolves around a system view of how change can be brought about by using the central core of Social Innovation, Design 3.0/Design 4.0/Systemic Design and Sustainability, as shown in figure 3 . Detailed description of Design 3.0/4.0 is in figure 4.

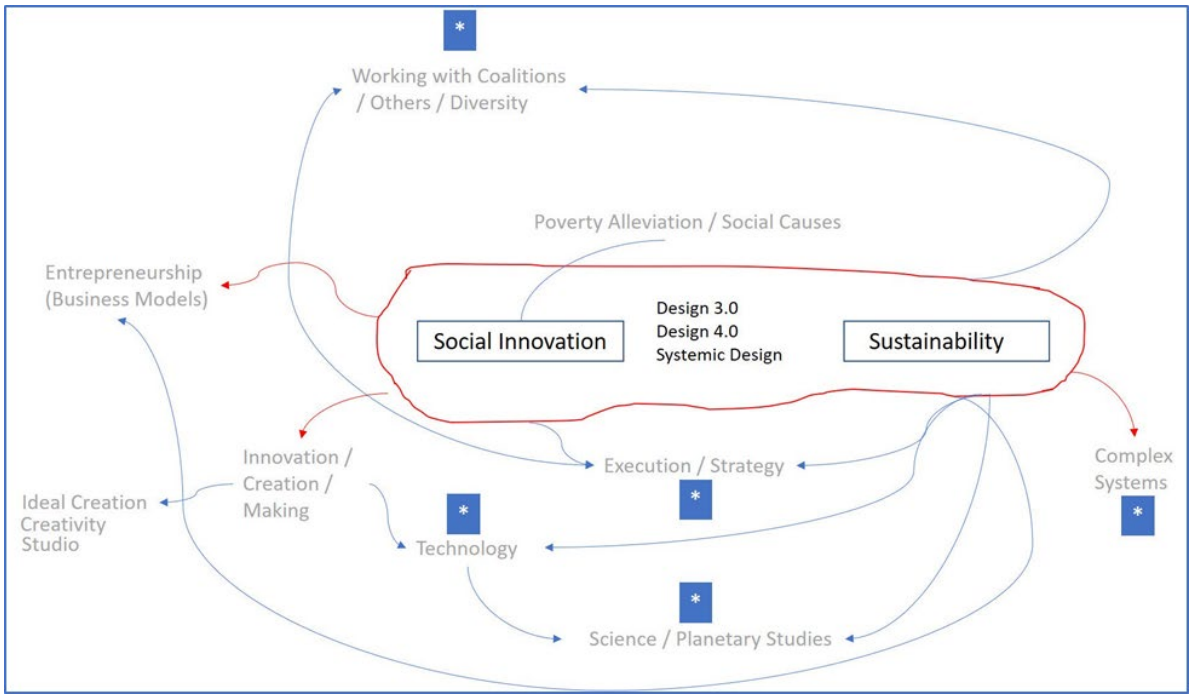

Figure 3: System View of Social Innovation Leading to Sustainability

The reason why I placed them in the central core was that to solve wicked problems (which Rittel[9] defined as not having any clear boundaries and having many overlaps with no clear solutions) requires an approach that involes multi-stakeholders in different settings which Design 3.0/ Design 4.0 (defined in detail) later and systemic design set out to do. Sustainability is a wicked problem with many connections with other related fields. Social innovation connects other fields in to the design paradigm that brings many people in many settings together, and hence it belongs in the core also.

"A **social innovation** is any initiative (product, process, program, project, or platform) that challenges and, over time, contributes to changing the defining routines, resource and authority flows or beliefs of the broader social system in which it is introduced".[10] (Frances Westley)

9. https://www.wickedproblems.com/1_wicked_problems.php
10. Westley, F. Keynote on the history of social innovation at Nesta's Social Frontiers, Nov. 14-15, 2013. from https://uwaterloo.ca/waterloo-institute-for-social-innovation-and-resilience/about/what-social-innovation

Schumpeter[11] talks about the circular flow of goods and services, and how innovation is at the margins of a system that is at rest. The entrepreneur is the agent who brings about the innovation in this structure. Many writers have been inspired to take the general theory forward based on the ideas that social innovation and social entrepreneurship can also be extrapolated from the Schumpeter circular flow model. However it has been argued that the two are different, in that by using the terminology of entrepreneurship, market forces are given more importance than other social change mechanisms and models that may not be business oriented.

Also, social movements, the welfare state and government policies are important drivers of social change and cannot be separated from the innovation equation. Ostrom[12] argues for a form of entrepreneurship which can be called "public entrepreneurship".
This is different from private entrepreneurship which is more person oriented.
"In this way, Ostrom's research and other collectively oriented approaches to public and social entrepreneurship represent knowledge that may prove decisive in finding new ways out of the economic and multidimensional crisis."[13]

In conclusion, it can be said that there are two trends in the delivery of social goods to the public. One is the privatisation of roles traditionally delivered by government entities through various interactions between civil society, private entities and government in the form of partnerships or social entrepreneurial ventures. It is these social entrepreneurial ventures that bring the social innovations to the market. Schumpeter[11] said: As long as they are not carried out into practice, inventions are economically irrelevant. It is this activity of bringing the inventions and innovations that entrepreneurs develop to market in the social setting that we are referring to. The other trend is the public sector innovation to make the delivery more efficient and effective. In my use of the term social innovation I am leaning to the implementation being carried out through government settings rather than through private enterprise in a social setting.
Social Innovation has evolved from the Welfare state of the late forties in the Scandinavian context, and it can be seen as an evolution of the welfare idea married to free market thinking in the 1970's[14]

11. Schumpeter, J. A. (1934). The Theory of Economic Development, Cambridge: Harvard University Press.
12. Ostrom, E. 1 965. Public Enterpreneurship: A Case Study in Ground Water Management. Ph.D. dissertation, University of California at Los Angeles.
13. p40, Social entrepreneurship and social innovation: Initiatives to promote social entrepreneurship and social innovation in the Nordic countries, Nordic Council of Ministers, 2015 http://norden.diva-portal.org/smash/get/diva2:856045/FULLTEXT01.pdf
14. ibid

As the trends of decentralization, deregulation and economic limits to growth coincided in the 1970s, change was needed and civil society organisations stepped in to create public private models in Europe. Most Western countries now have hybrid models of service delivery, which has resulted in greater accountability for bureaucracies, and more innovative practices in service delivery[15]. This has led up to the establishment of social innovation labs in many countries including Canada (Mars DD being one of the premier ones)[16]

As mentioned earlier, Design 3.0 and Design 4.0 are at the core of the system that is being explored in this research project (figure 3). What is important is the contexts in which design is being carried out, and this is dependant on the type of output that is expected. For complex social problems, the right context is a workshop or lab.

Design 3.0/Design 4.0 as shown in figure 4. are the areas of design where complex systems are designed in the social context.[17]

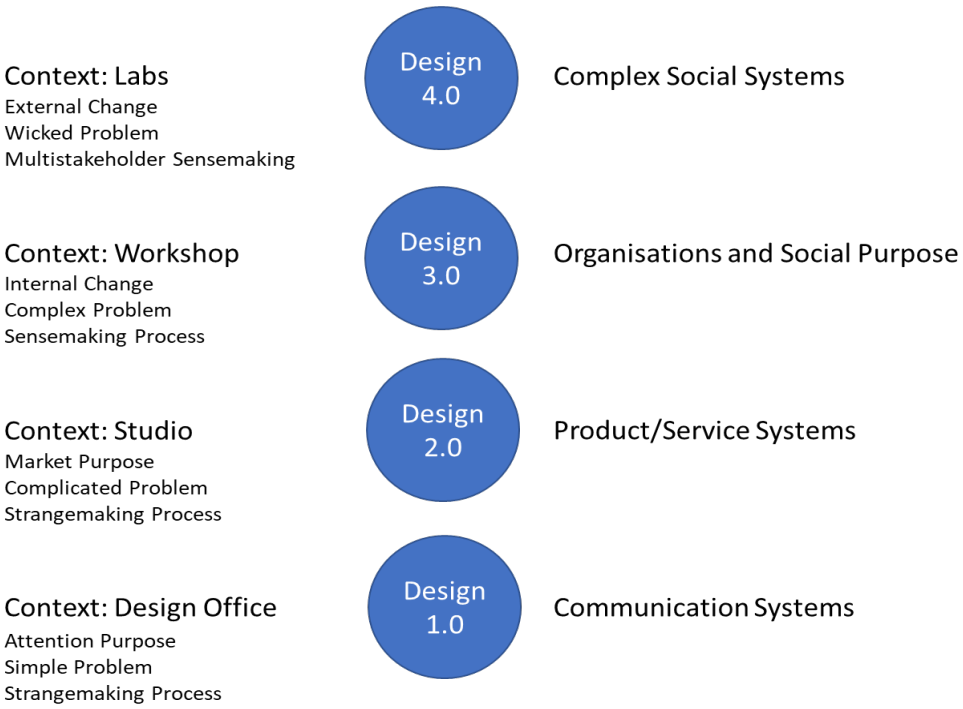

Figure 4: Design Domains and Associated Contexts

15. Oosterlynck, S., Y. Kazepov, A. Novy, P. Cools, E. Barberis, F. Wukovitsch, T. Sarius & B. Leubolt (2013), The butterfly and the elephant: local social innovation, the welfare state and new poverty dynamics. ImPRovE Discussion Paper No. 13/03. Antwerp: Herman Deleeck Centre for Social Policy – University of Antwerp.
16. http://www.sigeneration.ca/home/labs/
17. Jones, P. (2018), Contexts of Co-Creation: Designing with System Stakeholders, Draft Paper.

Peter Jones mentions four design contexts which are:

- Design 1.0: Simple design problems, well defined briefs in which output is an original artifact
- Design 2.0: Multidisciplinary team takes on a complicated yet resolvable problem in a commercial context
- Design 3.0: Design workshop is put together in the context of a complex organisational problem. Expertise disciplines are present in the workshops
- Design 4.0: Multi-organisational workshops hosted by third party mediators with the idea to achieve shared understanding for mutual action.

In terms of social innovation and problem solving that requires inter-disciplinary approaches, it is observable that the design 3.0 and design 4.0 contexts are more applicable because that is where multi stakeholder engagement and design of solutions can be undertaken.

The last central concept that needs to be defined is Sustainability. This is the outcome that we are setting out to achieve.

Sustainable development was first defined by the Bruntdland Commission in 1987 as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [18]There were three areas agreed on at the time: Environment, Economy and Society[19], shown in figure 5.

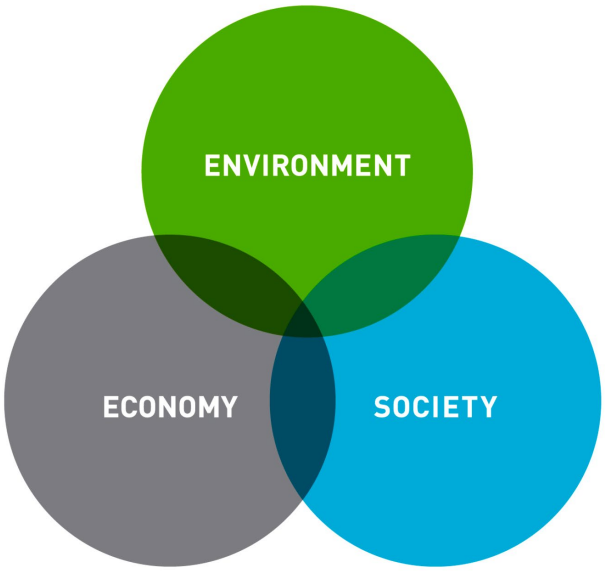

Figure 5: Sustainable Development definition

18. Our Common Future: Report of the World Commission on Environment and Development". UN Documents. n.d. Web. Retriev ed 27 June 2013. < http://www.un-documents.net/ocf-02.htm>, qupted in What is Sustainability, https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf
19. https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf

It is the effort of this activity to move toward the Millennium Goals which were morphed into the sustainability goals in 2016, the United Nations rates efforts of countries to achieve sustainability. "Achieving the SDGs requires the partnership of governments, private sector, civil society and citizens alike to make sure we leave a better planet for future generations."[20]

If we are to solve the problems created by the Anthropocene, and if we are to find solutions that work in the lab, in the university, and in the real world, we will have to create design methods and methodologies that bring people together, that allow for collaboration and ad onto existing learning and best practices from the world of social innovation. The actors in the higher education system that have an impact on systems that effect the environment and that map with various sectors in the system at large are:

- **Public Policy**
- **Business**
- **Technology**
- **Design**
- **Nature / Environment**

This is shown as a development of figure 3, to abstract the areas above into areas of study (figure 6)

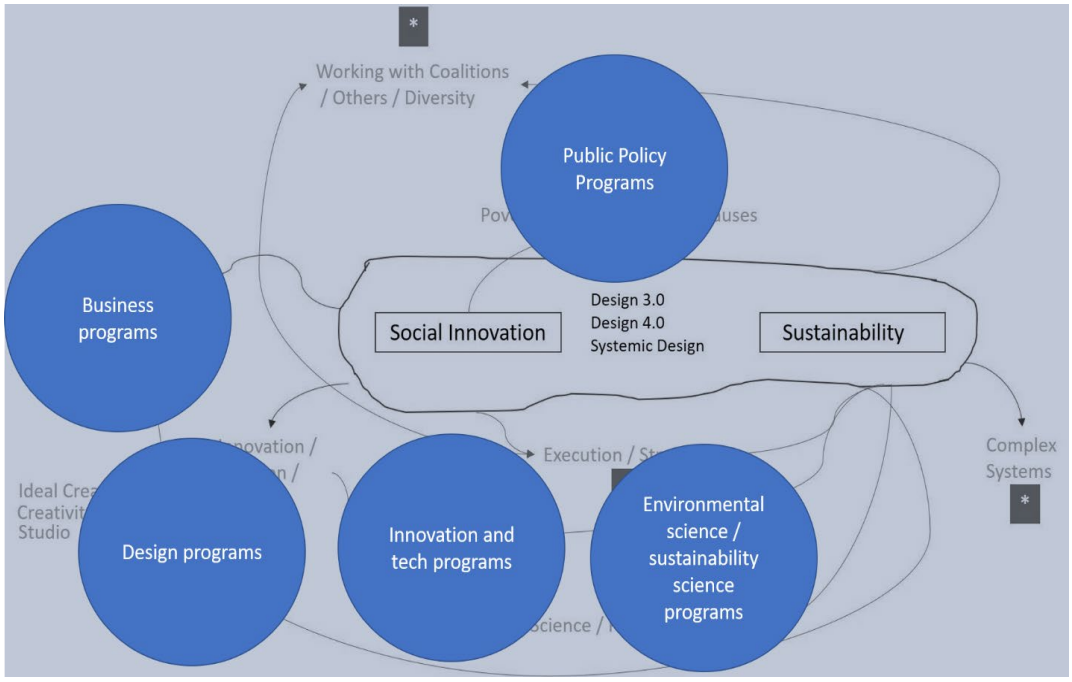

Figure 6: Abstracted Areas of Socio-Technical-Economic-Natural Systems

20. http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

Keeping in view the need to collaborate and work in a network, and that correspond to the socio-technical-economic and natural systems that interact to make the central nucleus work, these departments are best suited to problem solving in the Anthropocene. There may be other departments that are undertaking efforts to solve ecological problems for example art departments that are working on ecological art, or pure science programs that are working on technologies that may have direct consequences for the environment, but they have been left out from the list at present. They may be co-opted in, at a later stage if needed.

The area in the post secondary education system in Canada, that I am studying, is the area of graduate programs. I have selected graduate programs because graduate programs offer more scope for research and applied knowledge versus undergraduate programs. Post graduate programs become too focussed on academic outcomes and so may not be the best place to apply the thinking.

In the Anthropocene as a Transformative Pedagogical Platform, Wodak[21] connects pedagogy to the field of anthropocentric projects in higher education.

All human and natural sciences are directly linked to the Anthropocene, so these have to be added in through "transformational learning and ecological literacy" in all curricula form A(Accounting) to Z(Zoology)[21].

In his 2015 survey of Anthropocene pedagogy, Nisbet writes:

"universities and colleges will play a central role by sponsoring interdisciplinary courses, degree programs and related inititatives"[22] in creating a hopeful path in the Anthropocene.

Nisbet goes on to draw a clear path between the four core disciplines[22]:

1. Science: provide data and models to make predictions
2. Philosophy and religion: give a sense of what is right and what is of value
3. Social sciences: provide theory and data about human societal choices and decisions
4. Creative arts and communications: tell stories, promote learning and provide avenues for critical self reflection

21. Wodak (2018), The Anthropocene as a Transformative Pedagogical Platform, in Transformative Pedagogies and the Environment, Common Ground, 2018
22. Nisbet, M. (2015) Universities in the Anthropocene: Engaging students and communities. Retrieved from http://theconversation.com/universities-in-the-anthropocene-engaging-students-and-communities-36472

In terms of comparison, I have added business into the mix, as there are management roles and tasks, strategies and plans, marketing schemes and incentives, that can be drawn from the business world to solve the problems created by the Anthropocene. This is shown as a pedagogy of coalition building (Coalition Pedagogy) in figure 7. The components of coalition pedagogy are the different departments that would come together for solving problems related to sustainability.

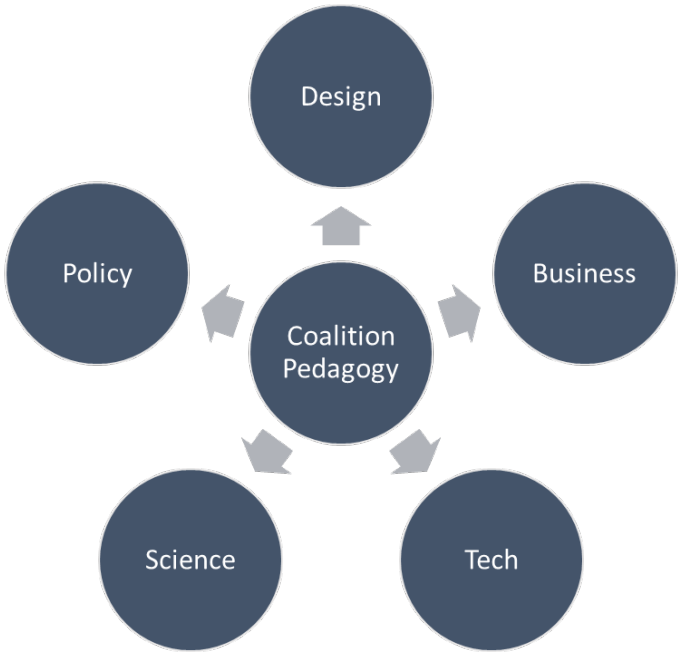

Figure 7: Coalition Pedagogy

It is my position that coalitions of inter-disciplinary programs would be the most effective way of tackling sustainability issues through social innovation and design. Inter-disciplinary programs are the ones that have a focus that allows for collaboration, and also programs that allow for students to meet stakeholders while addressing multi-pronged "wicked" problems. There are two examples that I have been able to find related to multi-stakeholder engagement to solve wicked problems. One is the Carnegie Mellon program structure that moves from service design to designing for sustainability to transition design[23]. The other is a course that has been introduced in UBC as a pilot undergraduate course offered by the Office of Regional and International Community Engagement (ORICE), the Liu Institute (which is a research institute in UBC, having environment as one its research areas) and the Department of Theatre and Film[24].

23. https://www.thesolutionsjournal.com/article/redesigning-a-design-program-how-carnegie-mellon-university-is-developing-a-design-curricula-for-the-21st-century/ accessed on 05-11-19
24. https://ctlt.ubc.ca/2017/10/31/new-course-tackles-wicked-problems-with-strategic-design-methodology/ accessed on 05-11-19

A flat and non-linear pedagogy that allows for interaction between different disciplines can be called a Coalition Pedagogy.

This means bringing the multi-subject approach into classroom, teaching coalition building as a skill, and mandating differing and divergent perspectives in all analysis. Also, this implies that all learning is equal, and one branch or subject is not more important than the other.

In the following section, I will describe the key distinguishing features in a number of university programs that are attempting inter-disciplinarity and trying to solve a number of atypical problems as well. By studying existing models, we can see the success points of various programs, and hope to learn from their experience.

Examples of Inter-disciplinary Programs:

While many interdisciplinary programs exist in the Higher Education, there have been efforts made to either make inter-disciplinary collaborations, or curriculum level changes to bring different parts of curriculums together. Here is a non-exhaustive list of programs and departments that offer inter-disciplinary studies in various formats:

Following is a list of schools that have been selected in the Springer Volume entitled "Creating Innovation Leaders"[25]

1. **SEAS Master Program in Engineering**
2. **Stanford d. school**
3. **Kanbar College of Design, Engineering, Commerce – Philadelphia University**
4. **M Des SFI – OCAD**
5. **Mission D @Tongji University**
6. **Alta Scuola Politecnica**
7. **Paris d.school**
8. **College of Arts and Humanities at Brighton University**

These programs are discussed in detail on pg 23 of this report.

Apart from these efforts, there have been other efforts also, including the formation of a "collaboratory"[26]. The collaboratory idea emerged from a consortium of business schools called the 50+20. During the 50+20 launch during the Third Global Forum on Responsible Management Education in the Rio+20 earth Summit in 2012, the idea of a Collaboratory emerged. Some of the salient features of a collab are[26] :

1. Facilitated Space
2. Concerned stakeholder
3. Solutions for societal, environmental, economic issues
4. Inclusive learning environment
5. Action learning and Action research

25. Bannerjee, B. & Ceri, S. (ed) (2016), Creating Innovation Leader, Springer International Publishing, Switzerland
26. Muff, Katrin (ed) (2014), The Collaboratory, Greenleaf Publishing, UK

One of the methods that can be used in a collab setup is transformative scenario planning[26], as shown in figure 8.

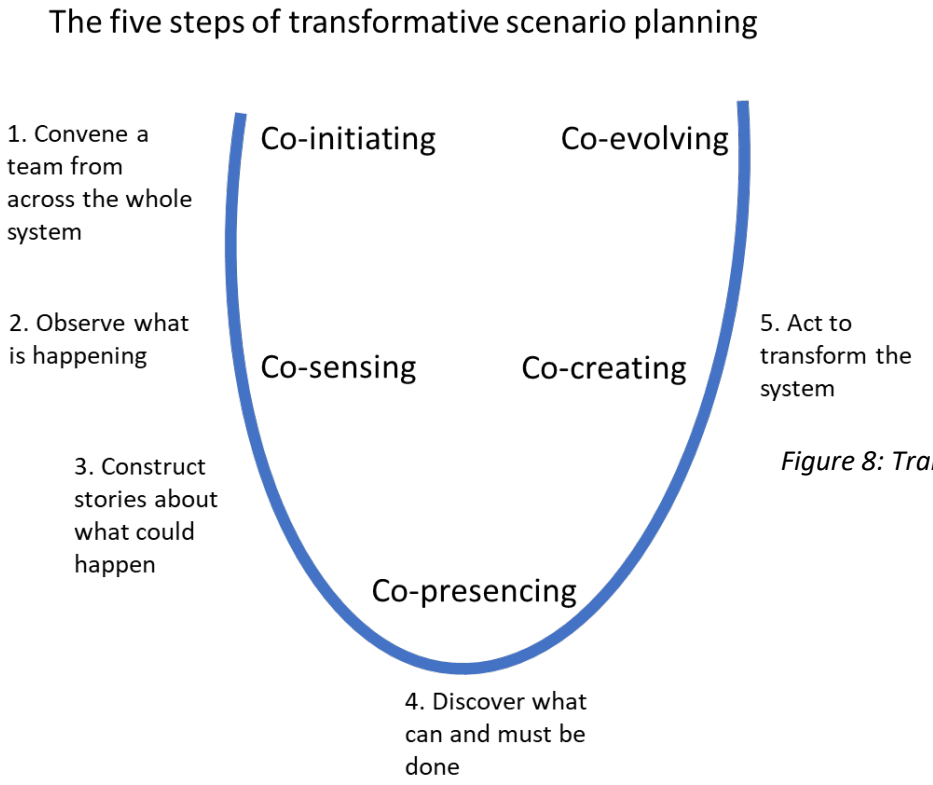

Figure 8: Transformative Scenario Planning

This can aid in developing a common vision and moving to implementation. The stages of transformative scenario planning start with convening a team from across the whole system (co-initiating) and using stories to construct alternative future narratives. After the stories are agreed upon an action plan is co-created and system wide transformation can be achieved. A similar approach is following in the action plan of this report.

If the Collab approach is followed, and the right people are brought into the room, there is a high chance that the system will find acceptance in the university setups. On the other hand, the question arises, that is the university even equipped to handle such heavy tasks. The collab approach assumes the business schools would lead the charge to sustainability, whereas, Ezio Manzini, who is one of the foremost thinkers on social design and role of design schools believes design schools can lead change and transformation to a sustainable future, both at a local, regional and global level.

Role of Design Schools:

Design schools can take one of three roles to lead change according to Manzini:

1. Design Networks:

The move from design expert to design process is happening as designers take the lead in transitioning to a more sustainable world. The traditional role of the designer as the only expert in a multidisciplinary team is now emerging as an enabler of "other actors to be good designers"[27]

Design schools can produce these facilitators and also create agents of sustainable change. Manzini proposes that that design schools create Design Labs within each school. These labs can undertake the following activities[27]

- Investigating – undertaking ethnographic research
- Facilitating – participative design tools
- Visioning – feeding the process with scenarios and proposals
- Communicating – visibility to initiatives
- Enabling – enabling communities
- Replicating – generalizable through toolkits / templates
- Synergising – developing framework strategies for systemic change

2. Open Design Programs:

Manzini envisions a network of design schools that is open and collaborative, capable of self-regulation and self-management[28]. This program would connect design labs to recognise emergence, exchange experience and have access to tools[27]

3. Distributed Design Agency:

Manzini looks at the agency model as a combination of[28]:

- Tackling social problems
- Connecting with others
- Working independently

27. Manzini, Ezio (2011), Design Schools as Agents of (Sustainable) Change (18/05/2011), DIS Poltecnico di Milano – DESIS Network
28. Design for Social Innovation and Sustainability (DESIS): http://www.desisnetwork.org/labs/

This “agency” would be its own client, hence being able to tackle issues that have a long term multi perspective solution. This is because clients usually have clear briefs with desired outcomes that are measured over a specific period. By being its own client, the “agency” would be able to work on long term projects with indeterminate and evolving outcomes.

By combining the above three factors design schools can lead change. The next logical question is, are there programs or coalitions in the “wild”, that are addressing large wicked problems related to sustainability? Each of the models that the coalitions follow is different from the other. Some are corporate university networks (SUGAR) while some are specific to tasks (AASHE, which looks at university buildings and curricula). Here is a non-exhaustive list of some of the coalitions that are attempting to tackle such issues:

DESIS[28]:

The DESIS network hopes to leverage design schools as agents of social change by creating a network of partners that are regional and international. The aim is to co-create solutions that are applicable on a regional and international level. There are 51 labs that are part of the DESIS network, at the time of writing this report. DESIS has a number of ongoing projects that include areas of research and thematic areas. Some of the current areas of action are:

- Food;
- Making;
- Clothing;
- Caring;
- Housing;
- Place-making;
- Others (mobility, tourism, etc)[29]

GRLI[30]:

The GRLI aims to make business schools into agents of positive social change. The initiative brings together “diverse groups of diverse groups of people and organisations that share a commitment to the development of a humanistic, fair and sustainable world”[30] based on the UN Sustainable Development Goals.

29. http://www.desisnetwork.org/the-desis-map/
30. GRLI (Globally Responsible Leadership Initiative): http://grli.org/about/global-responsibility/#who-and-what-is-grli

The consortium behind GRU is called 50+20. The name, 50+20 is based on 50 years since management education was started, and 20 years have passed since the RIO summit (1992). Hence it is time to reset the agenda for the business schools based on the SDGs[31]. At the time of writing this report, there were 26 business schools as partners in the network. However, Business School bodies such as AACSB international are also strategic partners[32]

SUGAR[33]:

The SUGAR network was setup by the Stanford d School to promote their agenda of design thinking. It was established in 2008, and now has 24 universities as part of the network[33]. Sugar network tackles "real" problems with corporate partners who provide funding for a 9 month project.

EAUC[34]:

The EAUC serves universities in UK and Ireland, and aims to disseminate good practices on environmental issues, campus greening and curriculum greening[34]. EAUC was setup in 1996 and became a registered charity in 2004. It is based at the University of Gloucestershire. There are around 300 members in the network.

CUMULUS[35]:

CUMULUS was setup in 1990 by The University of Art and Design in Helsinki (UIAH) (currently Aalto University School of Arts, Design and Architecture) and the Royal College of Art in London, in co-operation with Danmarks Designskole, Gerrit Rietvelt Academy, Universität Gesamthochschule Essen and Hochschule für Angewandte Kunst in Wien[35]. It was incorporated as the CUMULUS Association in 2001. In 2008, CUMULUS initiated the CULUMUS Green awards "focused on cultivating and leading global cultures, societies and industries towards more ecological and responsible solutions"[35]. There are currently 257 members of the network in 54 countries.

31. http://www.europeanbusinessreview.com/5020-management-education-for-the-world-part-1-designing-a-radically-new-vision-of-management-education/#!prettyPhoto
32. http://grli.org/about/our-network/#partners
33. https://sugar-network.org/about#university
34. EAUC (Environmental Association for Universities and Colleges): http://www.eauc.org.uk/who_we_are
35. CUMULUS (International Association of Universities and Colleges of Art, Design and Media): http://www.cumulusassociation.org/homepage/what-is-cumulus/

AASHE[36]:

AASHE was initially called Education for Sustainability Western Network (EFS West) serving the Western states in US and Canada in 2001. It was morphed into AASHE in 2005[36]. In 2015 the Sustainable Campus Index was launched Sustainability Tracking, Assessment & Rating System (STARS) assessment of universities and campuses[37]. The AASHE is the coordinating association of the The Higher Education Associations Sustainability Consortium (HEASC)[38]. There are 13 Centers for Sustainability Across the Curriculum which are part of the AASHE.

These centers offer workshops and curriculum development sessions for universities to develop sustainability courses[39]

SEPN[40]:

SEPN was founded in 2012 to analyse the systemic impact of sustainability education and research on sustainability practice in the Canadian context. Later it was expanded to incorporate other international partners and researchers also[40]. SEPN is housed in the Sustainability Education Research Center in the University of Sasketchewan[41]. There are four international partners in this network. It is largely a Canadian research initiative backed by Social Sciences and Humanities Research Council (SSHRC).

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As mentioned this list is non-exhaustive and an attempt to show that coalitions of programs of various types are trying to address large scale problems by working together in various configurations.

36. https://www.aashe.org/about-us/aashe-history/
37. AASHE (Association for the Advancement of Sustainability in Higher Education) : https://hub.aashe.org/browse/publication/15693/2016-Sustainable-Campus-Index
38. http://www.aashe.org/partners/heasc/members/
39. http://www.aashe.org/partners/centers-for-sustainability-across-the-curriculum/
40. SEPN (Sustainability and Education Policy Network): http://sepn.ca/the-project/
41. http://seri.usask.ca/

Implementing the different configurations involves an understanding of the challenges of interdisciplinarity, the idea of envelopes (which is the financial implication of university departments[42]) and how these envelopes (discussed on p 28 ahead) can work together, and also the human motivations for why people would want to work together. This section begins with a discussion on the different types of ID, and where the change could be brought about. The third section builds on the introduction section of this report, and talks about the human angle in developing pedagogies at the university level.

1. Inter-disciplinarity:

Table 1 shows the different terms that are used to describe inter-disciplinarity that have been identified by Davies and Devlin[43]. The chart starts from disciplinarity, which is the default position that departments take, all the way to Transdisciplinarity which would result in the collapse of boundaries. Each of the ID models has its pros and cons. While pondering over the nature of collaboration that could take place between the different departments in the various configurations that are described ahead, it is my opinion, that the outcome would be somewhere in the realm of Modification ID as defined in table 1 by Davies and Devlin[43], where the two or many disciplines are driven by a higher force or higher level outcome, which would be the positive impact that are expected from the collaboration. It is unlikely that the disciplines will break their barriers completely and merge as a result of this exercise.

The following list from page 17, is a non-exhaustive list of programs and departments that offer inter-disciplinary studies in various formats. While many interdisciplinary programs exist in the Higher Education, there have been efforts made to either make inter-disciplinary collaborations, or curriculum level changes to bring different parts of curriculums together. This list shows the many different forms that Inter-disciplinarity can take, starting from attempts within departments to break boundaries, to separate non-degree related institutions like the Stanford d.school.

42. The Interdisciplinary Witness: Interdisciplinary Pedagogy and Speaking the New: Marie Sierra, Kit Wise, and Ross Brewin in Sierra, M. & Wise, K. Ed. (2018) Transformative Pedagogies and the Environment: Creative Agency Through Contemporary Art and Design. Common Ground Research Networks. Champaign, IL, USA (p12)
43. Davies, M. & Devlin M. (2010) Interdisciplinary higher education: perspectives and practicalities (pp 3-28), Bingley, England: Emerald Group Publishing.

Term Used	Description
Disciplinarity	Undestanding of disciplines as thought domains, which are semi-autonomous, intellectual conveniences. They consist of specific histories, methods, communities and language.
Multidisciplinarity	Everyone co-exists, ie. Accepts other disciplines but "does his or her own thing"
Cross-disciplinarity	Involves the "sampling" of another discipline through the investigation of a topic outside a field
Interdisciplinarity	New concepts, methods are derived from different disciplines in a novel way. An axis of ID emerges
Relational ID	Subject is common, but two or more disciplines contribute their knowledge on a common subject (two perspectives, while acknowledging the other without integration)
Exchange ID	A contested argument between disciplines but little integration or ideas to generate anything "novel"
Pluridisciplinarity	"requires two or more areas to combine their expertise to jointly address an area of common concern". It is cooperative and collaborative. Outcomes may not be "novel" since the outlines of the contributing disciplines do not change…
Modification ID	Like pluridisciplinarity but the outcome is driven by a higher directive, and so the higher directive evaluates and combines the lower-level outcomes and develops them beyond their traditional boundaries
Transdisciplinarity	The collapse of academic borders and the emergence of new disciplines. Parent disciplines are re-formed and ultimately dissolved. Probably a theoretical possibility

Table 1: Types of Inter-disciplinarity

A. SEAS Master Program in Engineering[44]

Key features of this program are:

a. No departments
b. Research is inter-disciplinary
c. They offer system level courses

B. Stanford d. school[45]

This school in Stanford is also known as the Hasso Platner Institute of Design. This is not a degree awarding institute, which has the following key features:

a. Problem based studio format often with real private sector clients (the institute was setup with IDEO)
b. Offers short courses/workshops as inter-disciplinary collaboration
c. Offers a fellowship of 1 year

The d-school is known as a hub of "radical collaboration" comprised of:

a. Rapid prototyping
b. Human centered design
c. Collaboration

C. Kanbar College of Design, Engineering, Commerce – Philadelphia University[46]

This college offers a four year undergrad program with three majors (Design, Engineering, Commerce), with a core curriculum that is distributed over 4 years. Students are taught to take on VUCA (Volatile, Uncertain, Complex, Ambiguous) problems.

A Strategic Design MBA evolved out of the undergraduate core, which is under review by the University

D. M Des SFI – OCAD[47]

SFI tries to create a new type of designer, one who is a

a. Strategist having the ability to see the "human perspective"
b. Innovator imagining, planning and developing a better world

Research is conducted in the SLAB where design thinking, business intelligence, and strategic foresight come together to envision alternative futures. The process that is taught is:

44. p. 149, Bannerjee, B. & Ceri, S. (ed) (2016), Creating Innovation Leader, Springer International Publishing, Switzerland
45. P 163 ibid.
46. p175 ibid.
47. p 187 ibid

a. Problem finding (foresight)
b. Problem framing (strategy)
c. Problem solving (design)

E. Mission D @Tongji University[48]

Mission D is a minors program that is offered to undergrad, graduate and PhD level. It is offered in association with the Aalto Venture Program at the Sino Finnish Center (in association with the Aalto University). It provides an inter-cultural, inter-disciplinary, cross-education system environment

F. Alta Scuola Politecnica[49]

This is a collaborative program between Politecnico di Milano and Politecnico di Torino. The courses for this program are added on top of regular work and students are selected for this program from both schools. System level, interdisciplinary and complex programs are tackled.
The programs that are handled are in collaboration with government, private sector or research centers, so they are "real problems"

G. Paris d.school[50]

This is a collaboration between five schools in architecture, urban planning, engineering, business and finance. This collaboration also links to the Aalto Design Factory and the Stanford SUGAR NETWORK. Masters level students and professors are trained in design thinking in the d.school.

H. College of Arts and Humanities at Brighton University[51]

The main aim of this college is to work on design futures through the tools developed by Buchanan's four orders of design:

a. Signs
b. Things
c. Actions
d. Thoughts

The above order s of design, have been folded into a GRID (Generative Research Interface Device) process. Collaborative project based opportunities in undergraduate, graduate, post graduate study areas across arts, design, humanities, medicine, pharmacy, computing and business are present.

48. p 201 ibid
49. p215 ibid.
50. p 227 ibid
51. p 239 ibid.

Based on modification ID, the outcomes form the experiments or research from the various models above, may be based on science, economic policy and even behavior change. This behavior change can be prompted through policy nudges, or may be consumer driven (like the Marie Kondo phenomenon). The reason to incorporate behavior change is that science is often posited as a solution to all of human (mis) behavior, while the reality is that there are some things that only behavior can solve.

Some of the areas that could be possible non-science outcomes, based on Modification ID based collaboration between departments are:

a. Sustainable Economy (Sustainable Development Commission)[52]

This starts with understanding what would be needed to build and sustain an economy that had strict limits on carbon emissions, and other sustainability goals. Zero growth models that exist need to be looked at debated. Also, the depletion of natural resources need to be factored into new models of macro-economic analysis (setting the basis for "all factor" accounting on a regional, national and international level. One further important point is to highlight the need for technology transfer for ecological mitigation and for incentivising R&D in sectors that can play a part in bringing new technology that can reverse ecological decay.

b. Simplicity (Sustainable Development Commission)[52]

This has two areas of impact:

The first is the government level where policy can be made to reverse the culture of consumerism and incentivise simple living through product lifetime management, and other incentives (eg green incentives). Also based on low growth models, the government can incentivise part time employment, stay at home work and paid leisure.

c. Alternative Hedonism: The other area is the more social or personal. One of the major drivers for the growth of materialism is the idea of shame which Adam Smith posited as a need to overcome social pressure by buying things. This drives the consumerist culture forward. Kate Soper[52]points to a growing appetite for "alternative hedonism", the idea that satisfaction can be found outside the conventional market forces.

52. Jackson, Tim (2009). Prosperity without growth?: The transition to a sustainable economy. Sustainable Development Commission. http://www.sd-commission.org.uk/data/files/publications/prosperity_without_growth_report.pdf.

Voluntary simplicity can result in a "new" paradigm beyond the conventional conversations of market forces and perennial growth.

Governance Balance (Sustainable Development Commission)[52]

Apart from the macro-economic tools available to government that have been in point B, above, there are other policy parameters that can be brought into play. These imply that the government needs to balance the need for constant growth with the need to protect the environment and other social goods from further depletion. This is level zero in the game, which most governments struggle with. Advanced levels involve income guarantees, protection and revitalisation of open spaces and also reversing the imperatives of consumerism.

2. Envelopes: This idea of "envelopes" is developed in Transformative Pedagogies[53], in terms of financial envelopes existing for each department. The problem is taking money out of an existing envelope and giving it to other departments, or to create new envelopes as it were. Double degrees are an easy way to combat the envelope issue with each department staying with its own funding paradigm. One way to handle this is to create a new envelope for ID projects / courses and have it separately funded by Grant Organisations like the Social Sciences and Humanities Research Council and Natural Sciences and Engineering Research Council in Canada. These organisations represent envelopes themselves and it would be challenging to create cross-funding across these organisations.

3. Pedagogies of Anthropocene:

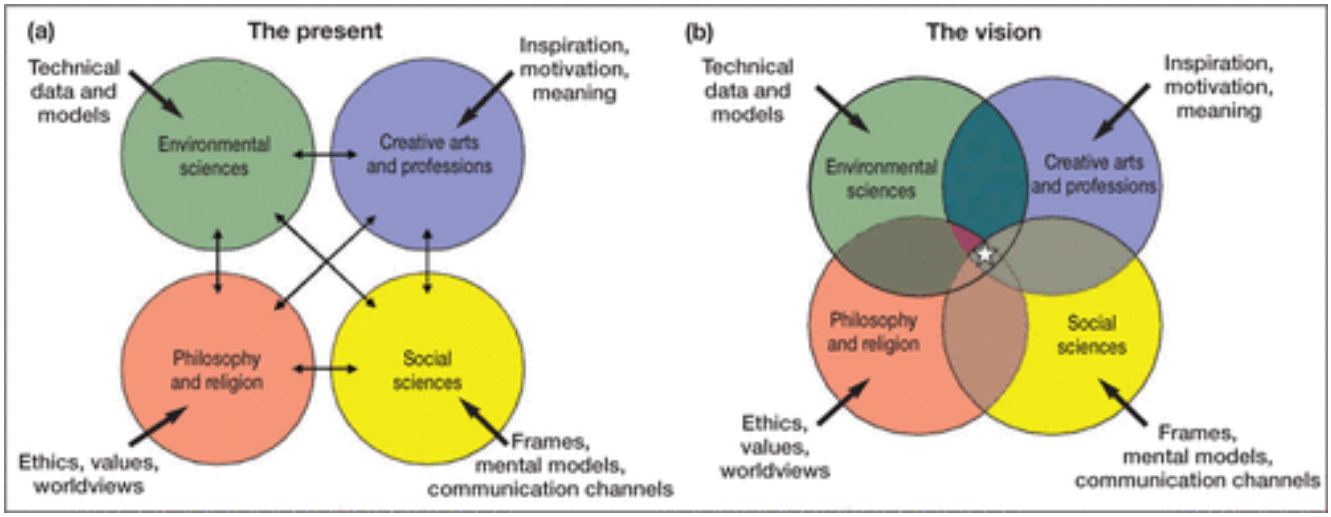
In order to analyse if any other models of pedagogies of the Anthropocene have been theorised, I looked at one theorist who has written about how it could be done.

Nisbet[54] has written extensively on how the four major disciplines can come together in higher education:

- The sciences provide data and models
- Philosophy help us recognise what is good and right
- Social sciences provide data and theories on human behaviour
- The creative arts and communication tell inspiring stories that shape human action and provide a space for critical evaluation[54] shown in figure 9.

53. p12, Sierra, M. & Wise, K. Ed. (2018) Transformative Pedagogies and the Environment: Creative Agency Through Contemporary Art and Design. Common Ground Research Networks. Champaign, IL, USA
54. Nisbet, M.C., Hixon, M., Moore, K.D., & Nelson, M. (2010). The Four Cultures: New Synergies for Engaging Society on Climate change. Frontiers in Ecology and the Environment, 8, 329-331. from https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/1540-9295-8.6.329

Figure 9: Nisbet's inter-disciplinary vision



Frontiers in Ecology and the Environment, Volume: 8, Issue: 6, Pages: 329-331, First published: 01 August 2010.

DOI: (10.1890/1540-9295-8.6.329)

This is a simplified model and seems to be very heavy on the social sciences side, however, it does provide a starting point for a discussion on how the traditional disciplines have to be transformed in order for the whole structure of society to be transformed to save the earth[53] Even with increased ecological literacy in all disciplines and school systems, the higher education challenge remains to bring the disciplines together and create a new pedagogy.

Building on from here, Hans Joachim Schellnhuber, in a conversation with Bruno Latour warns against trying to solve everything, describing the process of problem solving as "sharp objects cutting through social fabric"[55]. This is an important point to note, while we undertake on the journey of bringing diverse communities together.

Schon's understanding of how design-based projects can form a bond between various subject disciplines through project based learning[56], the following modular system (shown in figure 10) can emerge, so that rather than trying to solve the whole system, we are able to solve specific problems while working on larger problems as well.

55. Bruno Latour (Jun 18, 2018). Discussion with Bruno Latour, Hans Joachim Schellnhuber. Part of "Anthropocene Lecture: Bruno Latour" Moderated by Bernd M. Scherer. https://www.youtube.com/watch?v=Z-n_44M2nLw.
56. Waks, Leonard. (2001). Donald Schon's Philosophy of Design and Design Education. International Journal of Technology and Design Education. 11. 37-51. 10.1023/A:1011251801044.

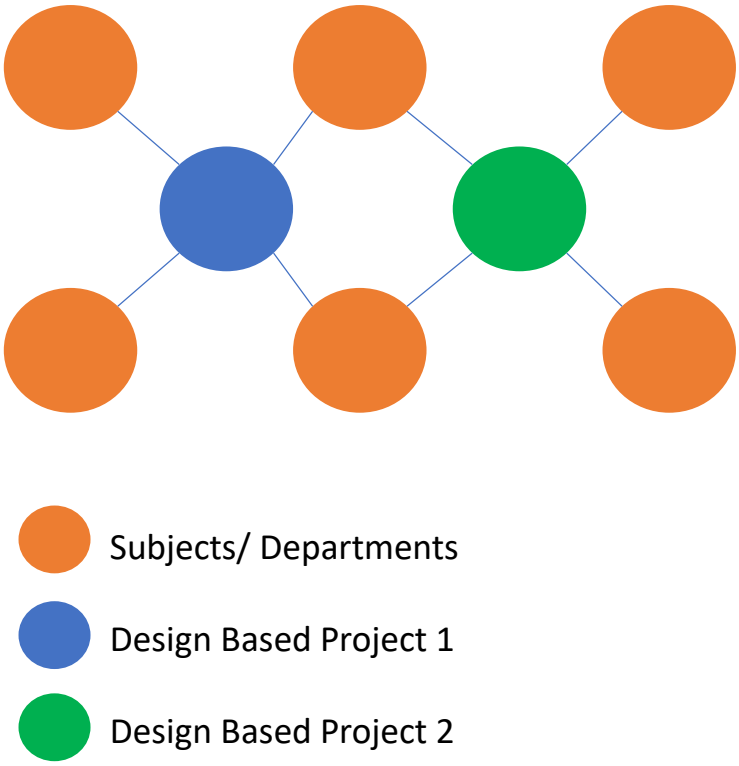


Figure 10: Modular approach to ID

After setting up the inter-disciplinary framework, and establishing the need for a pedagogy to solve the problems created by the Anthropocene. The model that I am proposing to start the research process is a model based on ideas extracted from earlier sections. These ideas include the creation of coalitions through dialogue and the execution of strategies through experiments and cases.

The Meta-Model:

The model (shown in figure 11)starts from the dialectic of creation and critique. The designer makes and receives critiques their work. The cycle continues through a dialogue revolving around the nature of the problem being solved itself. In the area of management called practice theory[57] create a relationship between "specific instances of situated action and the social world in which the action takes place". Orlikowski[57] has also written about knowledge or "knowing" being a social accomplishment. These relations in practice theory can be best explained by Escher's 1948 lithograph[58] in which 2 hands draw themselves. The parts produce the system. This is not to be confused with feedback, which implies a system of "distinct elements" that act through information flows, mutually constituted elements are constantly building the system itself[57]

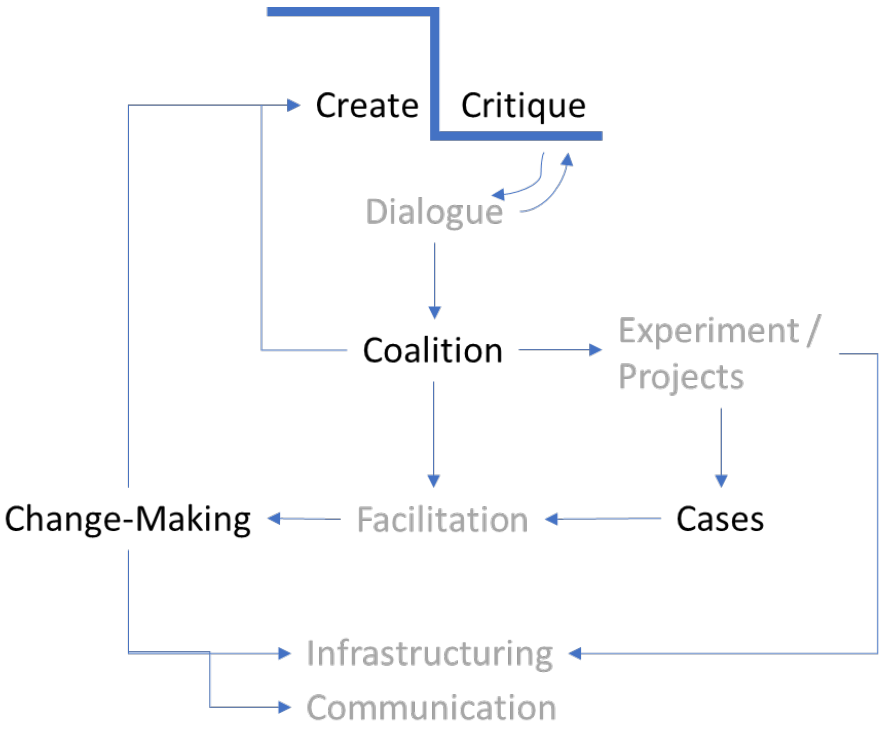


Figure 11: Meta Model

57. Feldman and Orlikowski: Theorizing Practice and Practicing Theory, Organization Science 22(5), pp. 1240–1253, © 2011 INFORMS
58. https://mcescher.com/gallery/lithograph/#iLightbox[gallery_image_1]/59

Seo & Creed[59] have spoken about human agency in institutional reform as a shift from "unreflective participation" to "imaginative critique" to "practical action". This is the basis for the dualism which is the create/critique paradigm. This is a social practice, however, there is a way to conduct this by a designer on their own also:.

" I went out for a walk and finally concluded to stay out till sundown, for going out, I found, was really going in" John Muir. This quote from the environmental philosopher John Muir, shows the importance of heuristic inquiry. Heuristic inquiry can be defined as a form of informal inquiry that uses informal and intelligent questioning to sense one's way forward[60]
In terms of design research, artists and designers can use heuristic inquiry to navigate between the "not yet formed and the formed"[61]

This critique can be conducted alone or through unstructured dialogue or through more structured methods like dialogic design.
Dialogue is best conducted with all stakeholders in the room. The stakeholders can include coalitions or consortiums of actors (institutions, companies, NGO's and research institutes)

These coalitions require a certain facilitation process to be in place, and can evolve into experiments or cases, that are worked on together with willing members of the coalition.
These projects may be short-term experiments, or they may be long-term projects where the coalition is attempting to bring systemic change. In some cases, the designer's role may change from facilitator to that of pitch-man or project champion[62].

The last component of this process is that of change-making . Change making can be through communication to the outer world, or through infrastructuring. To understand the connection between experiments, infrastucturing and change-making, one needs to understand the concept of place making. A place is a "space endowed with sense"[63]. Living in the same area does not make it a place. Manzini insists on a choice existing between people who choose to be there, and "intentionally" co-designing the community.

59. Seo, M.-G., W. E. D. Creed. 2002. Institutional contradictions, praxis, and institutional change. Acad. Management Rev. 27(2) 222–247. https://www.neh.gov/humanities/2011/marchapril/feature/john-muir-natures-witness.
60. Welby Ings, Private Properties: Heauristic Inquiry, Land and the Artistic Researcher, in Transformative Pedagogies and the Environment, Common Ground, 2018
61. Rosenberg, T. (2008). New beginnings and monstrous births: Notes toward an appreciation of ideational drawing. In S. Garner (Ed.), Writing on drawing: Essays on drawing practice and research (pp. 109-124). Bristol, England: Intellect Books

Anna Meroni & Co at the DESIS Lab in Milan call it a journey of "non-linear sequence of steps and actions that progressively engage a community and help it setup and prototype a social innovation"[64].

The concept of Infrastructuring[65] is based on Star and Ruhleder's understanding of infrastructures being "socio-material configurations embedded inside other structures and social arrangements".[66]
As such it can be seen how coalitions would lead to experiments and infrastructure development in human and material terms. This is only possible if "agency is distributed among different participants"[67] through coalitions.

These experiments and activist interventions need to be developed into case studies that can be replicated. Manzini borrows a term from Wolfgang Sachs "cosmopolitan localism" [68] and defines it as inter-connected nodes in a variety of networks, and in this way the local experiments can ad to planetary resilience.
For the purposes of this research, design is being taken in a broader context – not an activity that only "expert" designers can engage in, but an activity which "everyone" can engage in – either alone or together.

Different programs that may not naturally fit into the "design" discipline naturally can all "design" solutions through co-design and facilitation. Expert tools can be provided by the design programs in the coalitions, while others can be facilitated to experiment and create projects along with other partners.

This model can be used by a coalition or a department within a university itself. Starting with ideation conducted through dialogue with the required variety of audiences, taking the ideas to wider coalitions, and then taking them into experiments (cases) and then writing them up to create new theories through writing up the cases to create new knowledge. This model is the foundation of my research, and it informs the outcomes as well as the conclusions.

62. Manzini Ezio(2015), Design, When Everybody Designs MIT Press, Cambridge, Mass. London, England
63. p.189. Manzini Ezio (2015), Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England
64. p199, ibid.
65. Seravalli, Anna. (2018). Infrastructuring urban commons over time :learnings from two cases. Proceedings of the 15th Participatory Design Conference: Full Papers, vol. 1, p. null
66. 66. Susan Leigh Star and Ruhleder, K., (1996). Steps toward an ecology of infrastructure: Design and access for large information spaces. Information systems research, 7(1), pp.111-134.

Figure 12 boils down the meta model to five components:

- Creation
- Critique
- Coalitions
- Cases
- Change-making

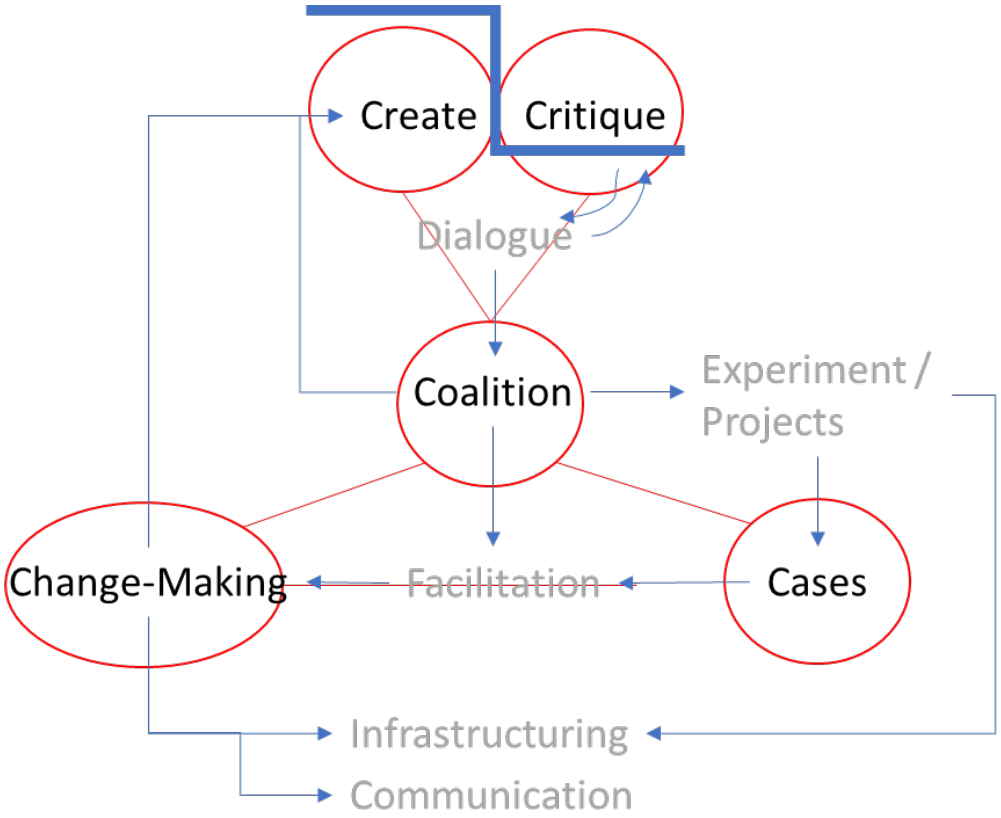


Figure 12: Abstraction from Meta Model

This model will be compared to other models, that can be applied to inter-disciplinary approaches to complex problem solving, that have been posited by various authors in the next section

67. Helena Karasti. (2014). Infrastructuring in participatory design. In Proceedings of the 13th Participatory Design Conference: Research Papers-Volume 1 , 141-150. ACM.
68. p.202. Manzini Ezio (2015), Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England

Comparison to Existing Models:

In this section, we will compare the meta-model - Creation, critique, coalitions, cases and change-making, with existing frameworks. Different models of design research and design pedagogy are compared with the meta-model to pull out common elements. In the next section, the meta-model and the other comparative models will be evolved into a research framework called the 5C model. This framework is an operationalization of the 5 characteristics and what questions would be used to analyse the data from the masters programs in the relevant fields.

Model 1: UrModel

Oppenheimer in her introduction to design pedagogy, critiques the new fascination with design thinking[69], in that the pedagogical principals that require time are not in line with the speed that goes with design thinking. She lists four important principles that seem to be lost in the discourse around design thinking[69]

1. Reflexivity
2. Inclusivity
3. Critical frameworks
4. Experimentation

While acknowledging that design thinking has moved from its emphasis on the "style, utility, material" to "ideological, social, economic" concerns as stated by Kietil Fallen, Oppenheimer prefers the rubric offered by Alain Findeli's Urmodell[69]:

Arts + Science + Technology

Oppenheimer presents her own Urmodell:

Work + Ethics + Criticality[70] shown in figure 13

69. p..4 Oppenheimer, Maya (2016). Histories of Design Pedagogy Virtual Special Issue for Journal of Design History, Journal of Design History.
70. p.8 ibid.

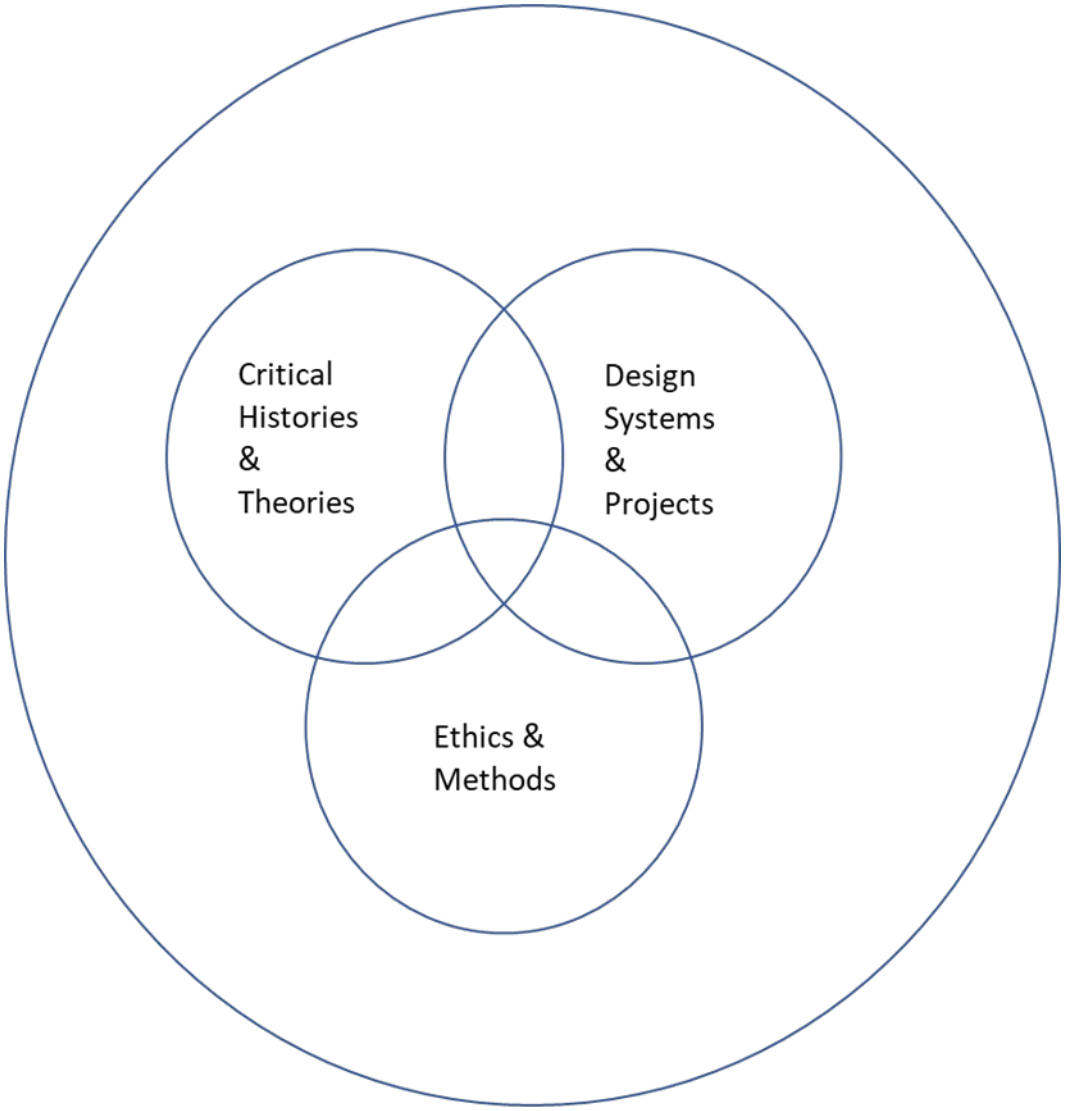


Figure 13: UrModel for Design Pedagogy

Core Concepts

- **C**reativity
- **C**oalition
- **C**ritique
- **C**ases
- **C**hange-making

Model 2: Social Innovation in Design – Manzini[71]

Manzini answers the question: "what does design do?" as "it collaborates actively and proactively in the social construction of meaning" [72]. This implies a problem solving approach[73] but in two domains:

1. Physical / biological (where humans live)
2. Social world (where humans make meaning)

Adjunct to the above roles of "new" design Manzini also differentiates between the role of the "expert design" and "diffuse design". [74]. Design experts are trained as design professionals, while diffuse design is carried out by "non-experts" .

Figure 14 shows the four design modes that are proposed by Manzini based on how rational/expert the process is versus emergent/diffused it is.

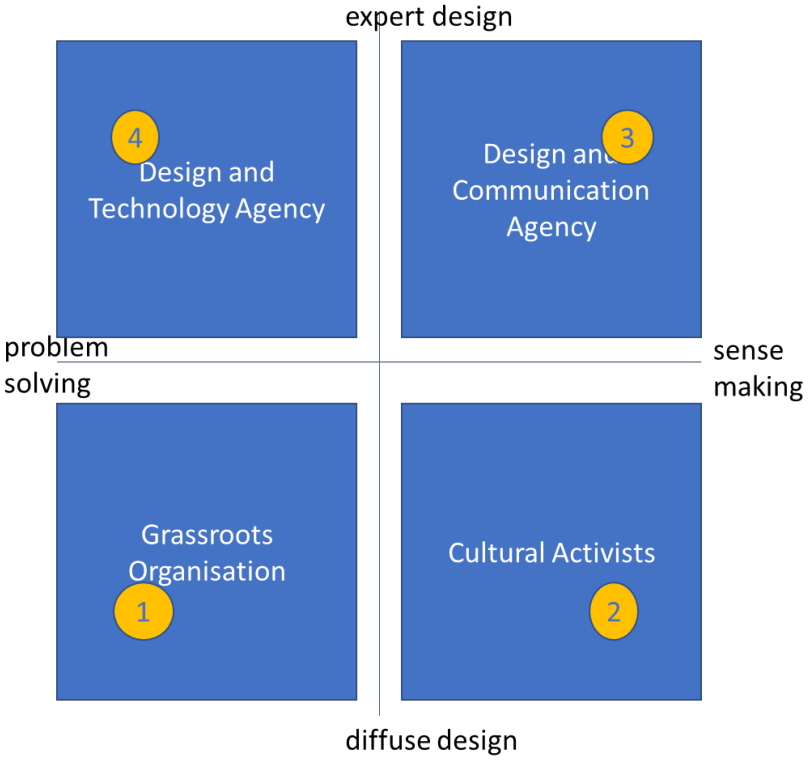


Figure 14: Design Mode Map

71. Manzini, Ezio (2015). Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England
72. p35 ibid
73. p33 Herbert, Simon quoted in ibid
74. p37, ibid

This is the basis of further development by Manzini (figure 15) and also the model proposed by David Ing and further developed by me (figure 16)

In the "normal" or old system the distinctions between the quadrants were possible and each was separate. However the emerging design culture is more like a coming together of all four quadrants. One conclusion that Manzini draws from this coming together of all four quadrants is that in a networked society, "all design processes tend to become co-design processes" [75]. Manzini sees co-design as a social conversation, started at "nodes of the networks" they are part of. Later, the designing phase is conducted by designers and non-designers in a network which is "never homogenous and undifferentiated" [76]. The strength of the network in these configurations can be "strong, dense and stable" in these configurations [76]

As can be seen in figure 15, in the "new" configurations, Manzini proposes that design coalitions become the norm, and this is a result of interplay between experts, and non-experts both.

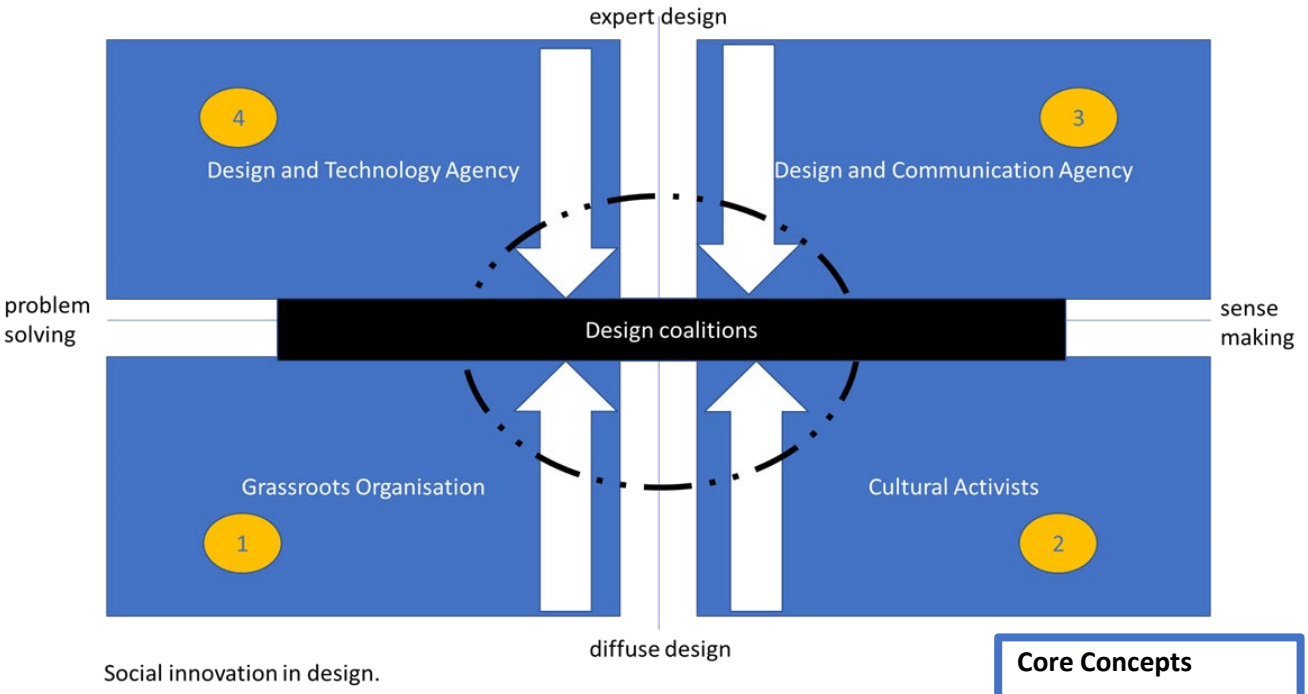


Figure 15: Manzini's Design Coalitions

Core Concepts

- Creativity
- Coalition
- Change-making

75. p48 Manzini, Ezio (2015). Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England
76. p49 ibid

Networks become coalitions when different initiatives taken by various design networks operating as collective entities[76]. Manzini differentiates between networks and coalitions in that designing networks are loose and uncoordinated while coalitions are "tighter networks" whose members collaborate to achieve shared results[77]

The multiplicity of actors creates problems and also unique solutions in terms of design process (open ended) versus design initiatives (specific focus and clear number of actors / companies).

In Manzini's model the role of design expert is not erased, rather the design experts play "a special fundamental role" [78] This role is role of creator of an environment (culture) favourable to such coalitions. **"Design is a culture and a practice" and role of a designer is to trigger and support these open-ended co-design processes using their design knowledge to conceive and enhance clear cut focussed design initiatives[79].**.

In this way, designers need to be at the vanguard of the transition from the old design initiatives to design processes

Model 3: David Ing[80]

David Ing presents a framework (the quadrants are in figure 16), which brings a critical lens to the quadrants that Manzini formulated, by introducing the opposing poles of teleological/teleonomical and descriptive/normative. The teleological is intentional, while the teleonomical is evolutionary. This is mapped onto the expert design/diffuse design from Manzini's framework (figure 15). On the other axis is descriptive/normative. Descriptive is about "what is" while normative is "what should be". This maps to the Manzini model axis of problem solving/sense making. On top of this quadrant framework from David Ing, I have added four areas (domains) that can map over the Manzini domains in figure 15. These four areas of activity are:

- Business/Profit based design: This is the standard commercial brief based design project
- Process improvement: This is a brief which is more open and allows for open exploration
- Sustainable design: This is a brief which allows for different outcomes for a common future for the planet
- Utopic design: This is perfect open brief, which can lead to desirable yet open outcomes

77. p 50, Manzini, Ezio (2015). Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England
78. p 53 ibid
79. p 54 ibid
80. Based on a lecture by David Ing, and further elaboration over email, June 2018

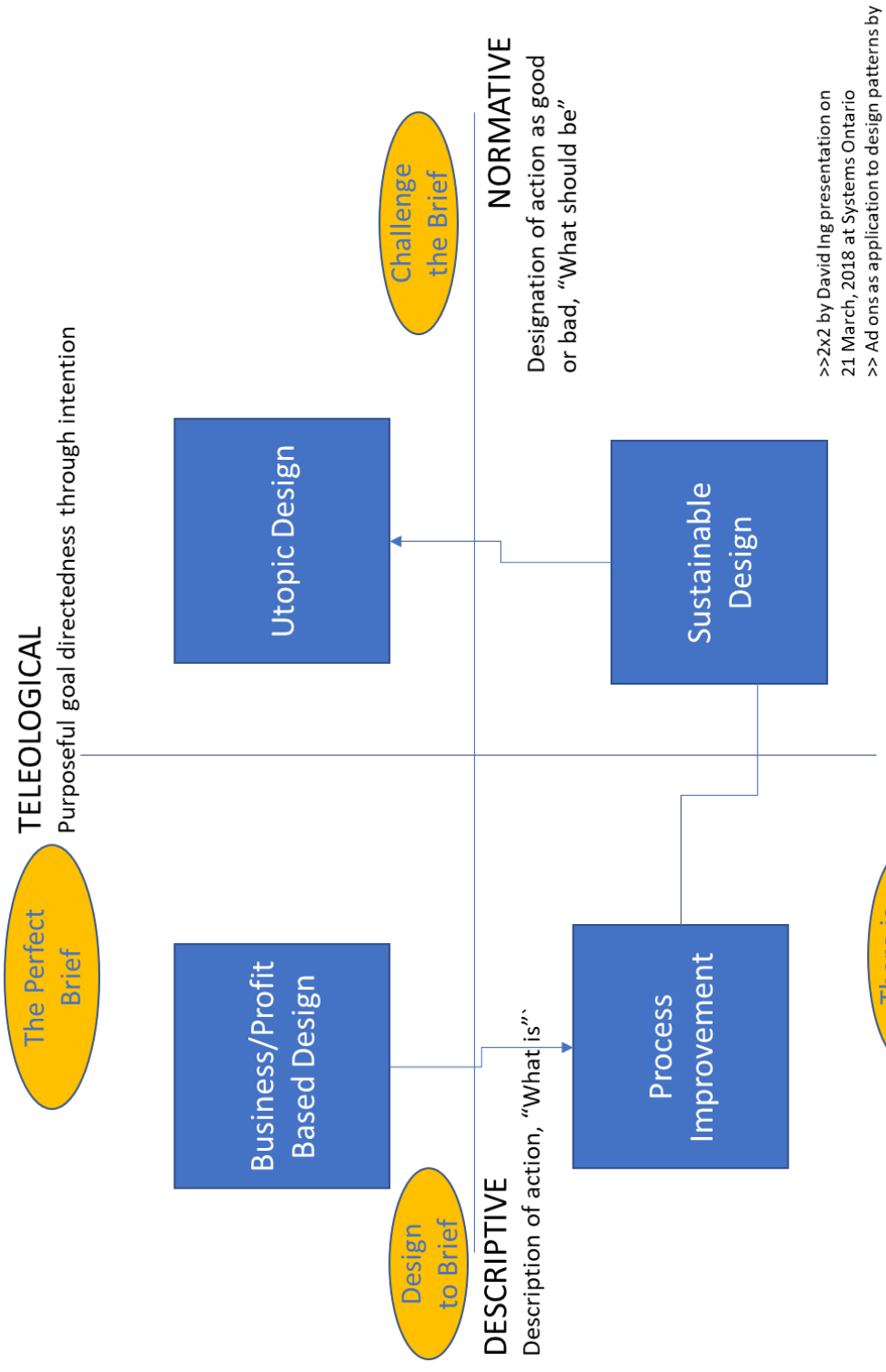


Figure 16: The path to Utopic Design

Core Concepts

- **C**reativity
- **C**ritique
- **C**hange-making

In my ad-on to augment the grid developed by David Ing, the four areas will lead from one to the other, leading potentially to utopic design.
One of the options is to use utopic design as an option to solve problems that cannot be solved by traditional approaches.

Here, rather than the original intention of the 2x2 which was to show that perhaps all 4 quadrants can co-exist simultaneously, I have hacked the diagram to show how the transition may occur. David responded to my posting by quoting The Systems Approach and Its Enemies, Churchman, 1979 who lists the following as enemies of systems:

- Politics
- Morality
- Religion
- Aesthetics

(quoted in blogpost by David Ing[81])
All four of the above "enemies" imply an intentionality which David says is not sustainable for a system.

My problem with this agnostic approach is that if we remove all intentionality, it seems impossible to reduce the harm caused by humans to the environment, because, in my view, stasis leads to laziness, and laziness, which can be a resting state of a system, needs no design. The role of the designer implies intentionality in my opinion.

81. http://coevolving.com/blogs/index.php/archive/the-systems-approach-and-its-enemies-c-west-churchman-1979/)

Model 4: Roles of a Designer – Manzini

Designing Coalitions as a process of design:

The process of coalition building also needs to be designed and all political figures need to be taken on board. This coalition building activity is a "strategic design activity in which visionary capacity must combine with dialogic ability"[82]

Designers need to take on one or many of the following roles [82]

1. Facilitator
2. Activist
3. Strategist
4. Cultural promoter

Facilitation is the first role which aims to bring people together to get social innovation going, and to help the process. In case the starting process is not successful, the designer would need to become an activist by triggering discussions. In case of systemic change projects (which would be the case if the change is to meaningful), the designers need to strategise, develop programs, create visions, build synergies, build culture and work with existing socio-technical systems. Lastly, as cultural promoters, designers can create a culture of positivity, of welcoming new ideas and values hence making co-design richer and meaningful.

Core Concepts

- **C**oalition
- **C**ritique
- **C**ases
- **C**hange-making

82. p 70, Manzini, Ezio (2015). Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England

Model 5: Peter Jones' Model[83]

This model developed by Peter Jones, is based on Warfield's Domain of Science Model[84] as shown in figure 17.

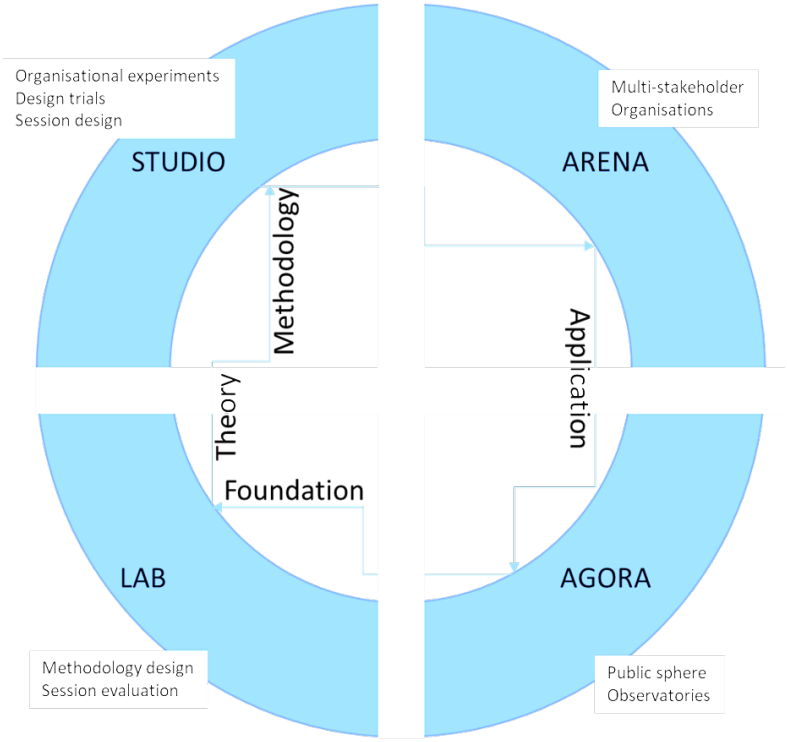


Figure 17: Stages of DoSM in Co-Creation Contexts

Core Concepts

- Creativity
- Coalition
- Cases
- Change-making

In the DoSM model, Warfield[84] postulates two contexts – the Corpus and the Arena. These contexts were expanded to 4 by Jones – Lab, Studio, Arena, Agora

The Lab in Jones' model is the venue where theory is proposed – the same as the foundation in the DoSM model. The studio is the place of making, where collaboration on nascent projects takes place. Experts come together in this phase (place). The arena is borrowed from Christakis and Warfield by Jones, as a "venue for engaging stakeholders"[85]. There is facilitation required in the arena and committed stakeholders are needed. The agora brings the arena to the public, drawing on the Athenian direct democratic methods. It involves publics direct conversations through "disciplined dialogue" (dialogic design)[86]

83. Jones, Peter (2018) Contexts of Co-Creation: Designing with System Stakeholders, Draft Paper
84. Warfield, J.N. (1986). The domain of science model: Evolution and design. Proc. 30th Meeting Society for General Systems Research. Salinas: Intersystems, H46-H59
85. p16, Jones, Peter (2018) Contexts of Co-Creation: Designing with System Stakeholders, Draft Paper
86. p17, ibid.

The applications of the Jones' model[87] are in the two areas of the Arena and the Agora. In the Arena there can be Co-creation Workshops and Co-creation conferences based on Strategic Dialogue. In the Agora are the options of Civic Inquiries which are open to public and Observatariums which can help in the "collective envisioning of the future"

All four of the above mentioned options can be used in the process of building coalitions before cases are written and finalized for change-making.

Model 6: Top Ten Skills in the Fourth Industrial Revolution - World Economic Forum[6]

The top five of the 2020 skills predicted by the World Economic Forum are Creative Problem Solving, Critical Thinking, Creativity, People Management and Coordinating with Others.

In terms of comparison with the meta-model, complex problem solving is a high level skill which has various components. The other components like critical thinking and creativity are sub-components of complex problem solving alongwith human skills like coordinating with others and people management. In the meta-model, creativity, critique and coalition building can be directly mapped onto the 2020 skills.

10 top skills in the Fourth Industrial Revolution, according to WEF

in 2020	in 2015
1. Complex Problem Solving	1. Complex Problem Solving
2. Critical Thinking	2. Coordinating with Others
3. Creativity	3. People Management
4. People Management	4. Critical Thinking
5. Coordinating with Others	5. Negotiation
6. Emotional Intelligence	6. Quality Control
7. Judgment and Decision Making	7. Service Orientation
8. Service Orientation	8. Judgment and Decision Making
9. Negotiation	9. Active Listening
10. Cognitive Flexibility	10. Creativity

Core Concepts

- Creativity
- Coalition
- Critique

Table 2: Ten Top Skills according to WEF

87. P 33, Jones, Peter (2018) Contexts of Co-Creation: Designing with System Stakeholders, Draft Paper

Analysis:

As can be seen in the chart below, each model provides a level of comfort that the meta model holds true. By taking a birds eye view of the amalgamation of these disparate models we can have a higher degree of certainty in the meta model holding as a valid research framework.

Model	Creativity	Critique	Coalition	Cases	Change-making
Meta-model	Yes	Yes	Yes	Yes	Yes
Urmodel	Yes	Yes	Yes	Yes	Yes
David Ing	Yes	Yes			Yes
Manzini – Social Design		Yes	Yes	Yes	Yes
Manzini-Roles of Designer	Yes		Yes		Yes
Peter Jones	Yes		Yes	Yes	Yes
WEF	Yes	Yes	Yes		

Table 3: Comparison of Models

5C Framework:

After comparing all the above models to the meta model, the following research framework was evolved, a sort of lens through which to evaluate graduate program. These 5 components will be called the **5C framework**:

The 5C framework has been developed with the lens of pedagogy in mind. The biggest question remains that is a new pedagogy needed to support these coalition building exercises. New design pedagogy principles as referred to in an earlier section, have been kept in mind while building the framework. Some of the questions that have been addressed are:

- Can the method be taught?
- Can the experiments be tied into a classroom / studio setting
- Can the tools be used in other settings apart from the design lab (where many of them originated) ie in business schools and science lab settings (details in table 4)

Creativity	Coalition	Critique	Cases	Change-Making
Methods of Creative Ideation and Development, Design of Material, Storytelling, Design Skills for Creative Expression	Links to other organisations, departments, universities, publics. > Use of dialogue / participatory design methods > Knowledge Clusters - Linkages	Critical analysis of solutions. > Research of Social Problems and Solutions form around the world > Application of various theoretical lenses to problems and solutions	Experiments / "Infrastructuring" > Experiments with partners in the public sphere / common good / commons / under-priveleged segments > Ongoing research projects / working with publics to work on wicked problems > Laying ground work for major change	Theory > Creating new knowledge > Participation in conferences > Papers by faculty and students > theories of social change development and analysis
Are creative tools taught in the classroom? Are projects graded on creative skills?	Are students involved in projects with partners? Are dialogue / participatory approaches taught?	Is critical theory and its application taught? > Is there a model or method that is used for this? > Is critical analysis needed to complete assignments?	Are students involved in projects / experiments? > Are wicked problems solved (attempts) in class or projects?	Are faculty creating new knowledge and bringing research into theory > Are students required to produce new knowledge

Table 4: Details of 5C Model

The methodology followed in the research is a mixed methods research paradigm, where qualitative research was converted to numerical analysis, followed by strategic game play, as shown in figure 18. As a first step, the criteria for evaluation has been settled, which is the 5C framework and its operationalization questions. After this is the stage of creating a list of all graduate programs that fit the criteria, in Canada.

After this is the application of the research framework to the list of programs, this is the stage of qualitative assessment. After the qualitative assessment has been completed, the written form is to be converted into numbers, so that rankings can be created. Next step is to play a coalition game in order to see how combinations could emerge. In this there are 4 steps: creation of cards, setting up the game, making the coalitions through hi-lo trade-offs and recording the results. After this, scoring would be done after the coalitions to see the effects of making coalitions, these are recorded in spreadsheets. Conclusions would be drawn at the end.

After the finalisation of the research instrument, the next question to answer was: Who to conduct the research on?

Step 1: Selection of Programs to Analyse and Qualitative Analysis:

A total of 63 masters programs in Canada selected from an internet keyword search including words such as "sustainability, environment, masters program…" , were analysed based on the areas of study, which were: Design, Business/Innovation, Public Policy, and Environment Science/Earth Science/Science. This list is exhaustive as per the internet search, no sampling method was used. 63 programs were found to meet the criteria. This is shown in table 5.

All the 63 programs were then analysed through their program websites. This analysis was boiled down to a descriptive phrase or sentence regarding its merits/demerits with regards to each of the 5C's. The reason why this particular method was used was that a standard format for data collection was needed, and the marketing material published on the website of each program is a good standardised method, which could account for variances in collecting and analyzing data across different programs and universities.

Figure 18: Research Model

Type of Program	
Design	10
Business/Innovation	13
Public Policy	20
Environment Management/Science/Earth Science	20

Note(1): some of the programs had overlaps like environment/business, environment/policy, design/business
Note (2): Some programs were included even though they did not fit the Masters degree requirement, because they fit the criteria of sustainability

Table 5: Program Survey Selection

Step 2: Scoring (conversion to numbers):

In Step 2, scoring of each descriptive sentence/phrase was done. The quantification scheme was a scoring from 1 to 10

1 was the lowest score given

9 was the highest score given

5/6 were considered as middle scores

Weightage depended on the nature of the written comments (ie. How close the qualitative data came to the critera mentioned in 5C framework)

Transformative design[88] in research is the process of converting one type of data into another, and a research method that employs such a method has been called a mixed model research system rather than mixed methods.

There are two ways that data can be collected in mixed model research.

1. Concurrent: Data is collected by qualitative and quantitative concurrently and then converted into usable data
2. Sequential: Data is collected by by one means and then converted to another

There are various ways to convert qualitative data into quantitative. One of which involves using Likert scales. The scale that was used in this research is shown in figure 19

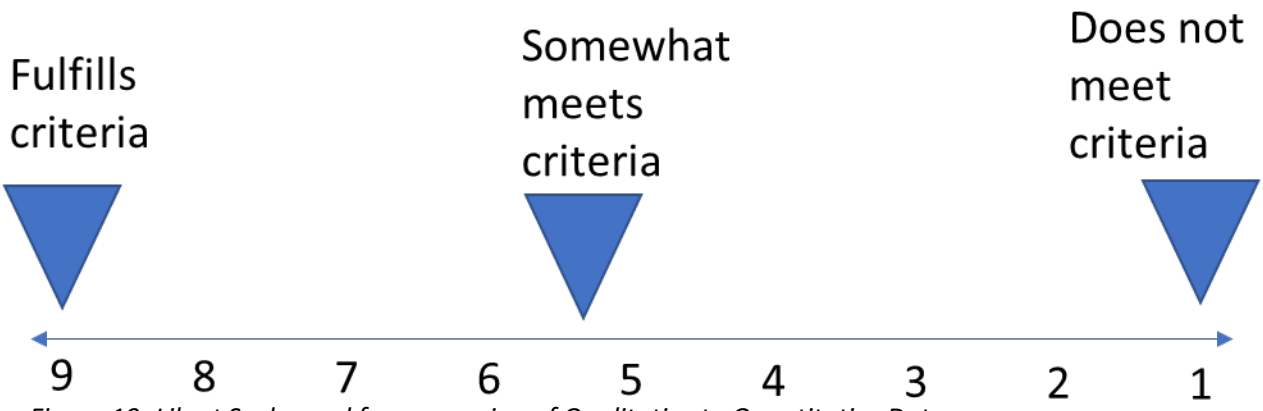


Figure 19: Likert Scale used for conversion of Qualitative to Quantitative Data

Each qualitative comment was scaled against measurement criteria and a score was created. Since the objective was to create a sum total of the scoring, and not to delve into each component, other problems with quantisation were reduced, such as coding errors. Also, since the survey data was not a sample, errors of sampling were eliminated also.

88. Driscoll, David L.; Appiah-Yeboah, Afua; Salib, Philip; and Rupert, Douglas J., "Merging Qualitative and Quantitative Data in Mixed Methods Research: How To and Why Not" (2007). Ecological and Environmental Anthropology (University of Georgia) http://digitalcommons.unl.edu/icwdmeea/18

Converting the Qualitative to a Quantified Number:

Table 5 shows how Step 1 and Step 2 were carried out, first with the qualitative written assessment followed by the quantification. While reading through the accessed website of the program, the basic questions were kept in mind for each criteria. The website material was then re-read for the next criteria and so on. After the qualitative assessment was made for all the programs, a scoring was done for each written statement. A strong yes, would result in a 9 and so on. The lowest possible score was a 0, which meant that no information was found to suggest that the criterion was being met at all. This was carried out for each of the 63 entries

Step 3: Sorting of the data and analysis

In this stage, the scoring was put together in a decreasing order and the top 25 were retained for further analysis. This is shown in table 7.

Step 4: Game Play

Before going into the detailed steps that were taken, it is important to lay the theoretical foundations of the game play mechanism used.

Strategic Play as Design Process.

Most play processes are designed to spark conversations and move co-design processes along, however, the play method that was developed for this study, was made for self-play or detailed analysis by one player.

Game Play in Solo Strategy Creation:

Caillois[89] presents two differing concepts of game play activity

1. Paidia (play) – in this format players have more freedom of action and hence many possible outcomes. This is often seen in young animals "playing"
2. Ludus (gaming) – in this format there is a rules based game process, with rules about actions and reactions of players. The end state is always predictable in ludus based games.

McGonigol [90] mentions that in the decision contexts Ludus is more important than Paidia. Most gamification is based on Ludus. Werbach and Hunter define gamification as the use of game design methods as a means to "leverage games for business benefit" [91].

Business applications have focussed on what Thygesen[92] calls the steering technologies of communication, in which games are used to enhance creativity, and provide reflection processes in business contexts[93]

89. Caillois, R. (2001) Man, Play, and Games. University of Illinois Press, Champaign, IL.
90. McGonigal, J. (2011) Reality Is Broken: Why Games Make Us Better and How They Can Change the World. Penguin, New York
91. Werbach, Kevin, & Hunter (2012). For the Win: How Game Thinking Can Revolutionize Your Business. Philadelphia: Wharton Digital Press, quoted in Steffen Roth, Dirk Schneckenberg and Chia-Wen Tsai, (2015) The Ludic Drive as Innovation Driver: Introduction to the Gamification of Innovation, Volume 24 Number 2 2015, John Wiley & Sons Ltd

	Creativity	Coalition	Critique	Cases	Change-Making
	Methods of Creative Ideation and Development, Design of Material, Storytelling, Design Skills for Creative Expression	Links to other organisations, departments, universities, publics. > Use of dialogue / participatory design methods > Knowledge Clusters - Linkages	Critical analysis of solutions. > Research of Social Problems and Solutions form around the world > Application of various theoretical lenses to problems and solutions	Experiments / "Infrastructuring" > Experiments with partners in the public sphere / common good / commons / under-priveleged segments > Ongoing research projects / working with publics to work on wicked problems > Laying ground work for major change	Theory > Creating new knowledge > Participation in conferences > Papers by faculty and students > theories of social change development and analysis
	Are creative tools taught in the classroom? Are projects graded on creative skills?	Are students involved in projects with partners? Are dialogue / participatory approaches taught?	Is critical theory and its application taught? > Is there a model or method that is used for this? > Is critical analysis needed to complete assignments?	Are students involved in projects / experiments? > Are wicked problems solved (attempts) in class or projects?	Are faculty creating new knowledge and bringing research into theory > Are students required to produce new knowledge
Institute Without Boundaries, George Brown College, PG Interdisciplinary Design Strategy	Yes. Courses in skills are offered in the 2 semesters.	Yes. Project work is all group based and project partners lead the projects	No. There does not seem to be a process to incorporate critical thinking and analysis in the process of making. There does not seem to be a model to incorporate critical skills	Yes. Every 3 to 5 years IWB takes on a research project and this project is the foundation of the coursework. "Massive Change, the World House Project, and the City Systems Project. Our most recent research project is about Regional Ecologies"	No. Faculty is practice based, and even though they would be bringing their knowledge and skills back from work to the class, there is no evidence of any ground breaking or different research having been conducted and written up by the faculty.
Scoring	**8**	**9**	**1**	**9**	**2**

Table 6: Sample of Text to Scoring

Environmental Sustainability Research Center	Environment	Brock University	Sustainability: Science and Society [Master of Sustainability]	41
School of Public Policy and Governance	Policy	University of Toronto	MPP	40
Institute for Social Innovation and Resilience	Policy	Waterloo University	Graduate Diploma Program (2011-2014)	40
School of Environment and Sustainability	Environment	University of Saskatchewan	Masters of Sustainable Environmental Management	37
Department of Political Science	Policy	Western University (UWO)	MPA	33
Department of Design and Computation Arts, Faculty of Fine Art	Design	Concordia University	M Design	32
Graduate School of International and Public Affairs	Policy	University of Ottawa	MA in Public and International Affairs	32
	Design/Busines	OCAD University	M Des SFI	31
Department of Political Science	Policy	University of Waterloo	MPS	31
Environmental Policy Institute	Environment/Po	Memorial University of Newfoundland	MA Environmental Policy	31
Smith School of Business	Business	Queens University	M Management Innovation and Entrepreneurship	30
School of Environment and Sustainability	Environment/pol	Royal Roads	MA Environmental Education and Communication	30
School of Public Administration	Policy	Dalhousie University	MPA	30
Institute of the Environment	Environment	University of Ottawa	Msc Environmental Sustainability	30
School of Environment and Sustainability	Environment/bus	Royal Roads	Master of Environment and Management (MA and MSc)	29
	Design	OCAD University	M Des Inclusive Design	29
Ottawa-Carleton Geoscience Centre	Environment	University of Ottawa/Carleton Univers	MSc. Earth Sciences - Environmental Sustainability	29
School of Public Administration	Policy	University of Victoria	MPA	29
Institute Without Boundaries	Design	George Brown College	PG Interdisciplinary Design Strategy	29
Department of Political Science and Public Administration	Policy	Ryerson University	MA Public Policy and Administration	29
Johnson Shoyama Graduate School of Public Policy	Policy	University of Regina & University of S	MPA	29
School of Public Policy and Administration and the Faculty	Policy/environm	Carleton University	MA Sustainable Energy Policy or MASc or MEng Sustainable Energy.	29
School of Art, Media, Performance and Design	Design	York University	M Design	28
	Design	Emilly Carr University	M Design	28
Bissett School of Business	Business	Mount Royal	BBA concentration in Social Innovation	28

Table 7: Top 25 Programs Based on Scoring

Open ended Game Play was the chosen route for coalition formation, based on scoring that was converted into Cards as seen in figure 20. Since the end state was not clear, in that any combination was explorable, Paidos was a much better framework to work while some elements of Ludic play were incorporated also, as there were rules that had to be followed. Like, A high score was to be connected to a low score. Variety was aimed at, in order to make the coalitions multi/inter-disciplinary. Having done the basic formulations, it was observed that it was possible to create interesting configurations that went beyond the basic models of variety. These have also been studied. There are benefits and disadvantages of using game play as a coalition formation strategy. The benefits are open ended problem solving which allows for interesting outcomes. Disadvantages are that the outcomes may not fit the initial hypothesis and hence the initial hypothesis may need to be revisited after the game play is complete. Lastly, practicality may be a concern, as some of the outcomes may not be workable in the real world.

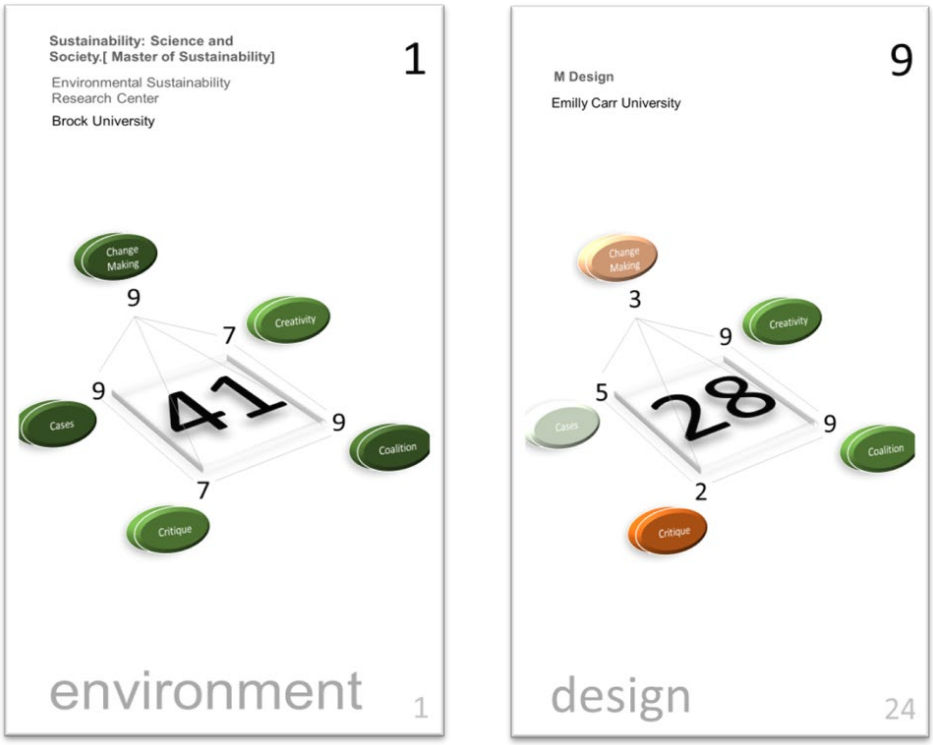


Figure 20: Examples of Cards

As can be seen in the photograph in figure 21, colour coding of each node helped in matching the strength of one program with the weakness of another program. This visual connection added to the game play.

92. Thygesen, N. (2007) Steering Technologies as Observation. Cybernetics & Human Knowing, 14, 151–72.
93. Andersen, N.Å. (2001) Power at Play: The Relationships between Play, Work and Governance. Palgrave Macmillan, Basingstoke.

Figure 21: Game Play representation

Concordia – Queens – Carleton (figure 22)

Diversity has been maintained through the design-business-policy/environment model. Each low score has been matched with a high score (shown by the grey lines) . There are a number of possible areas of collaboration and learning trade-off, and hence this would be potentially, a strong bond.

Starting with the Concordia MDes Program, it was identified as having a low score in Coalition building / Inter-disciplinarity. .There are many departments in Corcordia but no collaboration was visible between departments. On the other hand, Queens M Innov/Entrep was identified as having a high score on coalition building because the students are expected to be working on a startup during the time they are enrolled. This same program is weak in critique, cases and change-making. As far as change-making is concerned, even though there seem to be a number of faculty available, new knowledge does not seem to be disseminated in the areas of innovation or entrepreneurship. This is probably because this is a hands on (practical) program and change making in terms of new theory is not in its focus. The Carleton MA Sustainable Energy Policy/MSc Sustainable Energy joint program is already inter-disciplinary because two departments are collaborating, and this is its strength, however it scores low on the Creativity vector, where Queens scores high, and so there is a natural collaboration possible. Conversely, Carleton has a high score in change-making because the institute of environment faculty is well published, and this can be a good trade off with Queens.

There are 3 programs, as shown in table 8. in this coalition, they have variety and they have a number of possible links. Implications of this will be discussed in the final section.

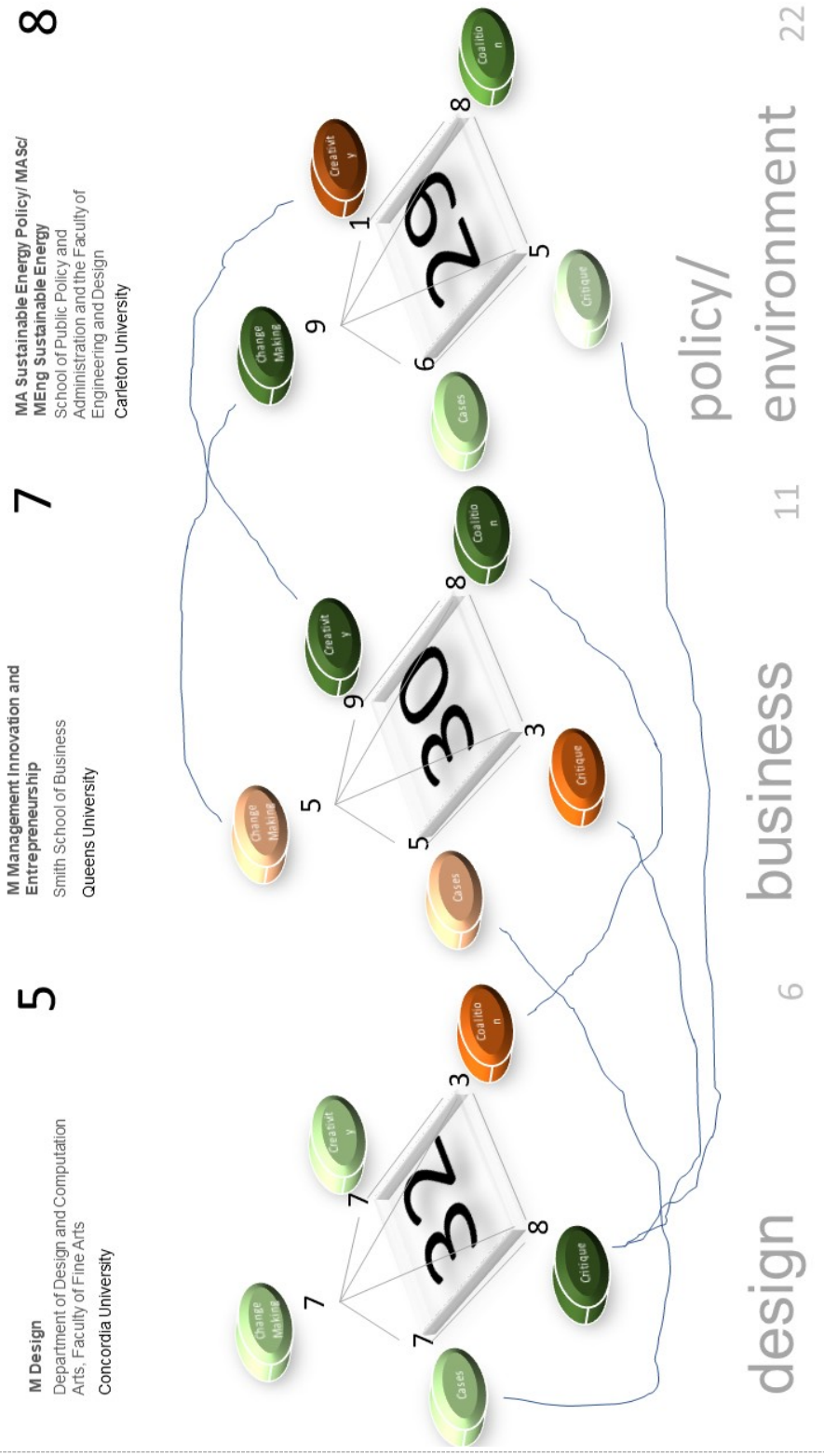


Figure 22: Coalition of Concordia-Queens-Carleton

University	Program	Category
Concordia	M Design	Design
Queens	M Innovation/ Entrepreneurship	Business
Carleton	MA Sustainable Energy Policy MSc/MEng Sustainable Energy	Policy/Environment

No of Programs	Variety	Potential Links
3	Yes	6

Table 8: Analysis of Concordia-Queens-Carleton

OCAD – Royal Roads (figure 23)

Diversity has been maintained through the design-business-policy/environment model, but in an interesting way because these two programs cover all four between them. While the number of potential trade-offs is low (as shown by the grey lines), the fact that there are only 2 potential partners makes this unit interesting..

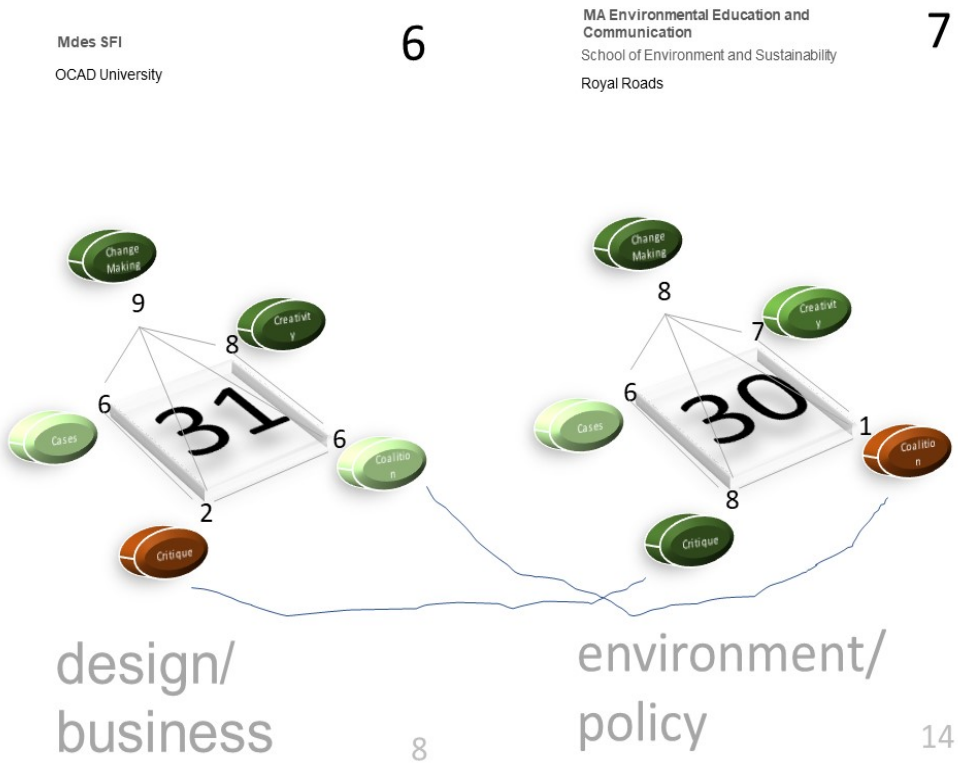


Figure 23: OCAD-RoyalRoads

The OCAD MDES SFI program seems quite strong except for the critique vector which scores very low. On the other hand the Royal Roads MS Ed/Comms program has a course on Ethics and Environment which can lay a foundation for asking critical questions related to environmental issues. This makes for an easy tradeoff between the programs. Similarly, Royal Roads program scores very low for coalition building while OCAD literature reveals a “hidden course” which offers methods that allow for dialogue to emerge. However, even the OCAD course is a high scorer in this vector, pointing to smaller gains in this collaboration.

One advantage that this configuration does have is that it involves working with one other program only and hence it should have lesser practical limitations. Secondly, since these programs are inter-disciplinary already, collaboration should be ingrained in their way of thinking.

There are 2 programs in this coalition, as shown in table 9. they have variety and they have a limited number of possible links. Implications of this will be discussed in the final section.

University	Program	Category
OCAD	M Design SFI	Design / Business
Royal Roads	MA Environment Education and Communications	Policy/Environment

No of Programs	Variety	Potential Links
2	Yes	2

Table 9: Analysis of OCAD-RoyalRoads

Saskatchewan - Mount Royal –York –Waterloo (figure 24)

Diversity has been maintained through the design-business-policy/environment model, with full component of 4. Potential collaboration on hi-low points is quite even also (which are shown in grey lines), with each member sharing on atleast 2 criteria.

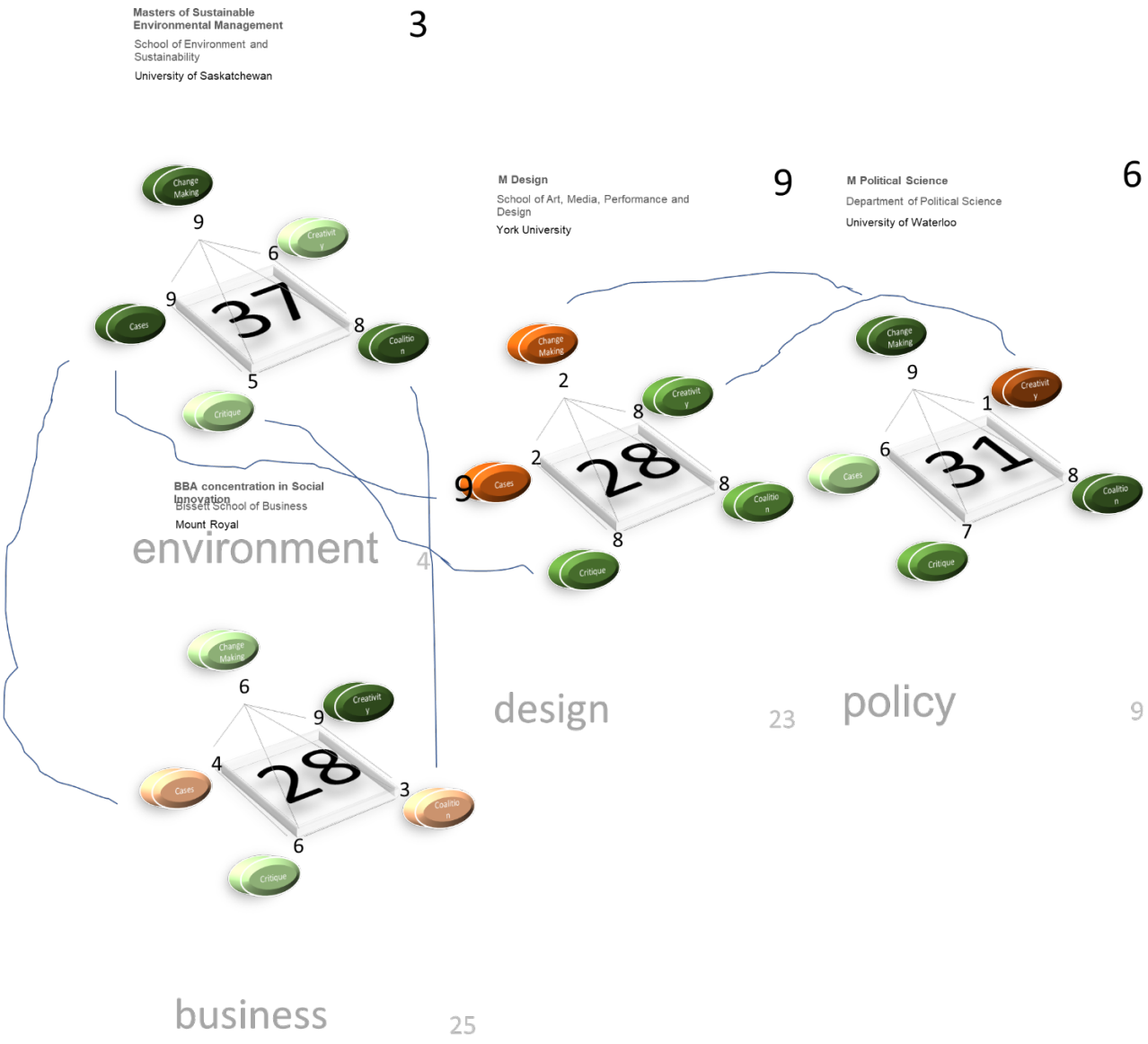


Figure 24: Saskatchewan - Mount Royal –York –Waterloo

Like many M Des Programs, the York program has distinct strengths and weaknesses. The strengths include a strong creative base, strong collaborative bones in the program, and elements of critical design in the courses. The weaknesses include there not being any attempt to tackle “wicked problems” and no visible change-making from faculty. This type of program has an easy trade-off with other collaborators. The first trade-off that can be made is with the MPS program at Waterloo. The parent department, department of Political Science, has the highest rate of journal publication among English Political Science Departments in Canada. In this way change-making can be strong bond between Waterloo and York. The York University Mdes program’s weakness in the case vector, can be easily offset by collaborating with M Sustainable Environmental Management offered in University of Saskatchewan. This program has a field school at the Redberry School Bioreserve and students start their graduate studies by working there. This is a great example of field learning and practical experiments. In this configuration there is a fairly weak business program, which even though it is not a graduate level program (BBA) offers a specialization in social innovation. Even though this program does not score too high on any vector, it has been included to provide variety (business) and also because it offers this unique specialization which is not available anywhere else.

There are 4 programs, as shown in table 10, in this coalition, they have variety and they have a number of possible links. Implications of this will be discussed in the final section.

University	Program	Category
Saskatchewan	M Sustainable Environmental Management	Environment
Mount Royal	BBA Social Innovation	Business
York	M Design	Design
Waterloo	M Political Science	Policy

No of Programs	Variety	Potential Links
4	Yes	6

Table 10: Analysis of Saskatchewan - Mount Royal –York –Waterloo

Dalhousie- Ottawa/Carlton- Western- OCAD (figure 25)

Diversity has been maintained through the design-business-policy/environment model, with full component of 4 (shown in grey lines). This configuration is interesting because it works like a daisy chain, with one university trading off with the next one, and so on. This might make for sequential implementation rather than in one go.

The Dalhousie MPA program has been classified in the business category because it is quite similar to MBA programs that offer general management degrees. The School of Public Admin has a very strong visible research agenda and hence change-making is definitely a strong suit for them. However, it is the critical thinking espoused in the program through their mandatory ethics course that provides a possible bond with the Ottawa-Carlton Geoscience Center's MSc Earth Sciences program, which offers its own course in Environmental Law. The double impact of an ethics overlay on top of a law course makes for a possible strong pedagogical bond. The Dalhousie program has a weakness in its creativity vector, which can be overcome by collaborating with the Ottawa-Carlton course called "Applied Environmental Sustainability", which focusses on creative solutioning in the environmental space. One area where the OCAD Inclusive Design program struggles is the case vector. This low score can be offset by teaming up with the Western MPA program housed in the department of political science. The department has an ongoing collaboration with the City of Sarnia, offering opportunities for long term and short term experiments and field work to build cases. The OCAD Inclusive Design framework can be used in local government case study building and the City of Sarnia link that Western has is a good point of collaboration.
On the flip side, OCAD Inclusive Design has a strong foundation in inclusive design ideals, and these critical/ethical parameters can form a close bond with the Western MPA program which seems to lack a critical parameter.

Because of the almost linear nature of the collaboration between these 4 departments, as shown in table 11. this configuration allows for sequential implementation – something that makes execution easier rather than onboarding all the departments simultaneously. This will be discussed in detail in the later section.

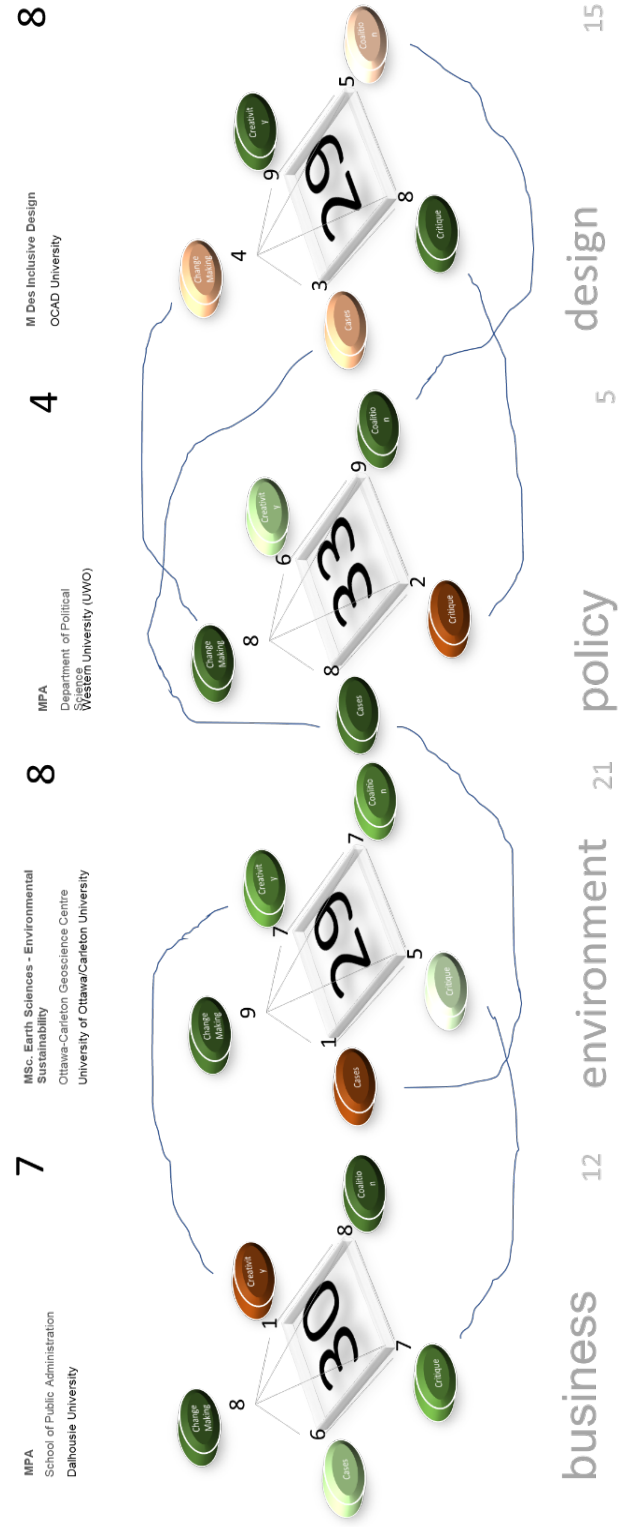


Figure 25: Dalhousie- Ottawa/Carlton- Western- OCAD

University	Program	Category
Dalhousie	MPA	Business
Carlton-Ottawa	MSc Earth Sciences – Environmental Sustainability	Environment
Western	MPA	Policy
OCAD	M Des Inclusive Design	Design

No of Programs	Variety	Potential Links
4	Yes	7

Table 11: Analysis of Dalhousie- Ottawa/Carlton- Western- OCAD

OCAD- Concordia- York- Emily Carr- George Brown- OCAD (figure 26)

This is a design school consortium / coalition. And this what makes it interesting. Also, OCAD is represented here by 2 departments, SFI and Inclusive Design, which makes this even more interesting, because these departments can start the coalition and others can be invited to join. The connections are shown in grey lines

This configuration tries to answer the question - what if all the top design schools in Canada made a consortium to take on “wicked problems”?

Since OCAD is represented by 2 programs, SFI and Inclusive design, in the top 25, it is pertinent to start by looking at the collaboration potential between these two departments. The change-making vector is usually a weakness for many design schools, but OCAD SFI has a strength in this area, because many faculty are thought leaders in their fields. Change-making is not a strength for Inclusive Design except in certain areas like built environments. This is where the collaboration can start by bringing sustainability into inclusive design from the change making perspective. On the other hand, the critical thinking that inclusive design requires and which the OCAD SFI program covers through the inclusive design framework, can be a collaboration point with the Institute Without Boundaries at George Brown College, because the program being run there does not have a strong critique component on paper. The Interdisciplinary Design Strategy program at the IWB has ongoing design projects which are updated every 3 to 5 years and courses are based on these long term cases. Their most recent project is about Regional ecologies, and this strength vector can form the basis of collaboration with Emily Carr’s M Des program. There are a number of long term faculty projects that are undertaken at Emily Carr, based on Communication Design, but it is unclear how students are involved in these. Tying these two approaches to long term “experiments” can yield very interesting results.

The critique vector allows for collaboration between Emily Carr and York University which has a number of electives in critical design. Apart from this the role of the designer is explored in many of the studio courses at York. Emily Carr does not seem to have any pedagogical focus on reflexivity and critical thinking, and so a strong bond can emerge. On the coalition vector there is possible collaboration between York and Concordia's M Des programs. The York program has elements of collaboration in it but the Concordia program does not seem to have any inter-disciplinarity built in. As a last tie-in possibility, Concordia has a lens of critique where different design aspects are discussed together, and there seems to be critique built into the course structure. On the other hand, OCAD SFI does not have a critical thinking / critique component, and so this can be an area of collaboration.

There are 6 programs in the configuration, as shown in table 12, with 6 possible links. There are clear areas of collaboration. However, the practicalities will be discussed in the next section.

design
design
design
design
design/
business
design
design
design
design

University	Program	Category
OCAD	M DeS Strategic Foresight Innovation	Design/ Business
George Brown	Certificate in Interdisciplinary Design Strategy	Design
Emily Carr	M Des	Design
York	M Des	Design
Concordia	M Des	Design
OCAD	M Des Inclusive Design	Design
No of Programs	**Variety**	**Potential Links**
6	No	6

Table 12: Analysis of OCAD- Concordia- York- Emily Carr- George Brown- OCAD (2)

Waterloo- Toronto- Ottawa- Western (figure 27):

This is a public policy consortium / coalition. It works on paper, the configuration is shown in grey lines.

This is a configuration of graduate policy programs in Canada. The University of Toronto's MPP Program offered in the School of Public Policy and Governance is the second highest rated program of all the programs that were rated. It scores high because of courses like Putting Strategy into Action, its partnership with Evergreen for experiments and coalition building, and moral and ethical foundations of Public Policy discussions. This program can offer other programs with low scores on various vectors, collaboration possibilities. As an example, Western University's Department of Political Science MPA program has a low score in the critique vector, which can be overcome by bringing the University of Toronto MPP program's moral and ethical foundation in play. On the other hand, University of Ottawa's MA in Public and International Affairs program has a low score in the creativity vector, which can be easily compensated for by the high score that the U of T program has because of its emphasis on putting strategy into practice.

There are 4 departments, as shown in table 13, in this configuration with 3 possible links between them, It is linear model meaning it can be implemented in sequence rather than simultaneously. Practical aspects will be covered in the later section.

The program that (was) best developed and best suited to address sustainability issues ran between 2011 and 2014 at the Institute for Social Innovation and Resilience at Waterloo University[94]. The program did not survive the demise of its founder, Brenda Zimmerman, who passed in 2014. Funding for the program also dried up in 2014. Taking a resiliency and systems approach, the program scored high on all vectors. It is worth noting that the program was unable to pass the torch to other programs in Waterloo or other parts of Canada. Because it is defunct, it was left out the configuration. The scoring card is shown in figure 28

94. https://uwaterloo.ca/waterloo-institute-for-social-innovation-and-resilience/

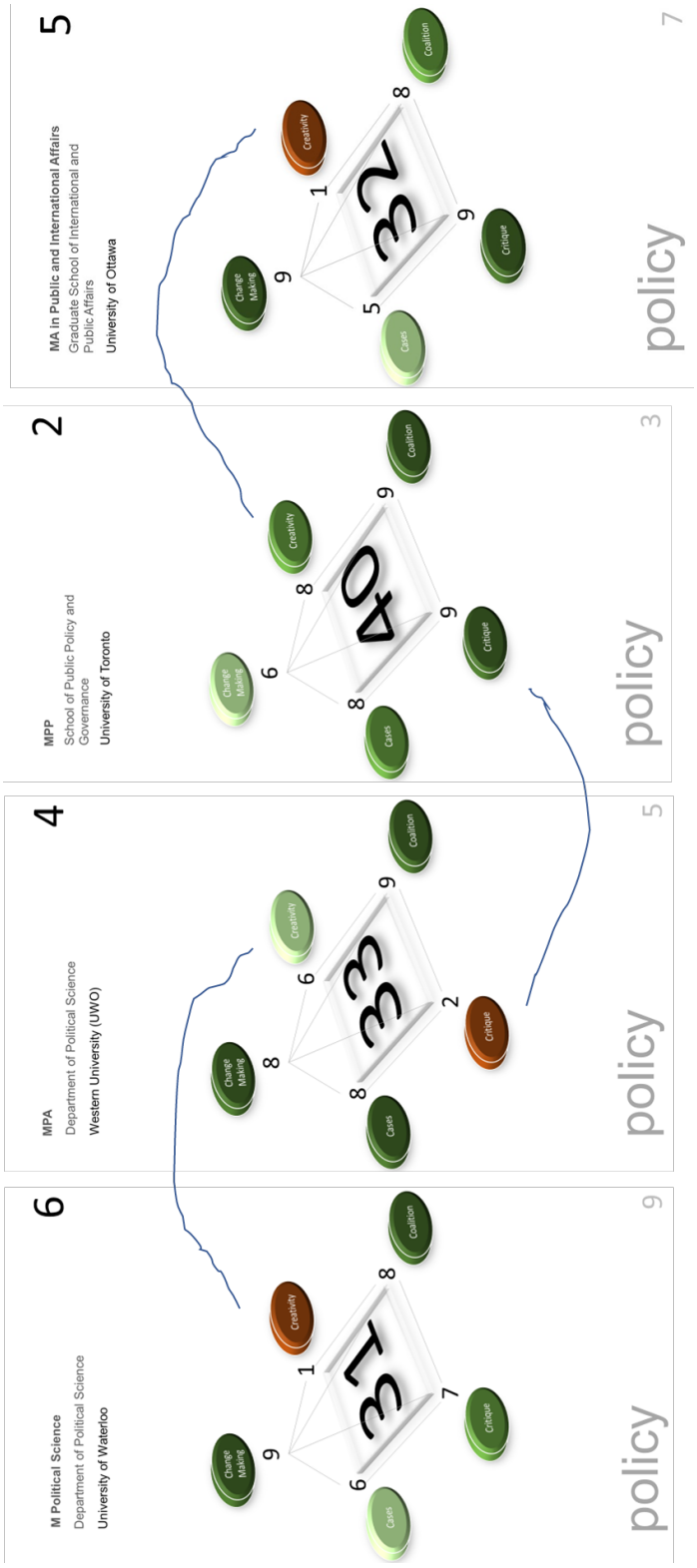


Figure 27: Waterloo- Toronto- Ottawa- Western

University	Program	Category
Western	MPA	Policy
Ottawa	MA Public & International Affairs	Policy
Waterloo	M Political Science	Policy
Toronto	M Public Policy	Policy

No of Programs	Variety	Potential Links
4	No	3

Table 13: Analysis of Waterloo- Toronto- Ottawa- Western

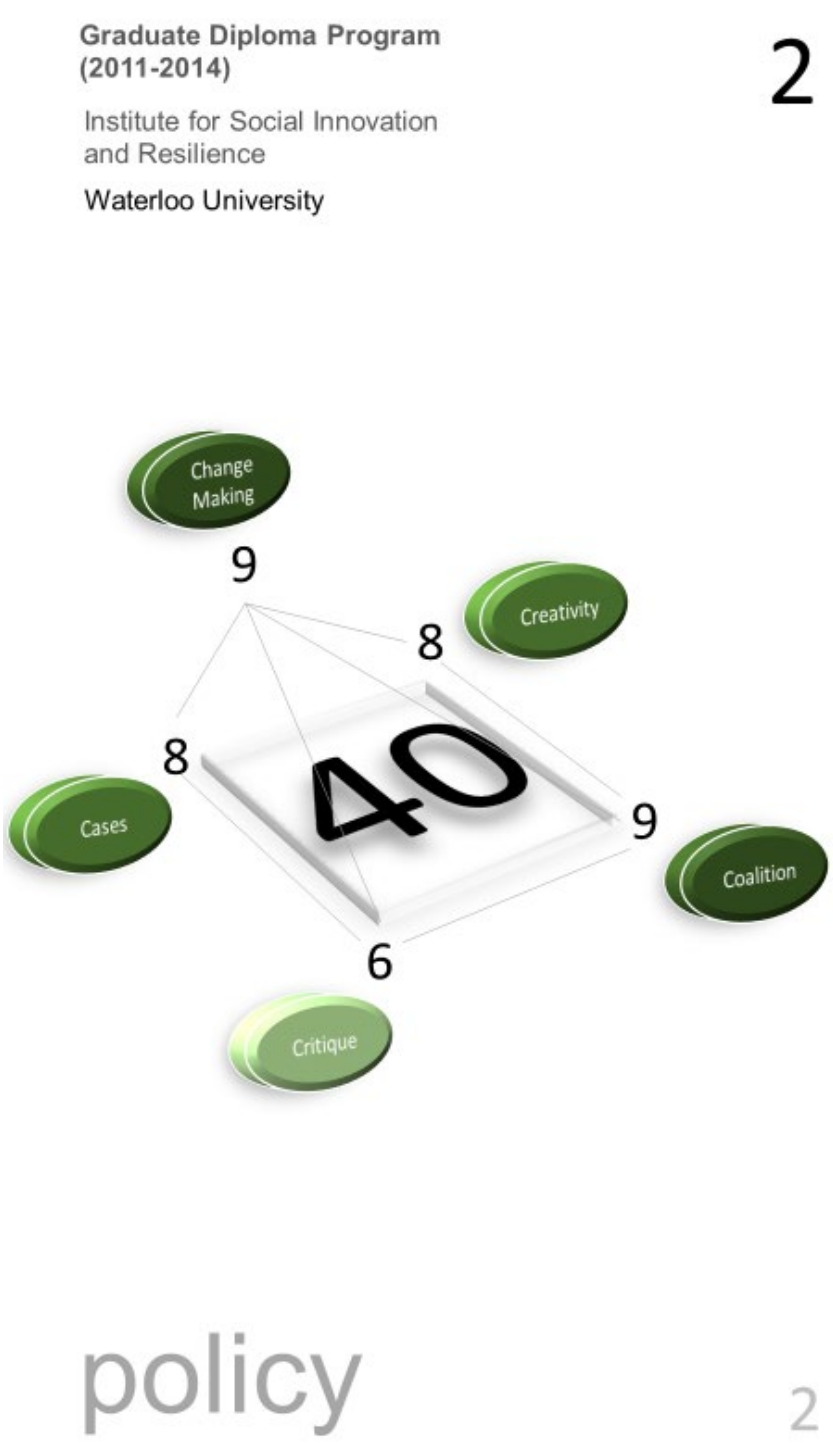


Figure 28: Scoring Card of Waterloo Graduate Diploma Program

Newfoundland- Brock- Ottawa/Carlton- Royal Roads (figure 29)

This is an environment based coalition. All the programs are interesting in their own way. It works on paper, the configuration is a daisy chain, shown in grey lines.

Each of these programs is interesting from a sustainability perspective. Practical considerations aside, this configuration has a diverse program set within an overall envelope of environmental sustainability.
To start with is the Master of Sustainability program at Brock University's Environmental Sustainability Research Center. This is the overall highest scoring program out of all the programs studied. With courses like Problem Solving in the Environment, Transdisciplinary Seminar, Electives that setup political engagement, a long term relationship with the Niagara Parks Commission to undertake research and experiments, and published research in environmental sustainability this is the best program according to the 5C's framework and published material.

The Memorial University of Newfoundland's Environmental Policy Institute offers an MA in Environmental Policy which has an interesting program but has one vector which has a low score, that is coalition building. This can be offset by the transdisciplinary seminar offered at Brock University. Similarly the jointly offered program at Ottawa-Carlton's Geoscience Centre, Msc Earth Sciences- Environmental Sustainability has courses like Applied Environmental Sustainability, Professional Skills for Environmental Sustainability, foundations of Environmental Law however there is no evidence of long term experiments or cases. This can be offset by collaborating with Brock University's engagement with the Niagara Parks Commission.
Royal Roads School of Environmental Sustainability offers an MA in Environmental Education and Communications, which brings Education and Communications together. Despite being strong on a research agenda and a "change making" campus designated by the Ashoka foundation, there is no evidence of any coalition building activities. There is a natural fit with the Ottawa Carlton program's inter-disciplinary approach

There are 4 departments in this configuration, as shown in table 14, with 4 possible links between them, It is linear model meaning it can be implemented in sequence rather than simultaneously. Practical aspects will be covered in the later section.

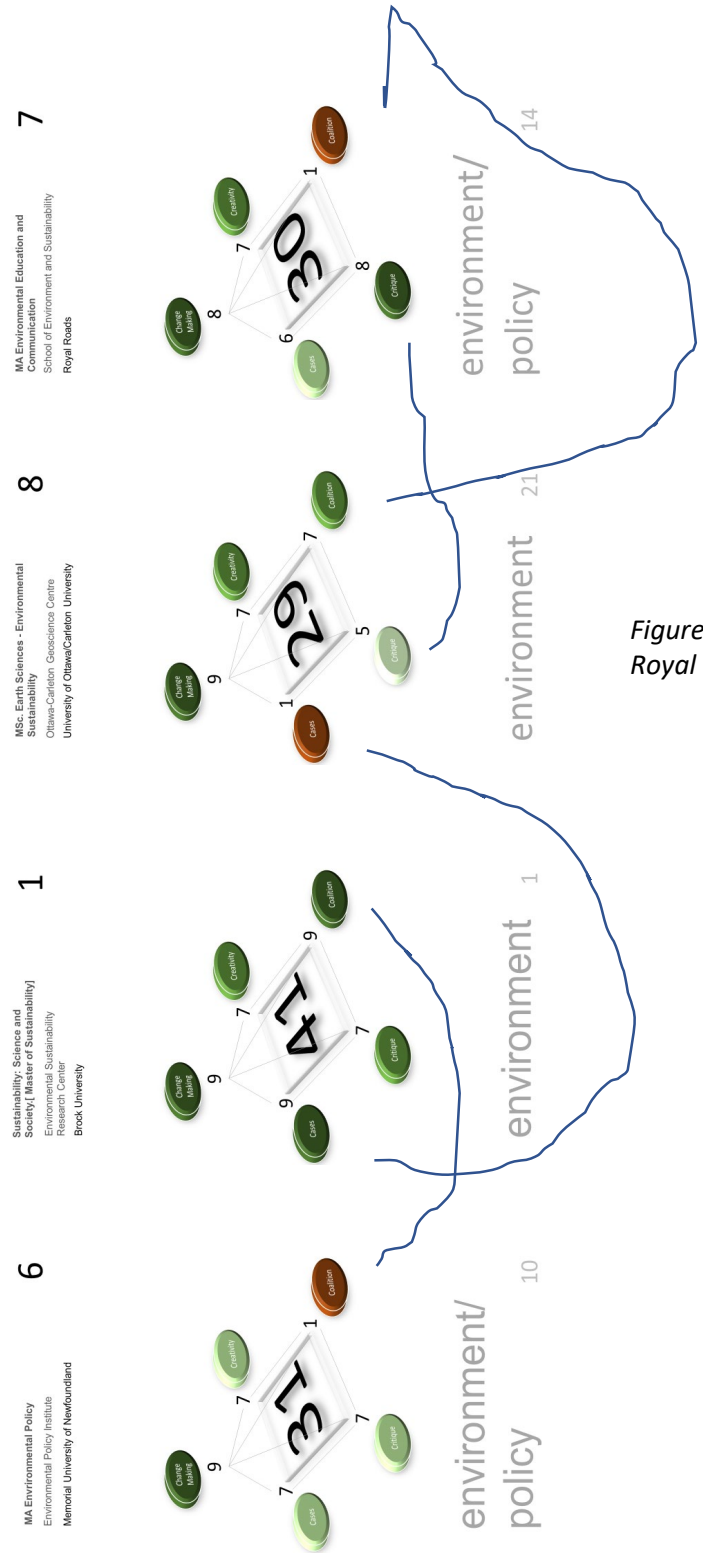


Figure 29: Newfoundland- Brock- Ottawa/Carlton- Royal Roads

University	Program	Category
Newfoundland	MA Environment Policy	Environment/Policy
Brock	Master of Sustainability	Environment
Ottawa-Carlton	MSc Earth Science – Environment Sustainability	Environment
Royal Roads	MA Environmental Education and Communication	Environment/Policy

No of Programs	Variety	Potential Links
4	No	4

Table 14: Analysis of Newfoundland- Brock- Ottawa/Carlton- Royal Roads

Brock (ctr)- OCAD- Victoria- George Brown: Waterloo- Royal Roads (figure 30)

This is a star configuration, shown in grey lines. With a high rated program in the center (Brock), and one program feeding of one of its high rated criteria. Requisite variety has been maintained here as well. Only problem is that if the center program is not willing, then the whole configuration will fall apart.

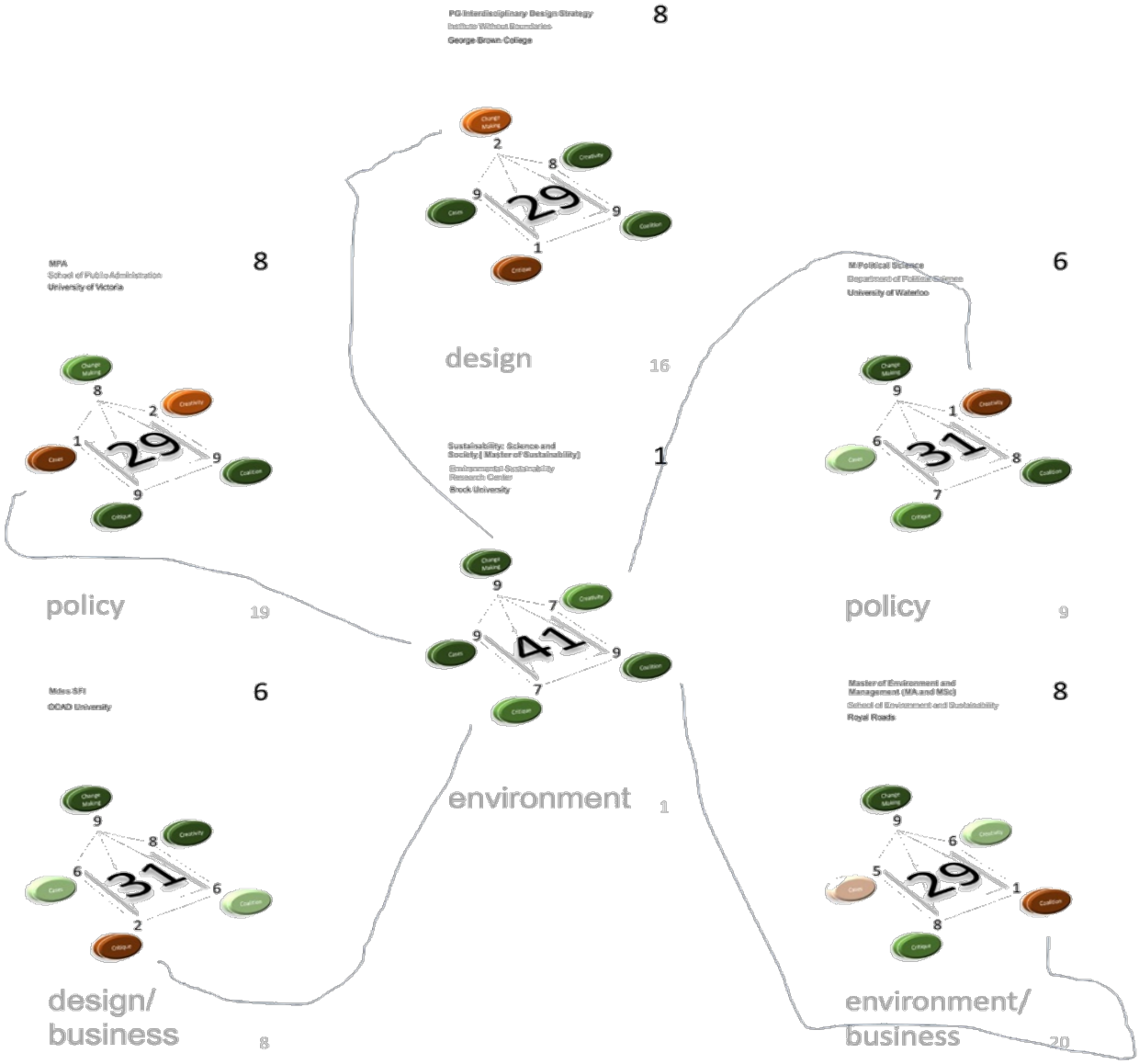


Figure 30: Brock (ctr)- OCAD- Victoria- George Brown: Waterloo- Royal Roads

There are 6 departments in this configuration as can be seen in table 15, with 6 possible links between them, It is a star model meaning one very highly rated program takes the center stage, and other programs feed off its high scores in various vectors. As long as the diversity of program type is maintained, the center can be any highly rated program. There are practical issues around the central role of one program. This will be discussed in the next section.

No of Programs	Variety	Potential Links
6	Yes	6

Table 15: Analysis of Brock (ctr)- OCAD- Victoria- George Brown: Waterloo- Royal Roads

As a last step, an assumptive uplift factor (of 2 points per link) was applied to the coalitions to see how they fared after working together. The assumption is that the net effect would be positive. The uplift factor is based on an assumption that for most of the programs, working together would ad a number of different perspectives to the outcomes. As an example, a business program would need to partner with a “practical” science in order to actually deploy any idea in the “wild”. Similarly, there would be programs in the sciences that would need help to design systems, create feasibilities and other “soft” skills that make for complete packages.

However, there are still some high-ranking programs that do not benefit from the consortiums. Specifically, Brock University’s Master of Sustainability, University of Toronto’s Master of Public Policy, and the University of Saskatchewan's Master of Sustainable Environmental Management score above the uplifted scores for various coalitions and they will need to be incentivised to participate. These incentives can be in the form of leadership roles, recognition, or grants.

As can be seen in table 16, Consortiums with variety have biggest lift, while consortiums with single subjects have lower lift potential. Hence one can conclude that it is better for multi-disciplinary cooperation to be put into place even though getting all the programs to agree will be challenging.

Configuration	Variety	Before Ave. Score	After Coalition Ave. Score
Concordia – Queens - Carleton	Yes	30.3	34.3 **(+4 lift)**
OCAD- Royal Roads	Yes	30.5	32.5 **(+2 lift)**
Saskatchewan - Mount Royal –York -Waterloo	Yes	31	34 **(+3 lift)**
Dalhousie - Ottawa/Carlton - Western - OCAD	Yes	30.25	33.75 **(+3.5 lift)**
OCAD- Concordia- York- Emily Carr- George Brown- OCAD	No (Design only)	29.5	31.5 **(+2 lift)**
Waterloo- Toronto- Ottawa- Western	No (Policy only)	34	35.5 **(+1.5 lift)**
Newfoundland- Brock- Ottawa- Carlton- Royal Roads	No (Environment only)	32.75	34.75 **(+2 lift)**

Table 16: Analysis of lift because of coalition formation

As can be seen in table 17, the top three programs do not have an incentive to participate in a coalition, and so some incentive needs to be created for them.

Also, some of the programs that have been brought together in a coalition, may be far apart geographically, and so physical interaction may be challenging. This can be overcome by online collaboration, however, it remains a challenge. This is discussed in the action plan section in which a structure has been created for this collaboration.

Low hanging fruit could be to start with change-making, and have faculty collaborate on research to create inter-disciplinary knowledge in tackling environmental sustainability issues.

Lastly, there are some very interesting field-work opportunities and these should be availed by all the willing participants in the coalition. For example, the Western's collaboration with the city of Sarnia, the Bioreserve that is available to the University of Saskatchewan, the partnership that U of Toronto has with Evergreen, or the work that Brock does in the Niagara Park, can be used as central points of collaboration.

Environmental Sustainability Research Center	Environment	Brock University	Sustainability: Science and Society.[Master of Sustainability]	41
School of Public Policy and Governance	Policy	University of Toronto	MPP	40
School of Environment and Sustainability	Environment	University of Sasketchewan	Masters of Sustainable Environmental Management	37
4 schools (2)			**Policy Schools only (after)**	**35.5**
D+PE+P			**3 Schools (after)**	**35.3**
4 schools(1)			**Environment Schools only (after)**	**34.75**
D+B+PE			**3 Schools (after)**	**34.3**
4 schools (2)			**Policy Schools only (before)**	**34**
D+B+P+E(1)			**4 Schools (after)**	**34**
D+B+P+E(2)			**4 Schools (after)**	**33.75**
Deathstar			**6 Schools (after)**	**33.33**
D+PE+P			**3 Schools (before)**	**33.3**
Department of Political Science	Policy	Western University (UWO)	MPA	33
4 schools (1)			**Environment Schools only (before)**	**32.75**
DB+PE			**2 Schools (after)**	**32.5**
Department of Design and Computation Arts,	Design	Concordia University	M Design	32
Graduate School of International and Public A	Policy	University of Ottawa	MA in Public and International Affairs	32
Deathstar			**6 Schools (before)**	**31.7**
6 schools			**Design schools only (after)**	**31.5**
D+B+P+E(1)			**4 Schools (before)**	**31**
	Design/Busines	OCAD University	M Des SFI	31
Department of Political Science	Policy	University of Waterloo	MPS	31
Environmental Policy Institute	Environment/Po	Memorial University of Newfoundland	MA Environmental Policy	31
DB+PE			**2 Schools (before)**	**30.5**
D+B+PE			**3 Schools (before)**	**30.33**
D+B+P+E(2)			**4 Schools (before)**	**30.25**
Smith School of Business	Business	Queens University	M Management Innovation and Entrepreneurship	30
School of Environment and Sustainability	Environment/pol	Royal Roads	MA Environmental Education and Communication	30
School of Public Administration	Policy	Dalhousie University	MPA	30
Institute of the Environment	Environment	University of Ottawa	Msc Environmental Sustainability	30
6 schools			**Design schools only (before)**	**29.5**
School of Environment and Sustainability	Environment/bus	Royal Roads	Master of Environment and Management (MA and MSc)	29
	Design	OCAD University	M Des Inclusive Design	29
Ottawa-Carleton Geoscience Centre	Environment	University of Ottawa/Carleton Univers	MSc. Earth Sciences - Environmental Sustainability	29
School of Public Administration	Policy	University of Victoria	MPA	29
Institute Without Boundaries	Design	George Brown College	PG Interdisciplinary Design Strategy	29
Department of Political Science and Public A	Policy	Ryerson University	MA Public Policy and Administration	29
Johnson Shoyama Graduate School of Public	Policy	University of Regina & University of S	MPA	29
School of Public Policy and Administratio	Policy/environm	Carleton University	MA Sustainable Energy Policy or MASc or MEng Sustainable Energy.	29
School of Art, Media, Performance and Desig	Design	York University	M Design	28
	Design	Emilly Carr University	M Design	28
Bissett School of Business	Business	Mount Royal	BBA concentration in Social Innovation	28

Table 17: Comparison of coalitionss with single programs

Universities have an opportunity to take the lead and demonstrate how working together in different combinations can bring about long-term change in social systems, economic systems and in the technical aspects of change. This change making role can be a beacon of hope in the age of he Anthropocene, as man created problems can be solved through unique man created structures, with universities and departments taking the lead.

The concept of envelopes as was discussed earlier is an important conclusion. This concept brings up financial/funding issues which can be solved in various ways: eg. The solution to the envelope problem can be a third party solution. A new institute which gets funded by a funding agency, or entities like the Bloomberg foundation or the Bill and Melinda gates foundation etc.

On a smaller scale, the envelope issue can be resolved by departments who are willing to work together. Each department brings its own funding to the table.

The idea is to create a new pedagogical framework., as shown in figure 7, This model implies teacher as coach/facilitator to solve problems. Along with long-term problem solving on a departmental basis, this brings research into the classroom. Basically, we need to break the one-teacher, one-class, one-subject methodology to many-“teachers”, many-subjects and many-classes.

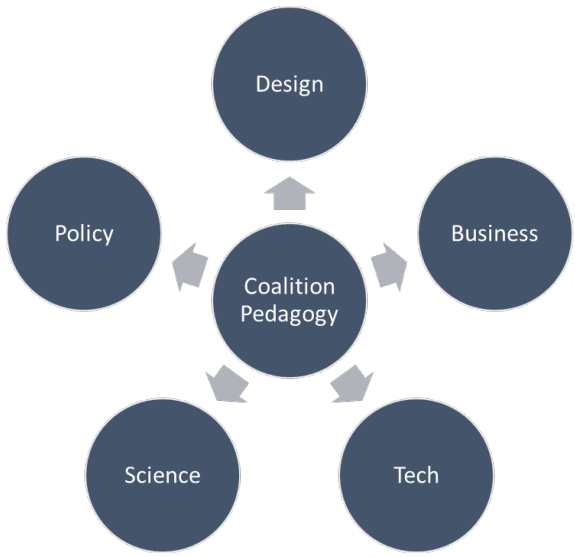


Figure 7: Coalition Pedagogy

Coalition pedagogy needs to be developed based on the 5C principles, which have been elaborated in depth in research. These are:

5 C's Framework

- **C**reativity
- **C**oalition
- **C**ritique
- **C**ases
- **C**hange-making

After the coalitions were formed, they scored higher than individual programs as a whole. There were some programs that did not have an incentive to participate because they scored higher than any coalition on their own. To make them participate, it is necessary to incentivise them.
Apart from the above, individual programs would need to be incentivised to introduce the 5C framework and coalition pedagogy in their curriculum as much as possible, to join existing networks, and work on solving wicked problems. These incentives could be in the form of recognition and rewards from government, an awards ceremony celebrating the participation and a certification system.

For OCAD, the implications are for OCAD SFI to be open to collaborate with other departments, and also to join coalitions with other design schools and different schools. SFI program has much to offer in terms of inter-disciplinary teaching methods.

One of the programs that scored very high on the ranking was the Graduate Diploma Program that was part of the Institute for Social Innovation and Resilience at Waterloo University92. This program ran from 2011 to 2014 and then ran out of funding.

Implication of the Waterloo program is that perhaps it was ahead of its time, and also it was setup with the sole purpose of working on sustainability, which may have been why when the funding dried up, the program was not able to pivot to survive. On the other hand, the other programs covered in the research have other functions which can be repurposed for sustainability. This may make their models more resilient to political and other challenges within and outside the University.

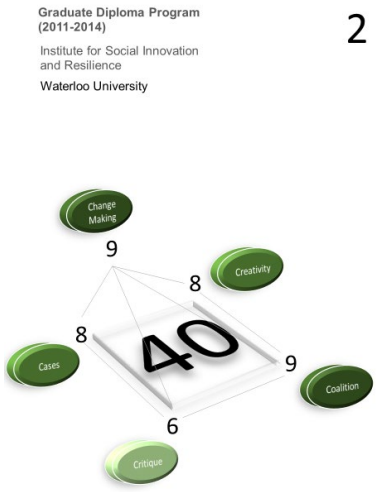


Figure 28: Scoring Card of Waterloo Graduate Diploma Program

Cross faculty collaboration intra and inter University will remain a challenge. Collaboration tools are present in many high scoring programs. Many schools and programs have programs that collaborate with other schools and programs. Other programs may need nudges in the form of rewards or recognition. As far as internal politics of institutions are concerned, that's real and needs addressing through rewards and recognition.

One of the cases that can be made for inter-disciplinary collaboration is that while a focus area of research is a good way to help students/faculty bring attention to different facets of a particular problem. On the other hand, there can be multiple problems which are outside the realm of any one department, and faculty and students can focus on areas, as they wish. Inter-disciplinary collaboration while difficult to start can yield more resilient systems.

Action Plan

Whereas coalition pedagogy can be looked at as the overall strategy, this section details an action plan that can be set in motion in order to make the coalition pedagogy a reality. A plan is a detailed document that lays out the exact steps that will be taken to achieve a goal. Strategy is a broader picture which lays out the "why should we do it this way" questions in the whole equation[95].

To make the action plan work (shown in figure 31) would require a ranking system for the participants. Brian Lawson and Kees Dorst[96] have identified stages in which design expertise is obtained. The Stages are:

1. Novice
2. Advanced Beginner
3. Competence
4. Proficiency
5. Expertise

Novice designers follow rules to the letter, and then learn to use intuition. When the participants attain a level of expertise in the process that we are following, they will be awarded certificates / badges with the above titles.

Before we get into the various modules and workshops that both faculty and students would be required to take in order to make this system a success, their needs to be a core secretariat that ideally would be resourced and housed in one of the departments, but would need to have representation from other university departments and stakeholders also.

The Secretariat:

There would be two levels on which the secretariat would work to implement the plan:

Level 1: Wider secretariat

One "champion" from each department that agrees to be a part of the coalition

Level 2: Managing Committee

3 or 4 people from any department, with experience in similar inter-departmental environmental sustainability initiatives and high level of commitment to the idea.

95. https://www.infinityconcepts.net/2011/09/the-difference-between-a-plan-and-a-strategy/
96. Lawson, Bryan and Dorst,Kees (2009). Design Expertise. Abingdon: Architectural Press. Quoted in Bijil-Brouwer, Mieke van der (2019). Problem Framing Expertise in Public and Social Innovation. She Ji: The Journal of Design, Economics, and Innovation. Volume 5, Issue 1, Spring 2019, Pages 29-43

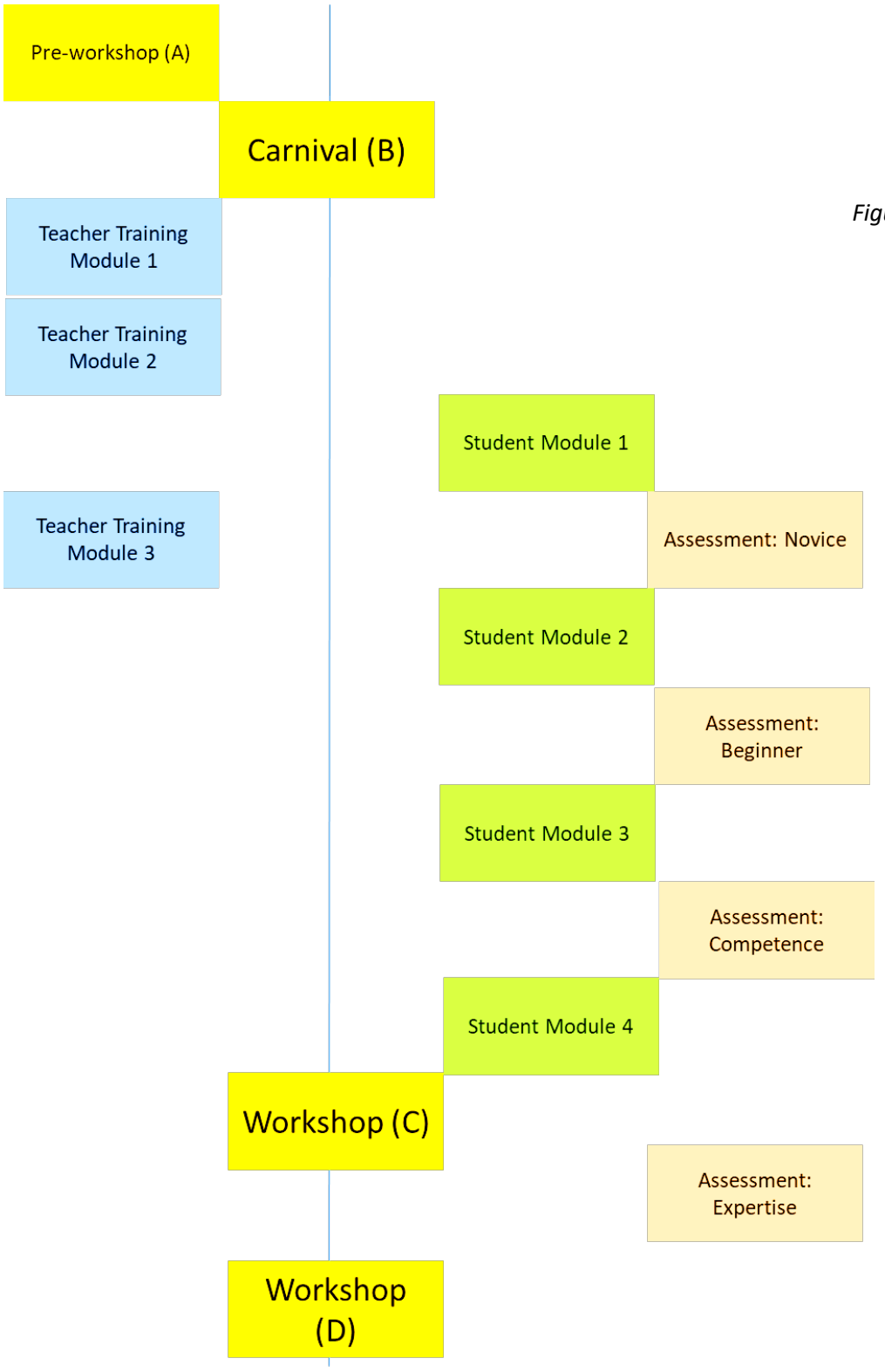


Figure 31: Action Plan Flow

The secretariat model, is a good way to handle the issue of design groups in a non-design organisation. In the secretariat, there will be designated members from various types of organisations – their dialogues will be used to "handle" the issue. Secondly the definition of design as problem solving needs to considered, which brings many other types of organisations within the ambit of design.

The roll-out plan has three components:

1. Faculty Workshops
2. Student Workshops
3. Combined Workshops

i. Pre-workshop [WKSP A]

This workshop is intended to be a program for the faculty and departments who have been invited and accepted. The main idea here is to introduce the concept of the collaboration to the faculty, to get early buy-in. This workshop would also help to bring on board ideas, and identify potential champions in the departments.

There are 5 characteristics of innovation champions[97]:

1. High level of networking – must be well known in the department
2. Well respected in the department – not necessarily the senior most person
3. Open to new ideas and concepts
4. Passionate about the idea of system level change in sustainability and planetary systems
5. Cross functional mix is needed to ensure requisite variety

The first 4 characteristics of the above list will ensure that the right people are onboard. The fifth characteristic is already guaranteed by selection of the different departments.

97. Logan, Shelly. (2014). Is there an innovation champion within your midst?. Blogpost. From: https://www.inventium.com.au/five-invaluable-traits-of-an-innovation-champion/ . Accessed on 10-20-19.

ii. The Carnival [WKSP B]

This workshop is to be based on the idea of a Carnival. Sabine Junginger in her description of a public sector engagement describes how she facilitated what she refers to as a Carnival. She describes the carnival as "people passionate about innovation working together to create something bigger than what they could achieve on their own. A carnival is creative, and allows for new ideas and experimentation."[98]

There will be fun activities in a safe zone, that allows for experimentation Invitees would include teachers, department staff and students.
Activities would include: Games for problem solving, sustainability creative contests and unconference style open mics

iii. Teacher Training. Module 1:

In the typology suggested by Donald Schon[99], there are three main functions of coaching in the design context:

1. Dealing (along with the novice) with the large problem at hand
2. Find a way to turn the moves into words so that each novice can understand what is being done and can formulate their own way forward
3. Maintaining a relationship with the novice, so that the novice does not feel loss of control or over dependence on the coach

All three of the above will be covered in this module, along with a discussion of horizontality, which is borrowed from Olivier Desvoignes[100] Desvoignes contrasts the horizontal pedagogy to vertical pedagogy which implies a power relationship between the supervisor/teacher and the student. In the horizontal hypothesis, the student co-creates the project with the staff.

98. Junginger, Sabine (2018). Design Research and Practice for the Public Good: A Reflection. She Ji: The Journal of Design, Economics, and Innovation. Volume 3, Issue 4, Winter 2017, Pages 290-302
99. Waks, Leonard. (2001). Donald Schon's Philosophy of Design and Design Education. International Journal of Technology and Design Education. 11. 37-51. 10.1023/A:1011251801044.
100. Desvoignes, O. quoted in Chapter: Cross, David: A Placement for Everyone, in Sierra, M. & Wise, K. Ed. (2018) Transformative Pedagogies and the Environment: Creative Agency Through Contemporary Art and Design. Common Ground Research Networks. Champaign, IL, USA

iv. Teacher Training Module 2:

Waks while commenting on Schon's understanding of teaching as design mentions how Schon equated teaching with design if "frame experiments" were conducted as part of teaching[97] . The difference between didactic teaching, discursive activities and heuristic inquiry is as follows[97]:

In didactic lessons teachers would be taking students to a pre-determined outcome
In discursive activities, teachers act as facilitators to search for a meaning together with the participants
In heuristic activities, teachers and students engage in joint experimentation and frame experiments while reflecting within the exercise itself.

After discussing the above with the teachers in this module, the approach to and advantages of Participatory Action Research will be discussed, alongwith the ideas behind long-term experiments (discussed in earlier section)

Participatory Action Research works in cycles which gradually increases awareness and increases social agency in a particular situation[60] . The feedback cycles in Participatory Action Research tie in well with the principals of Heuristic Inquiry. After the closing of the exercise, the next batch of students will pick up where the last batch left of and new cycles will emerge. This is how the long-term experiments will continue even though batches of students will cycle through.

The last thing that will be covered in this Module is the concept of Compound Authorship[42] The idea that when different disciplines work together, they all have to give up on the "I" and accept that the output will be a "We" with no clear authorship. Specially over a number of cycles, this will mean that a lot of people will have worked on the same problem. A new way of recognising achievements in academia would be needed for inter-disciplinary research to take place and for it to have clear outcomes.

v. Teachers Training Module 3:

In this module, the selection criteria for students will be discussed. The lists of the students will be used to generate possible teams, and these teams will then be used as starting points in the student module 3. The planetary advocate position and its logic is discussed in Students Module 3. Other criteria for selection are to balance the 4 types of learners are defined by Honey and Mumford[101], shown in figure 32:

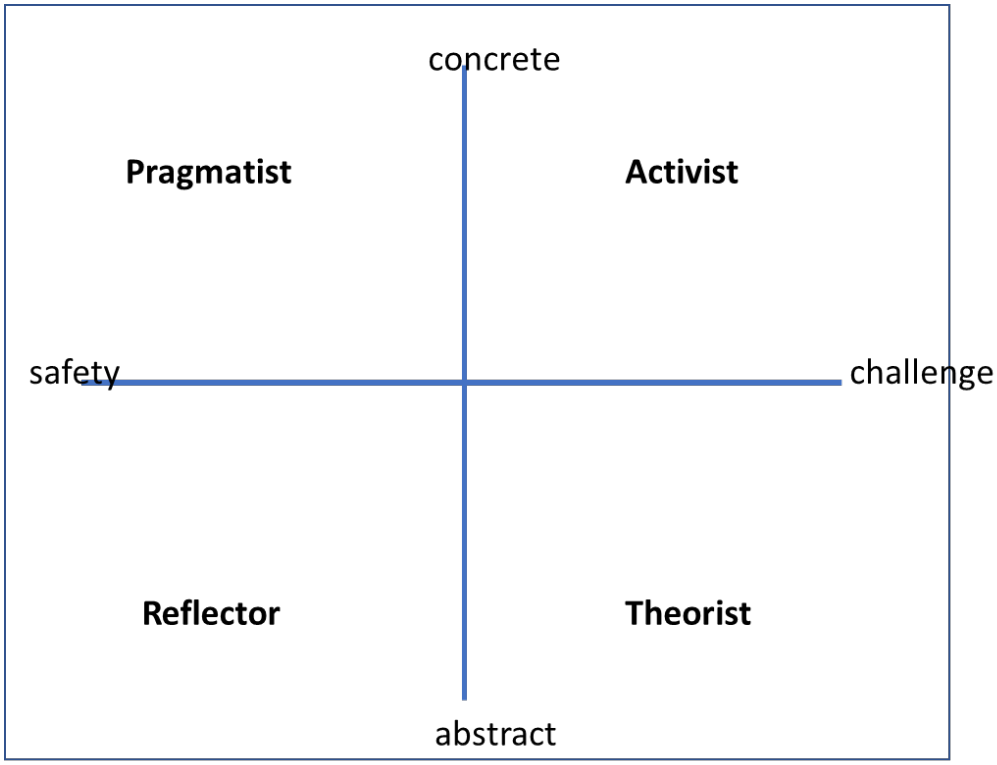


Figure 32: Honey and Mumford learning model

Activist: Learn by doing. Involve themselves fully in new experiences

Theorist: Learn by understanding theory. Prefer to analyse and synthesise.

Pragmatist: Need to see how the learning will be put into practice. They are always trying out new ideas

Reflector: Learn by observing and thinking. They prefer to stand at the sidelines and view experiences from a number of different perspectives.

101. Honey, P. & Mumford, A. (1982) Manual of Learning Styles London: P Honey. Summary From: https://www2.le.ac.uk/departments/doctoralcollege/training/eresources/teaching/theories/honey-mumford

Ideally the teams should have equal representation from each type. The selection can be done through the Learning Style Questionnaire developed by Honey and Mumford[102].The learning styles have been abstracted by Groat & Musson[102] into the following four quadrants with hints about what type of material or environment they would like:

Lastly, the students have to be filtered by commitment to the cause of planetary sustainability. This is essential to ensure that the students are not in the process for other reasons.

As can be seen, the styles work well together but not on their own[102]

Outcome (v): Selection of Students based on commitment to environment sustainability and LSQ in each program. Sharing of lists with the secretariat.

vi. Students Module 1:

Donald Schon[56] talks about education in terms of coaching by an expert to a novice. In this module a generalised application of design coaching would be implemented to demonstrate how specific sustainability problems could be solved. This exercise would be one requiring general knowledge from the novice, so that they are initiated in the process of heuristic inquiry. The process that Sabine Junginger talks about[98] is introduced to the students as:

a. Assemble
b. Motivate
c. Participate / Observe
d. Solve (?)
e. Implement
f. Iterate

Participants would feel they are somewhere between step b and c at the moment.

102. Anne Groat & Tim Musson (1995) Learning styles: individualizing computer-based learning environments, ALT-J, 3:2, 53-62, DOI: 10.1080/0968776950030206. Accessed online at https://www.tandfonline.com/doi/pdf/10.1080/0968776950030206 on 10-10-19

Heuristic Inquiry implies that the practitioners do not need to withdraw from the inquiry in order to reflect. They would "reflect in action" [56] in order to learn "tacit" knowledge[56]. This is a process that resembles a "practicum" – which is an offline situation that closely approximates the real world[56], which is done under supervision. Heuristic inquiry is deeply personal, and also can be deeply troubling because of its uncertain nature[60]. The nature of the heuristic inquiry is fundamentally different from the science method which has a separation of theory and practice[56]

Assessment Level 1: Novice

vii. Student Module 2:

In order to demonstrate the strength of project-based learning, the participants will be presented with the donut problem from Raworth[103] shown in figure 33

Figure 33: The donut problem

The specific problem that can be presented as a challenge to participants is how to show inequality in this donut. Ie how to show that a few people and a few geographies use many more resources than most of humanity

103. Raworth, Kate (2012). A safe and just space for humanity: CAN WE LIVE WITHIN THE DOUGHNUT? Oxfam Discussion Papers. https://www-cdn.oxfam.org/s3fs-public/file_attachments/dp-a-safe-and-just-space-for-humanity-130212-en_5.pdf

How can policy be created across various governmental and inter-governmental levels in order to return the earth to its safe space, as shown in the chart from the Stockholm Resilience Center[104] shown in figure 34.

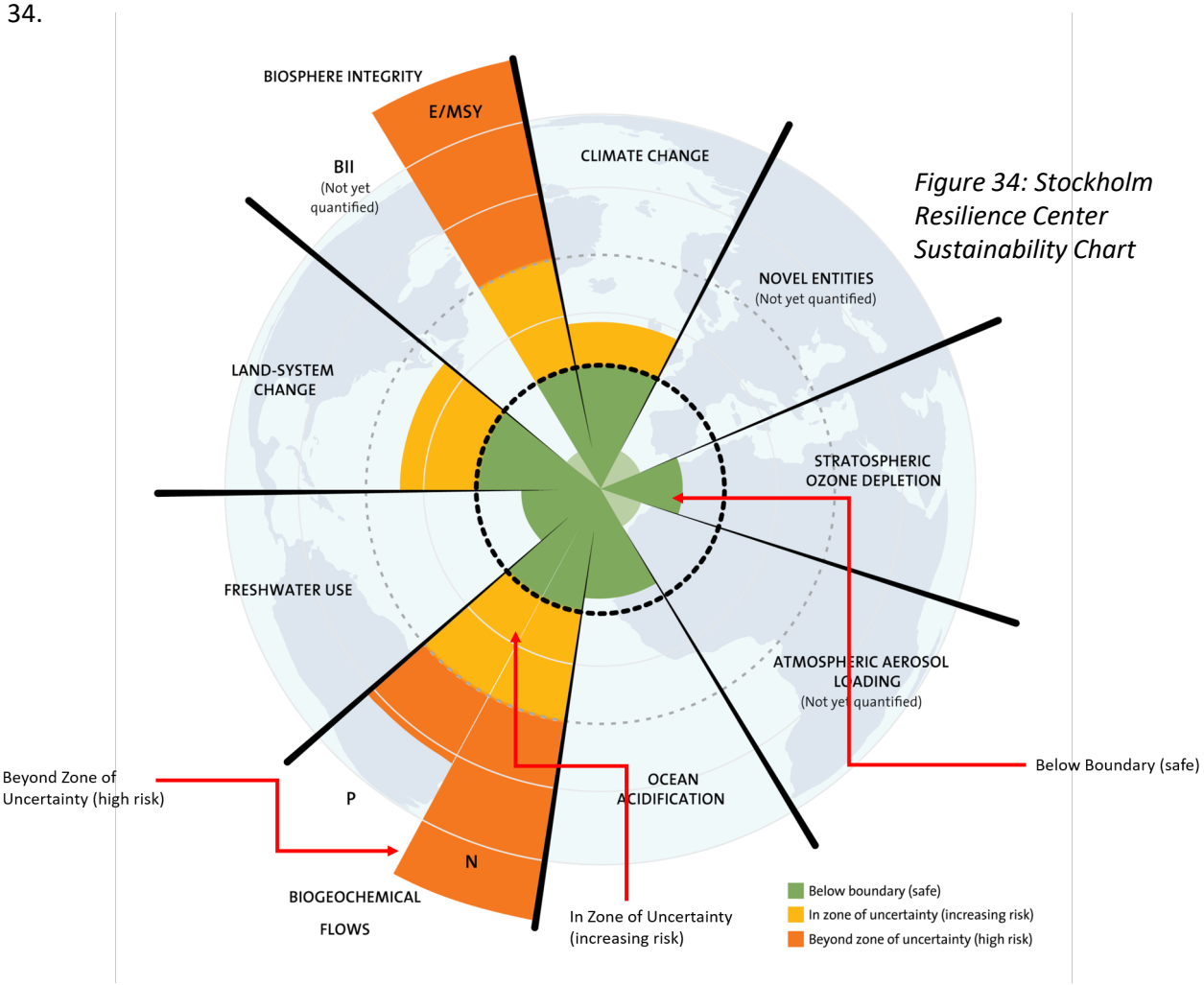


Figure 34: Stockholm Resilience Center Sustainability Chart

After this exercise is done, the long-term experiments will be setup and discussed by each inter-disciplinary team, in conjunction with the faculty coaches. Here the secretariat will ensure that different angles are taken into consideration through pro-forma submissions.

After the long-term experiment has been setup, the first self-evaluation will be done, in order to fulfill the requirements of heuristic inquiry[56] and design coaching[56].

Assessment Level 2: Beginner

104. Stockholm Resilience Center and graphic accessed from: https://www.stockholmresilience.org/research/planetary-boundaries.html

viii. Student Module 3:

In this module the students will lead the inquiry with the teachers acting as coaches and facilitators. The initial questions will be reframed as discussed in Donald Schon[56]. This reframing requires the use of words and images, written statements and sketches to move beyond first questions and to get to the solution space.

This reframing is an essential part of heuristic inquiry. At this stage the expert and the novice, who is no longer a novice[56], will be using the same language and will be making similar if not exactly the same moves in the studio setting.

In terms of time spent, this stage would require the most time, as this is the problem framing, reframing and first solutions area.

Assessment Level 3: Proficiency

ix. Student Module 4:

At this stage the student groups will start their documentation, build protypes or experiences to show the products in action and also build out the storytelling and communication elements into the final products. This is essential so that feedback can be given in the next session which will be a combined session.

x. Workshop – Single Loop Feedback (Workshop C)

In this workshop, all participants are invited back into a big tent to have a feedback session based on prototypes, and communication pieces (like posters).

According to Schon[103] there are two levels of feedback as shown in figure 35:

- Single-loop learning
- Double-loop learning

In this session, the feedback that will be given will be based on single-loop learning. In terms of learning, this involves the corrections of errors, and in terms of heuristic inquiry, it involves the feedback given without questioning the parameters (goals, values and frameworks)[105.]

In double-loop learning, the framing and learning goals are also called into question. After this exercise, the final assessment will be undertaken.

Assessment: Expertise

105. Smith, M. K. (2001, 2011). 'Donald Schön: learning, reflection and change', the encyclopedia of informal education. [www.infed.org/thinkers/et-schon.htm.

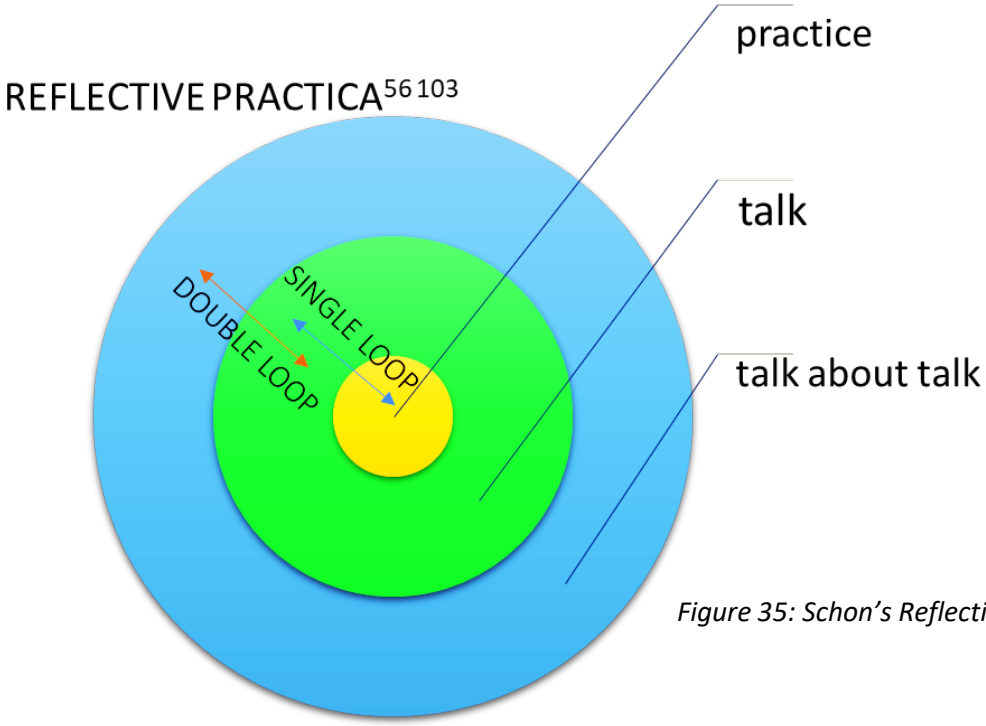


Figure 35: Schon's Reflective Practica

xi. Workshop – Double Loop Feedback (Workshop D)

This workshop, which is the last in the series of events and meetings, is based on Schon's idea of their being a "reflective ladder"[56]. In this workshop, expert students and faculty champions and secretariat members will reflect on the process itself. This is meant to be a reflective exercise to talk about the talk (double loop learning[103]). The learning strategies, frameworks and outcomes will be debated and further improvements to the system will be suggested so that refinements can be adopted into the next cycle.

Reflection on action plan:

There may be other possible variations on how the goal of coalition pedagogy can be achieved, however, based on the systems and structures in which higher education institutions operate, this seems to be a valid means of achieving the goals. One round of the action plan process can be undertaken and then the feedback can be used to make appropriate changes as needed.

In case an organization wants to implement the 5C model on its own, each linkage point in the model could be a delay which would be a point of reflection. Through the critique area, there would be double-loop learning (what problem to solve could be re-framed again and again) at that stage. Also, the change-making role at the end of the process would be a good reflection point to look at whether the process was good, and whether the problem to solve was worth the effort.

Bibiliography

1. Wahl, DC, Designing Regenerative Cultures, Triarchy Press, Axminster, England, 2016

2. Latour, B. P7, On actor-network theory. A few clarifications plus more than a few complications. Bruno Latour CSI-Paris/Science Studies-San Diego in Finn Olsen (special issue of the Danish philosophy journal), " Om aktor-netvaerksteroi. Nogle faafklaringer og mere end nogle fa forviklinger" Philosophia, Vol. 25 N° 3 et 4, pp.47-64; (article écrit en article written in 1990]. version anglaise (English version) in Soziale Welt, vol. 47, pp. 369-381, 1996._-version anglaise sur le web web édition http://www.cours.fse.ulaval.ca/edc-65804/latourclarifications.pdf

3. P.8 Cressman, D. (2009), A Brief Overview of Actor-Network Theory: Punctualization, Heterogeneous Engineering & Translation, ACT Lab/Centre for Policy Research on Science & Technology (CPROST) School of Communication, Simon Fraser University, April 2009

4. Schwab, K. from https://www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab

5. The Anthropocene, A man-made world, Economist, Print edition, May 26th 2011, accessed at https://www.economist.com/briefing/2011/05/26/a-man-made-world, on 19 Feb, 2019 at 7:00pm EST

6. Philbeck, Davis & Larsen, Values, Ethics and Innovation: Rethinking Technological Development in the Fourth Industrial Revolution, World Economic Forum white paper, April 2018.

7. Rice, C. (2011). The inside of space: Some issues concerning heterogeneity, the interior and the weather. In M. Hensel, C. Hight, & A. Menges (Eds), Space Reader: Heterogenous Space in Architecture (pp 185-193). London, England: Wiley

8. Universities Join Cause: Technology for Public Good, New York Times, March 12, 2019. Accessed from: https://www.nytimes.com/2019/03/11/technology/universities-public-interest-technology.html?smtyp=cur&smid=tw-nytimesbits

9. https://www.wickedproblems.com/1_wicked_problems.php

10. Westley, F. Keynote on the history of social innovation at Nesta's Social Frontiers, Nov. 14-15, 2013. from https://uwaterloo.ca/waterloo-institute-for-social-innovation-and-resilience/about/what-social-innovation

11. Schumpeter, J. A. (1934). The Theory of Economic Development, Cambridge: Harvard University Press.

12. Ostrom, E. 1 965. Public Enterpreneurship: A Case Study in Ground Water Management. Ph.D. dissertation, University of California at Los Angeles.

13. p40, Social entrepreneurship and social innovation: Initiatives to promote social entrepreneurship and social innovation in the Nordic countries, Nordic Council of Ministers, 2015 http://norden.diva-portal.org/smash/get/diva2:856045/FULLTEXT01.pdf

14. ibid

15. Oosterlynck, S., Y. Kazepov, A. Novy, P. Cools, E. Barberis, F. Wukovitsch, T. Sarius & B. Leubolt (2013), The butterfly and the elephant: local social innovation, the welfare state and new poverty dynamics. ImPRovE Discussion Paper No. 13/03. Antwerp: Herman Deleeck Centre for Social Policy – University of Antwerp.

16. http://www.sigeneration.ca/home/labs/

17. Jones, P. (2018), Contexts of Co-Creation: Designing with System Stakeholders, Draft Paper.

18. Our Common Future: Report of the World Commission on Environment and Development". UN Documents. n.d. Web. Retriev ed 27 June 2013. < http://www.un-documents.net/ocf-02.htm>, qupted in What is Sustainability, https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf

19. https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf

20. http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

21. Wodak (2018), The Anthropocene as a Transformative Pedagogical Platform, in Transformative Pedagogies and the Environment, Common Ground, 2018

22. Nisbet, M. (2015) Universities in the Anthropocene: Engaging students and communities. Retrieved from http://theconversation.com/universities-in-the-anthropocene-engaging-students-and-communities-36472

23. https://www.thesolutionsjournal.com/article/redesigning-a-design-program-how-carnegie-mellon-university-is-developing-a-design-curricula-for-the-21st-century/ accessed on 05-11-19

24. https://ctlt.ubc.ca/2017/10/31/new-course-tackles-wicked-problems-with-strategic-design-methodology/ accessed on 05-11-19

25. Bannerjee, B. & Ceri, S. (ed) (2016), Creating Innovation Leader, Springer International Publishing, Switzerland

26. Muff, Katrin (ed) (2014), The Collaboratory, Greenleaf Publishing, UK

27. Manzini, Ezio (2011), Design Schools as Agents of (Sustainable) Change (18/05/2011), DIS Poltecnico di Milano – DESIS Network

28. http://www.desisnetwork.org/labs/

29. http://www.desisnetwork.org/the-desis-map/

30.http://grli.org/about/global-responsibility/#who-and-what-is-grli

31. http://www.europeanbusinessreview.com/5020-management-education-for-the-world-part-1-designing-a-radically-new-vision-of-management-education/#!prettyPhoto

32. http://grli.org/about/our-network/#partners

33. https://sugar-network.org/about#university

34. http://www.eauc.org.uk/who_we_are

35. http://www.cumulusassociation.org/homepage/what-is-cumulus/

36. https://www.aashe.org/about-us/aashe-history/

37. https://hub.aashe.org/browse/publication/15693/2016-Sustainable-Campus-Index

38. http://www.aashe.org/partners/heasc/members/

39. http://www.aashe.org/partners/centers-for-sustainability-across-the-curriculum/

40. http://sepn.ca/the-project/

41. http://seri.usask.ca/

42. The Interdisciplinary Witness: Interdisciplinary Pedagogy and Speaking the New: Marie Sierra, Kit Wise, and Ross Brewin in Sierra, M. & Wise, K. Ed. (2018) Transformative Pedagogies and the Environment: Creative Agency Through Contemporary Art and Design. Common Ground Research Networks. Champaign, IL, USA (p12)

43. Davies, M. & Devlin M. (2010) Interdisciplinary higher education: perspectives and practicalities (pp 3-28), Bingley, England: Emerald Group Publishing.

44. p. 149, Bannerjee, B. & Ceri, S. (ed) (2016), Creating Innovation Leader, Springer International Publishing, Switzerland

45. P 163 ibid.

46. p175 ibid.

47. p 187 ibid

48. p 201 ibid.

49. p215 ibid.

50. p 227 ibid

51. p 239 ibid.

52. Jackson, Tim (2009). Prosperity without growth?: The transition to a sustainable economy. Sustainable Development Commission. http://www.sd-commission.org.uk/data/files/publications/prosperity_without_growth_report.pdf.

53. p12, Sierra, M. & Wise, K. Ed. (2018) Transformative Pedagogies and the Environment: Creative Agency Through Contemporary Art and Design. Common Ground Research Networks. Champaign, IL, USA

54. Nisbet, M.C., Hixon, M., Moore, K.D., & Nelson, M. (2010). The Four Cultures: New Synergies for Engaging Society on Climate change. Frontiers in Ecology and the Environment, 8, 329-331. from https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/1540-9295-8.6.329

55. Bruno Latour (Jun 18, 2018). Discussion with Bruno Latour, Hans Joachim Schellnhuber. Part of "Anthropocene Lecture: Bruno Latour" Moderated by Bernd M. Scherer. https://www.youtube.com/watch?v=Z-n_44M2nLw.

56. Waks, Leonard. (2001). Donald Schon's Philosophy of Design and Design Education. International Journal of Technology and Design Education. 11. 37-51. 10.1023/A:1011251801044.

57. Feldman and Orlikowski: Theorizing Practice and Practicing Theory, Organization Science 22(5), pp. 1240–1253, © 2011 INFORMS

58 https://mcescher.com/gallery/lithograph/#iLightbox[gallery_image_1]/59

59. Seo, M.-G., W. E. D. Creed. 2002. Institutional contradictions, praxis, and institutional change. Acad. Management Rev. 27(2) 222–247. https://www.neh.gov/humanities/2011/marchapril/feature/john-muir-natures-witness. Accessed 20-03-2019 9:20am

60. Welby Ings, Private Properties: Heauristic Inquiry, Land and the Artistic Researcher, in Transformative Pedagogies and the Environment, Common Ground, 2018

61. Rosenberg, T. (2008). New beginnings and monstrous births: Notes toward an appreciation of ideational drawing. In S. Garner (Ed.), Writing on drawing: Essays on drawing practice and research (pp. 109-124). Bristol, England: Intellect Books

62. Manzini Ezio(2015), Design, When Everybody Designs MIT Press, Cambridge, Mass. London, England

63 p.189. Manzini Ezio (2015), Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England

64. p199, ibid.

65. Seravalli, Anna. (2018). Infrastructuring urban commons over time :learnings from two cases. Proceedings of the 15th Participatory Design Conference: Full Papers, vol. 1, p. null

66. Susan Leigh Star and Ruhleder, K., (1996). Steps toward an ecology of infrastructure: Design and access for large information spaces. Information systems research, 7(1), pp.111-134.

67. Helena Karasti. (2014). Infrastructuring in participatory design. In Proceedings of the 13th Participatory Design Conference: Research Papers-Volume 1 , 141-150. ACM.

68. p.202. Manzini Ezio (2015), Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England

69. p. 4 Oppenheimer, Maya (2016). Histories of Design Pedagogy Virtual Special Issue for Journal of Design History, Journal of Design History.

70. p.8 ibid.

71. Manzini, Ezio (2015). Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England

72. p35 ibid

73. p33 Herbert, Simon quoted in ibid

74. p37, ibid

75. p48 ibid

76. p49 ibid77. p 50, Manzini, Ezio (2015). Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England

78. p53 ibid

79. p54 ibid

80. Based on a lecture by David Ing, and further elaboration over email, June 2018

81. http://coevolving.com/blogs/index.php/archive/the-systems-approach-and-its-enemies-c-west-churchman-1979/)

82. p 70, Manzini, Ezio (2015). Design, When Everybody Designs, MIT Press, Cambridge, Mass. London, England

83.Jones, Peter (2018) Contexts of Co-Creation: Designing with System Stakeholders, Draft Paper

84. Warfield, J.N. (1986). The domain of science model: Evolution and design. Proc. 30th Meeting Society for General Systems Research. Salinas: Intersystems, H46-H59

85 p16, Jones, Peter (2018) Contexts of Co-Creation: Designing with System Stakeholders, Draft Paper

86. p17, ibid.

87. P 33, ibid

88. Driscoll, David L.; Appiah-Yeboah, Afua; Salib, Philip; and Rupert, Douglas J., "Merging Qualitative and Quantitative Data in Mixed Methods Research: How To and Why Not" (2007). Ecological and Environmental Anthropology (University of Georgia) http://digitalcommons.unl.edu/icwdmeea/18

89. Caillois, R. (2001) Man, Play, and Games. University of Illinois Press, Champaign, IL.

90. McGonigal, J. (2011) Reality Is Broken: Why Games Make Us Better and How They Can Change the World. Penguin, New York

91. Werbach, Kevin, & Hunter (2012). For the Win: How Game Thinking Can Revolutionize Your Business. Philadelphia: Wharton Digital Press, quoted in Steffen Roth, Dirk Schneckenberg and Chia-Wen Tsai, (2015) The Ludic Drive as Innovation Driver: Introduction to the Gamification of Innovation, Volume 24 Number 2 2015, John Wiley & Sons Ltd

92. Thygesen, N. (2007) Steering Technologies as Observation. Cybernetics & Human Knowing, 14, 151–72.

93. Andersen, N.Å. (2001) Power at Play: The Relationships between Play, Work and Governance. Palgrave Macmillan, Basingstoke.

94. https://uwaterloo.ca/waterloo-institute-for-social-innovation-and-resilience/

95. https://www.infinityconcepts.net/2011/09/the-difference-between-a-plan-and-a-strategy/

96. Lawson, Bryan and Dorst,Kees (2009). Design Expertise. Abingdon: Architectural Press. Quoted in Bijil-Brouwer, Mieke van der (2019). Problem Framing Expertise in Public and Social Innovation. She Ji: The Journal of Design, Economics, and Innovation. Volume 5, Issue 1, Spring 2019, Pages 29-43

97. Logan, Shelly (2014). Is there an innovation champion within your midst?. Blogpost. From: https://www.inventium.com.au/five-invaluable-traits-of-an-innovation-champion/ . Accessed on 10-20-19.

98. Junginger, Sabine (2018). Design Research and Practice for the Public Good: A Reflection. She Ji: The Journal of Design, Economics, and Innovation. Volume 3, Issue 4, Winter 2017, Pages 290-302

99. Waks, Leonard. (2001). Donald Schon's Philosophy of Design and Design Education. International Journal of Technology and Design Education. 11. 37-51. 10.1023/A:1011251801044.

100. Desvoignes, O. quoted in Chapter: Cross, David: A Placement for Everyone, in Sierra, M. & Wise, K. Ed. (2018) Transformative Pedagogies and the Environment: Creative Agency Through Contemporary Art and Design. Common Ground Research Networks. Champaign, IL, USA

101. Honey, P. & Mumford, A. (1982) Manual of Learning Styles London: P Honey. Summary From: https://www2.le.ac.uk/departments/doctoralcollege/training/eresources/teaching/theories/honey-mumford

Bibiliography

102. Anne Groat & Tim Musson (1995) Learning styles: individualizing computer-based learning environments, ALT-J, 3:2, 53-62, DOI: 10.1080/0968776950030206. Accessed online at https://www.tandfonline.com/doi/pdf/10.1080/0968776950030206 on 10-10-19

103. Raworth, Kate (2012). A safe and just space for humanity: CAN WE LIVE WITHIN THE DOUGHNUT? Oxfam Discussion Papers. https://www-cdn.oxfam.org/s3fs-public/file_attachments/dp-a-safe-and-just-space-for-humanity-130212-en_5.pdf

104. Stockholm Resilience Center and graphic accessed from: https://www.stockholmresilience.org/research/planetary-boundaries.html

105. Smith, M. K. (2001, 2011). 'Donald Schön: learning, reflection and change', the encyclopedia of informal education. [www.infed.org/thinkers/et-schon.htm.

Appendix A: Accompanying Digital Material

1. Research Instrument-Salman Abedin-2020(1).pdf

File contains the MS Excel Sheet that was used to make notes – full version

2020-01-15

2. Research Instrument-Salman Abedin-2020(2).pdf

File contains the MS Excel Sheet that was used to quantify the qualitative data – full version

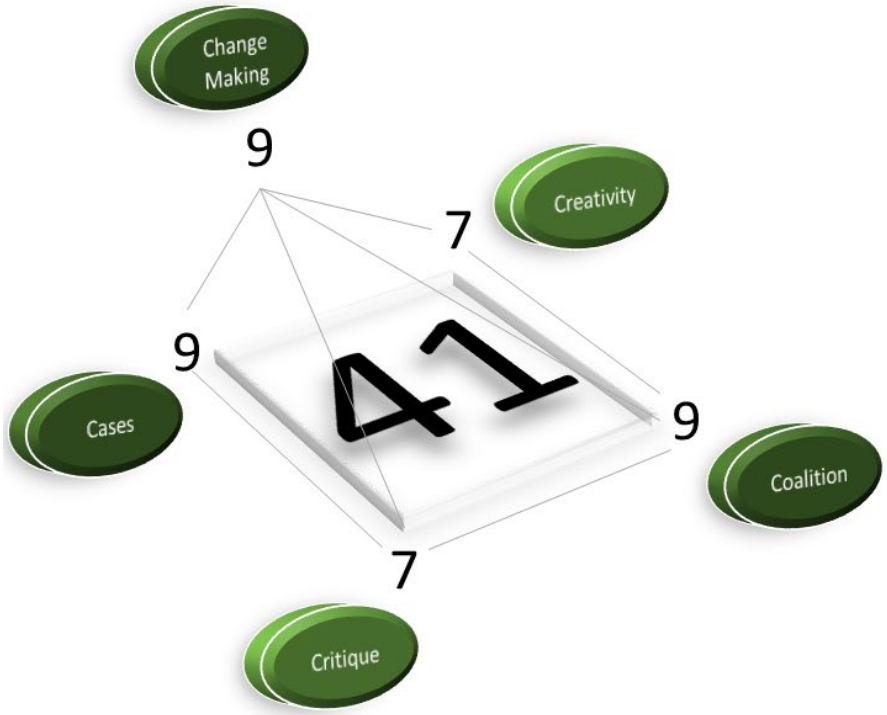
2020-01-15

Sustainability: Science and Society.[Master of Sustainability]

1

Environmental Sustainability Research Center

Brock University



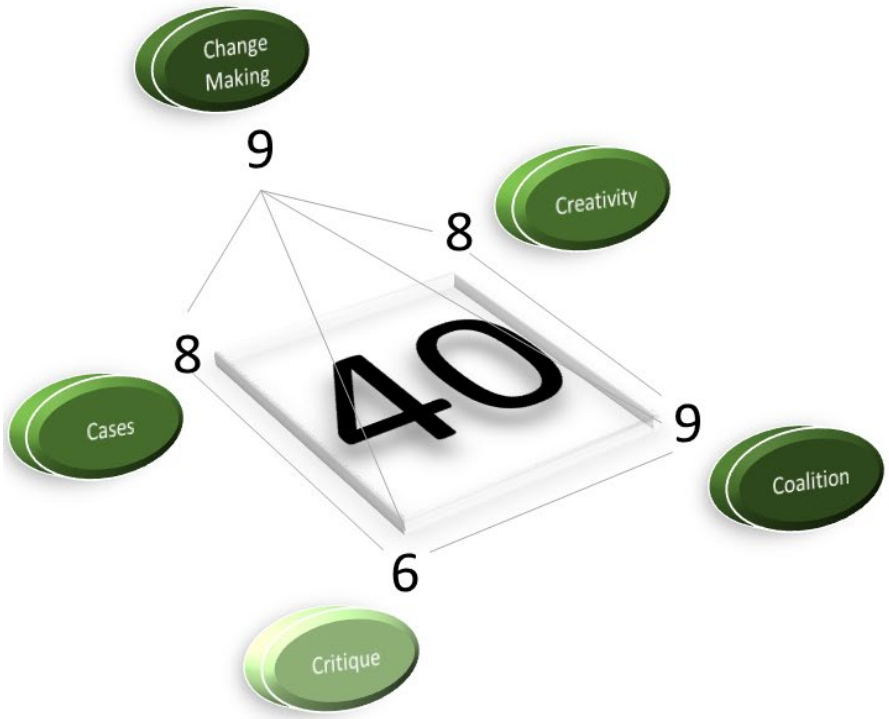
environment 1

Graduate Diploma Program (2011-2014)

Institute for Social Innovation and Resilience

Waterloo University

2



policy

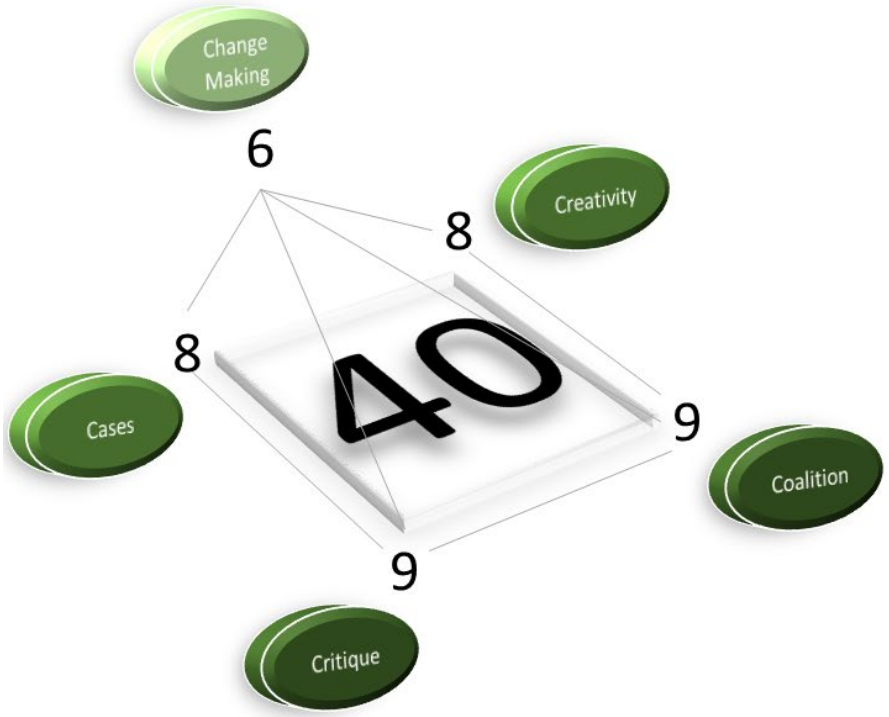
2

2

MPP

School of Public Policy and Governance

University of Toronto



policy

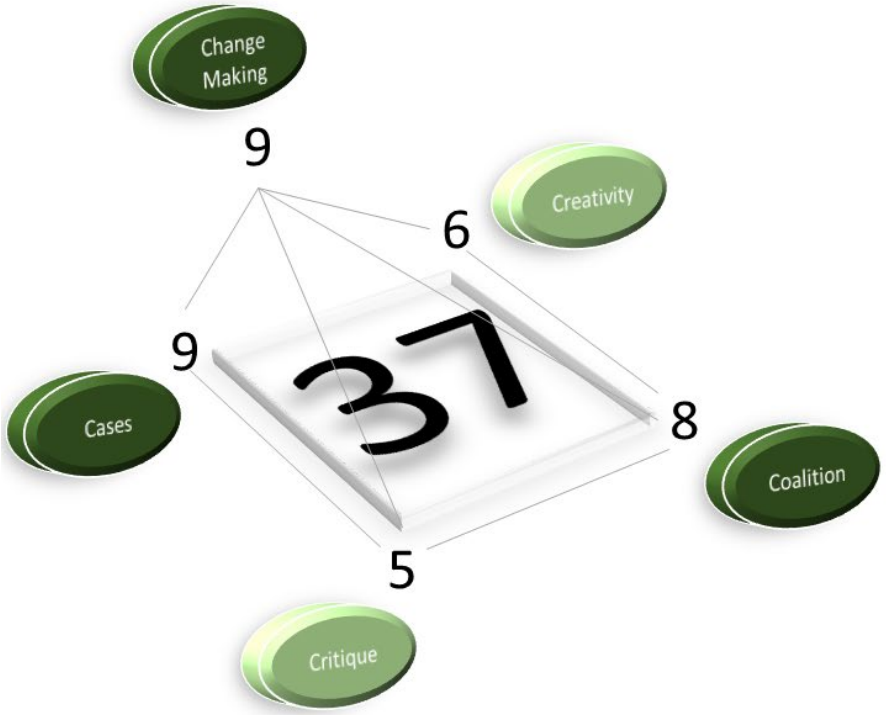
3

Masters of Sustainable Environmental Management

School of Environment and Sustainability

University of Saskatchewan

3



environment

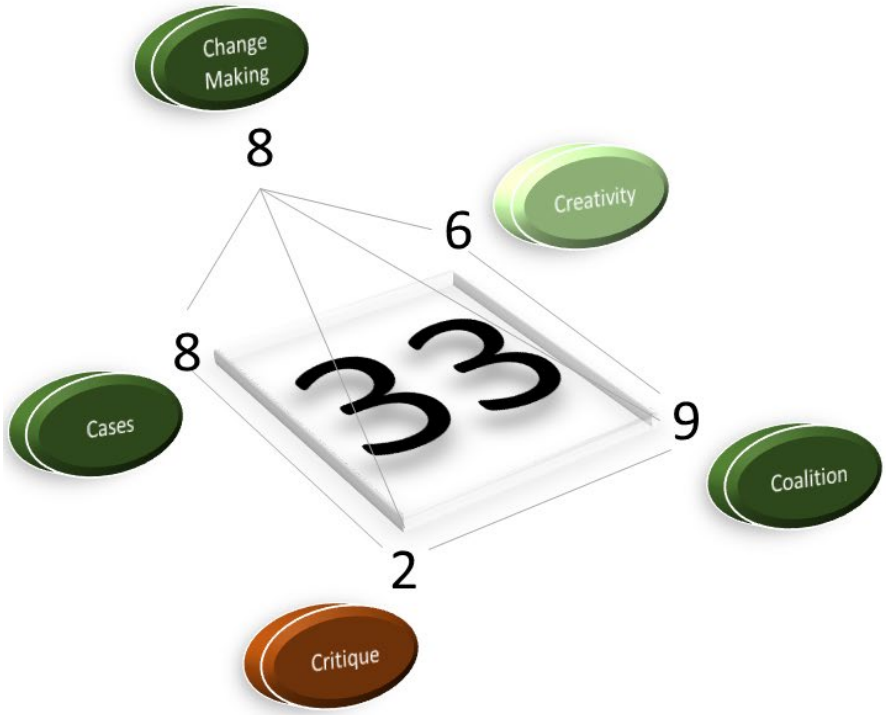
4

MPA

Department of Political Science

Western University (UWO)

4



policy

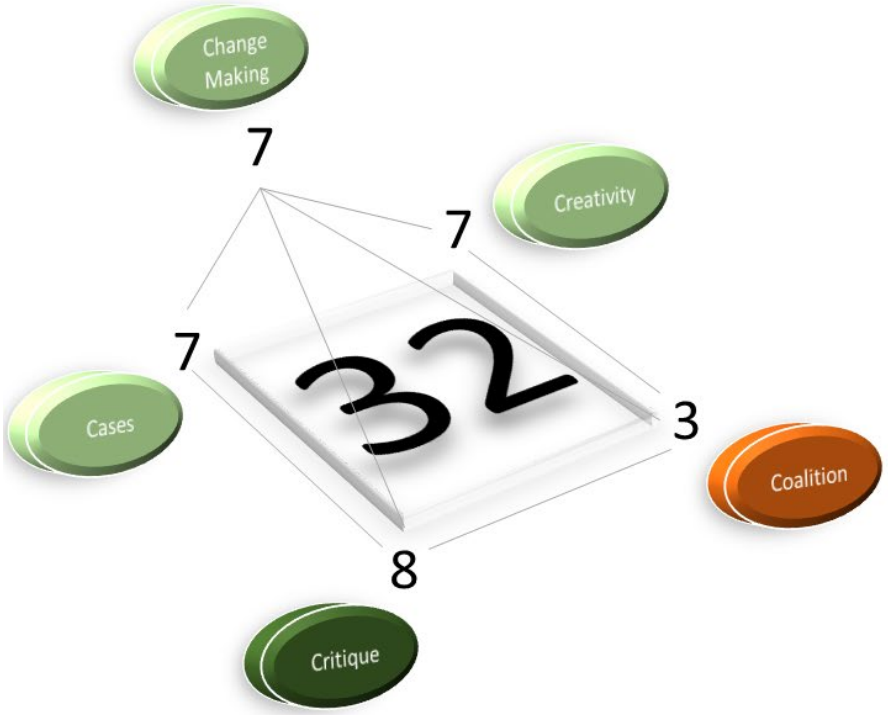
5

M Design

Department of Design and Computation Arts, Faculty of Fine Arts

Concordia University

5



design

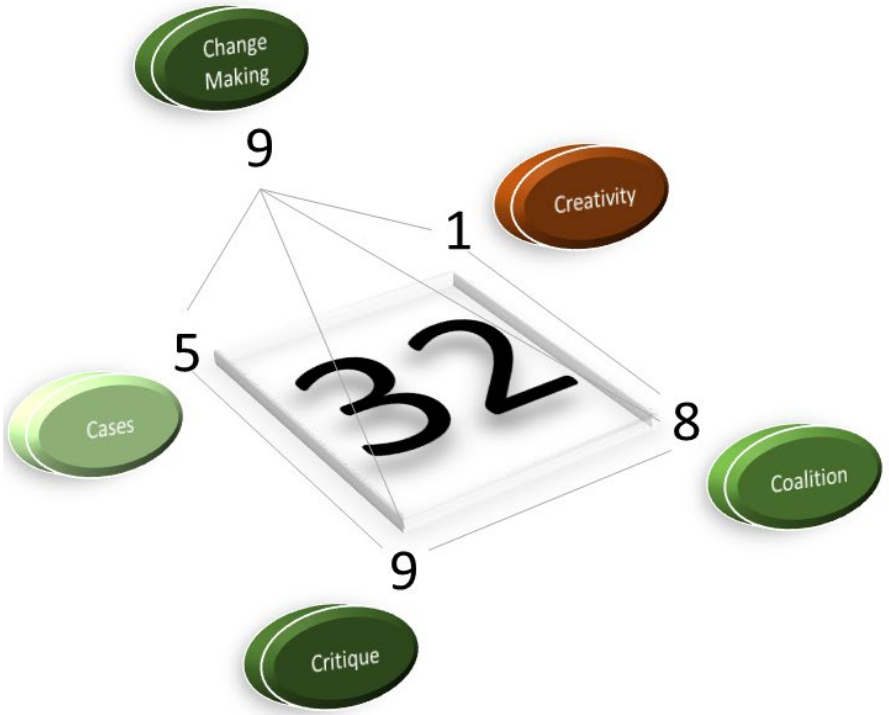
6

MA in Public and International Affairs

Graduate School of International and Public Affairs

University of Ottawa

5



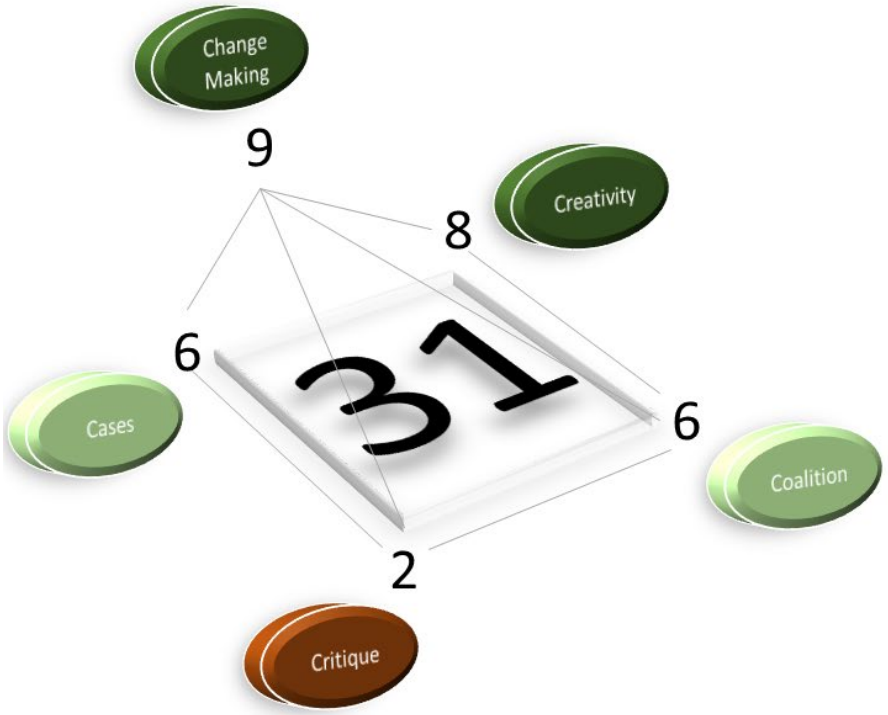
policy

7

Mdes SFI

OCAD University

6



design/
business

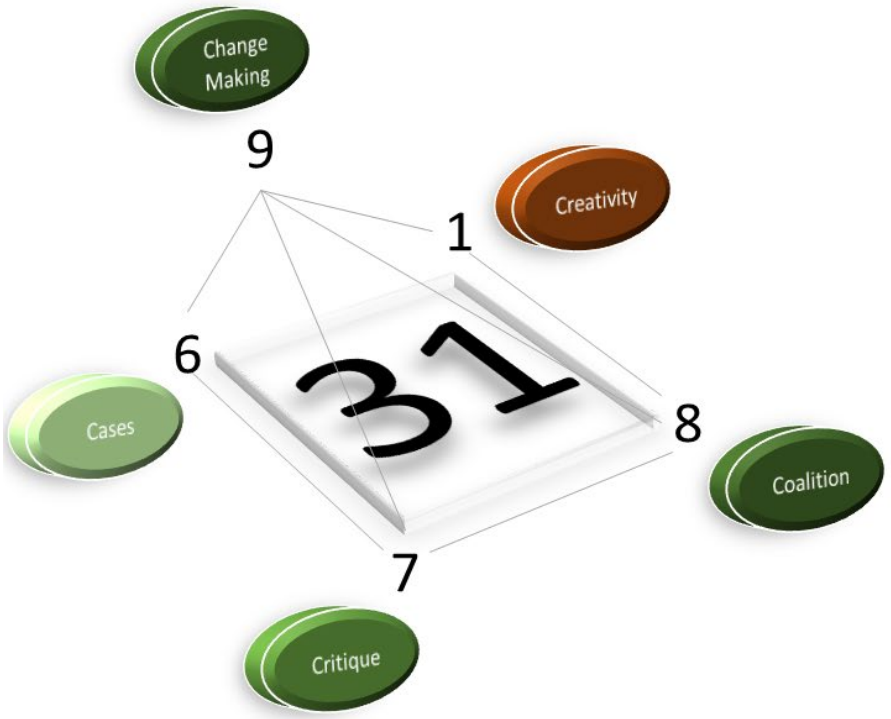
8

6

M Political Science

Department of Political Science

University of Waterloo



policy

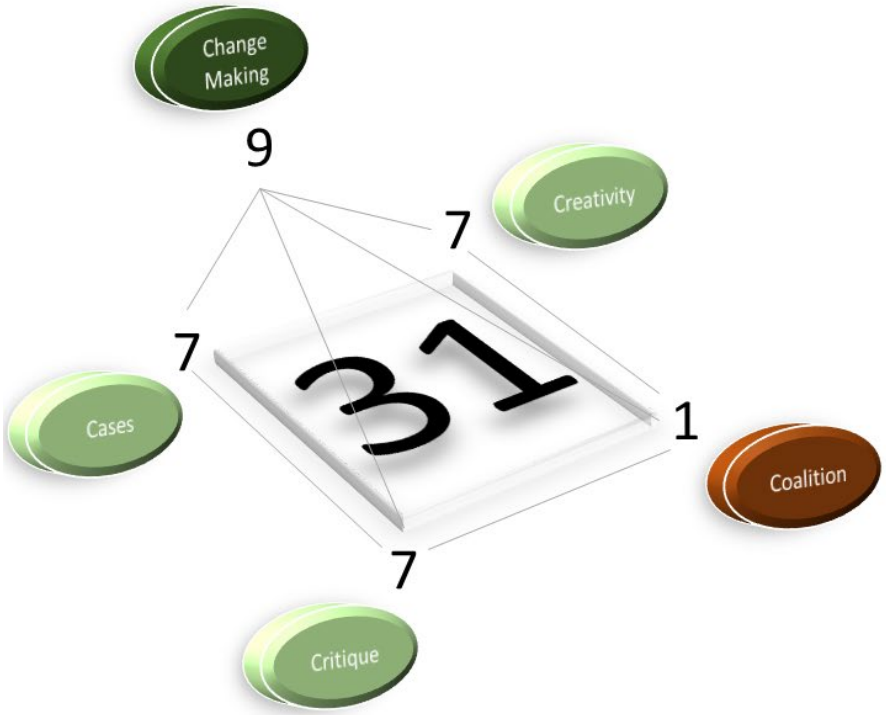
9

MA Envrironmental Policy

Environmental Policy Institute

Memorial University of Newfoundland

6



environment/ policy

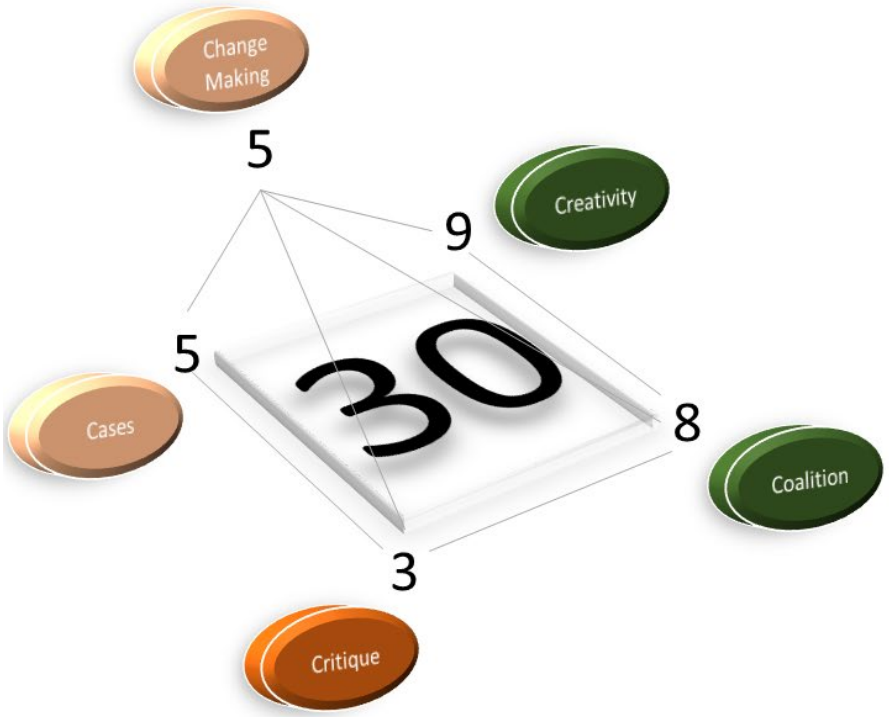
10

M Management Innovation and Entrepreneurship

Smith School of Business

Queens University

7



business

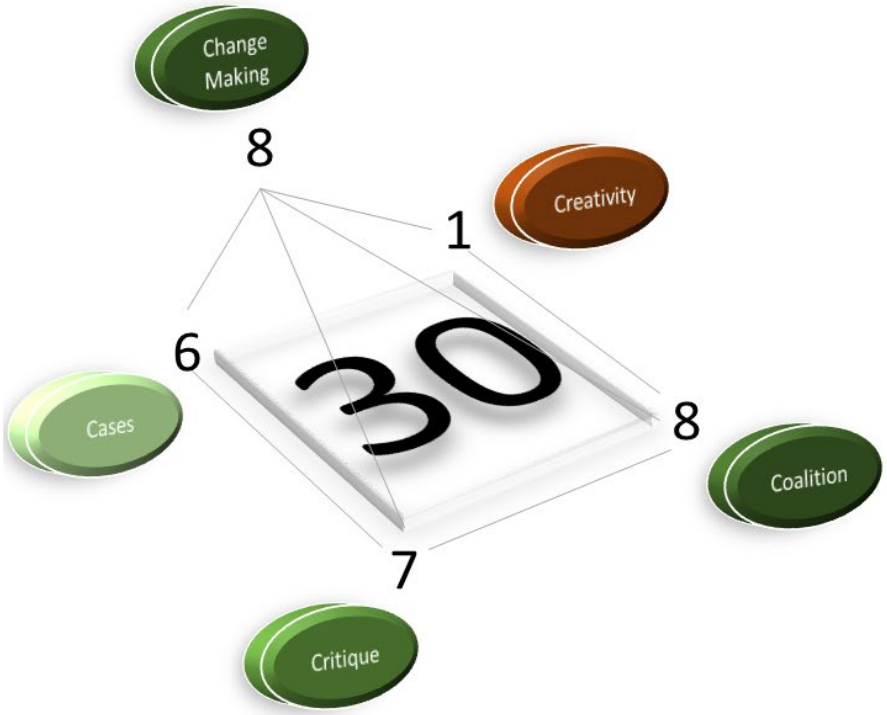
11

MPA

School of Public Administration

Dalhousie University

7



policy

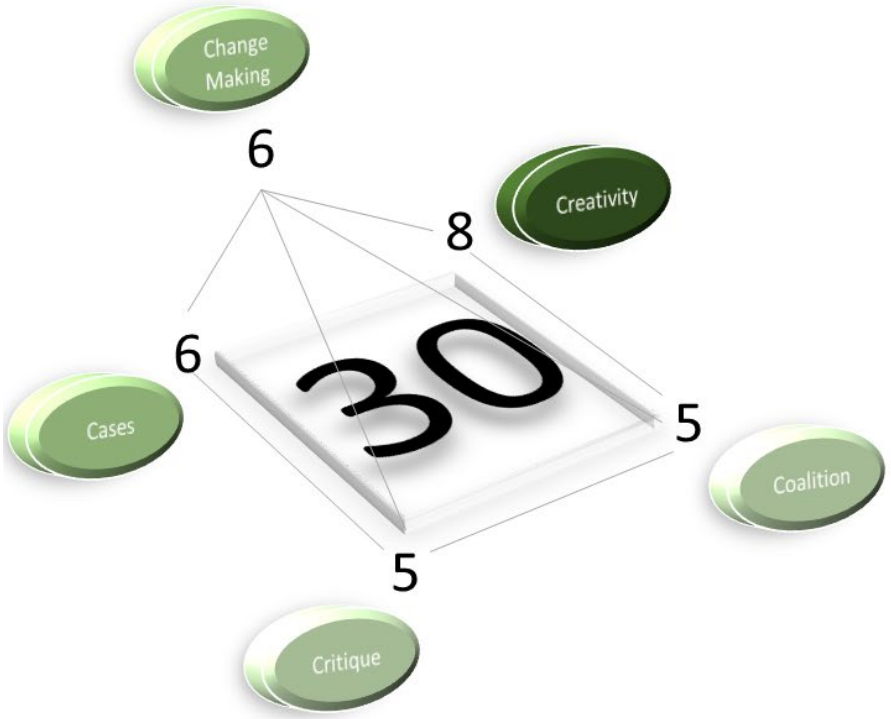
12

Msc Environmental Sustainability

Institute of the Environment

University of Ottawa

7



environment

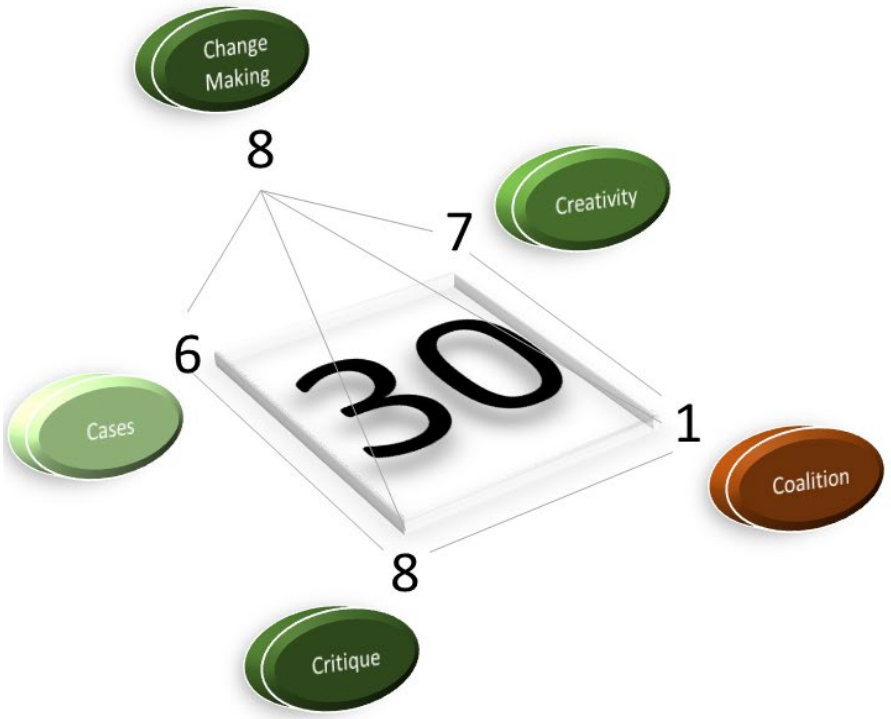
13

MA Environmental Education and Communication

School of Environment and Sustainability

Royal Roads

7



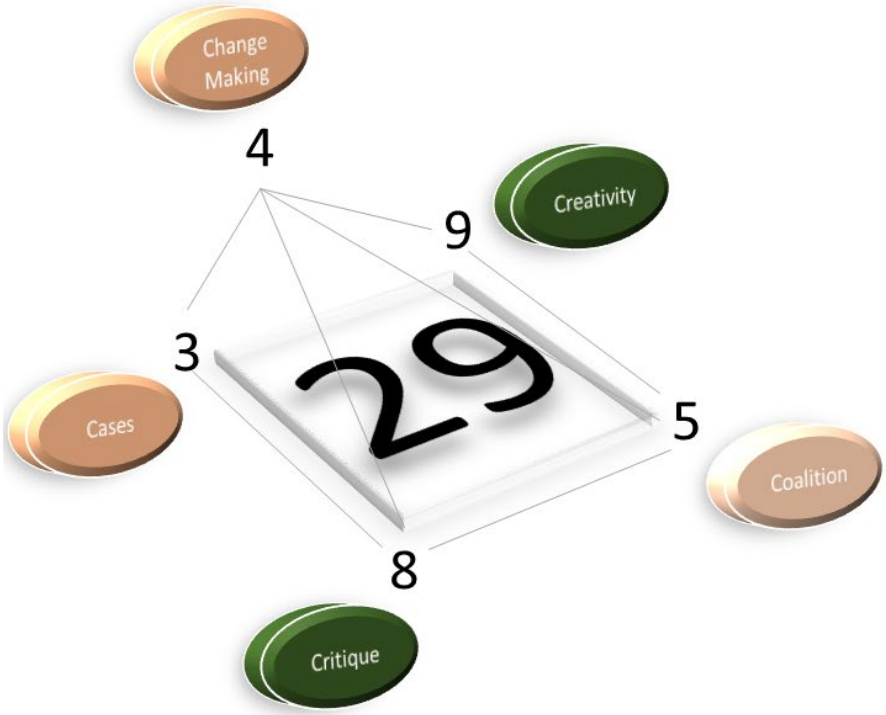
environment/ policy

14

M Des Inclusive Design

OCAD University

8



design

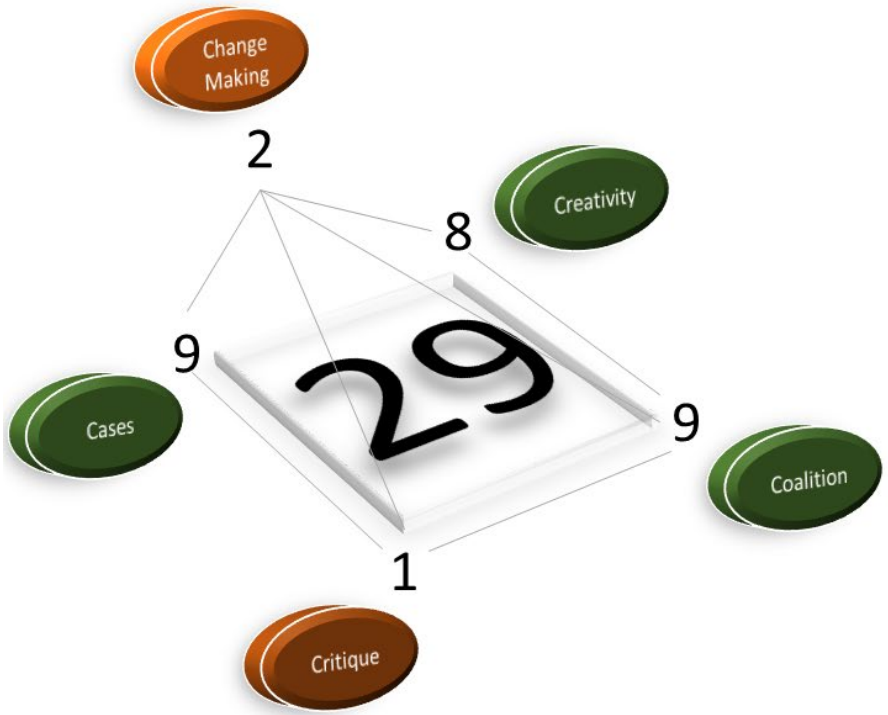
15

PG Interdisciplinary Design Strategy

Institute Without Boundaries

George Brown College

8



design

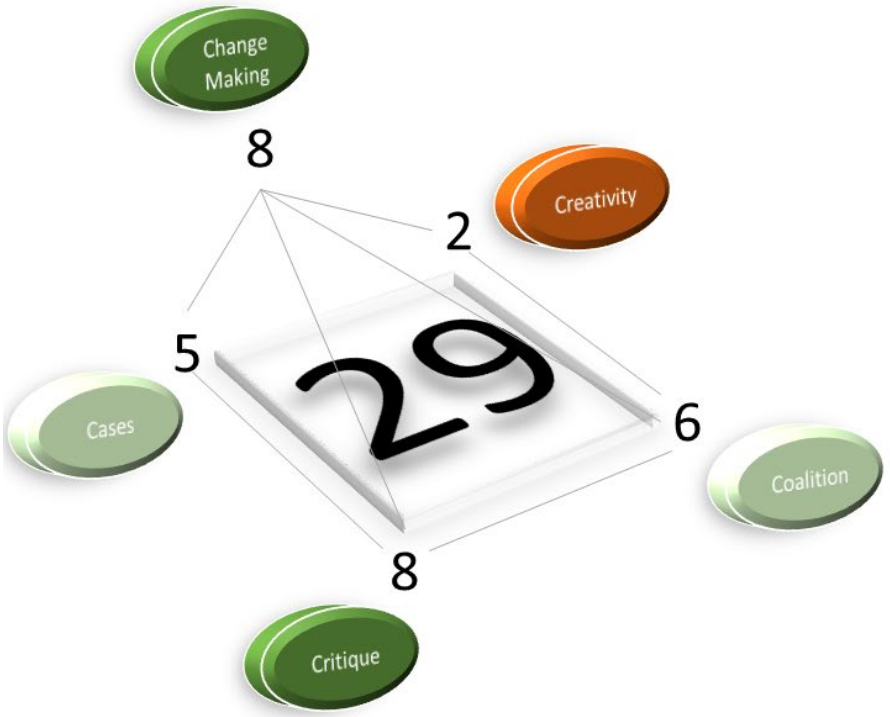
16

MA Public Policy and Administration

Department of Political Science and Public Administration

Ryerson University

8



policy

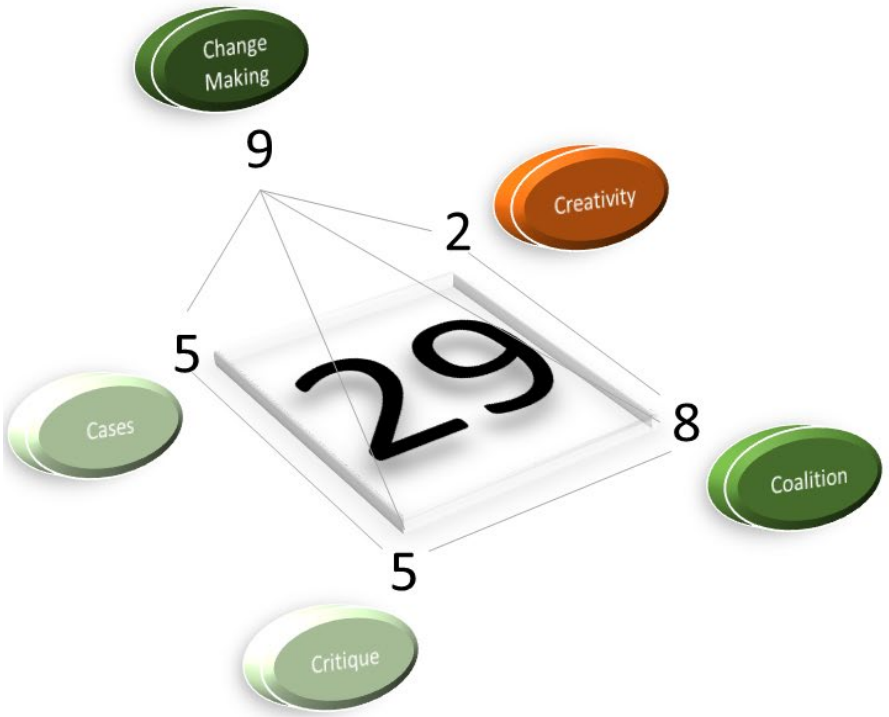
17

MPA

Johnson Shoyama Graduate School of Public Policy

University of Regina & University of Sasketchewan

8



policy

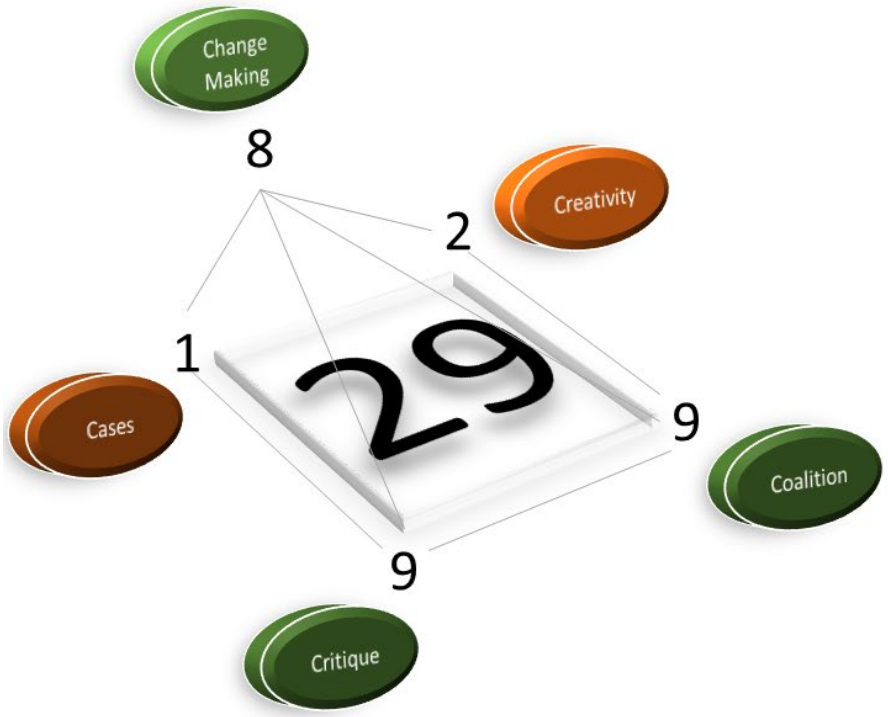
18

8

MPA

School of Public Administration

University of Victoria



policy

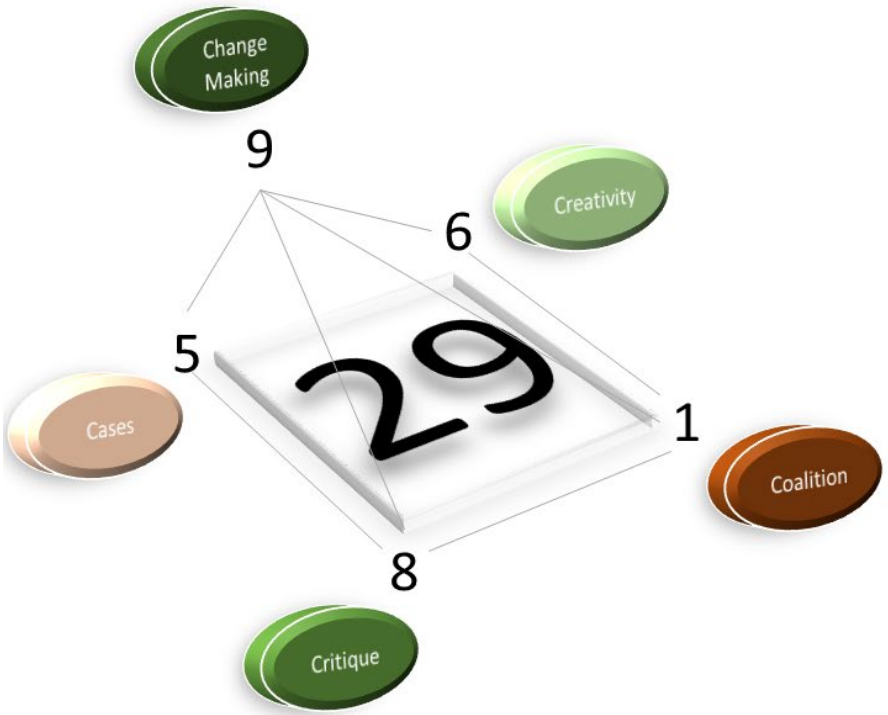
19

Master of Environment and Management (MA and MSc)

8

School of Environment and Sustainability

Royal Roads



environment/ business

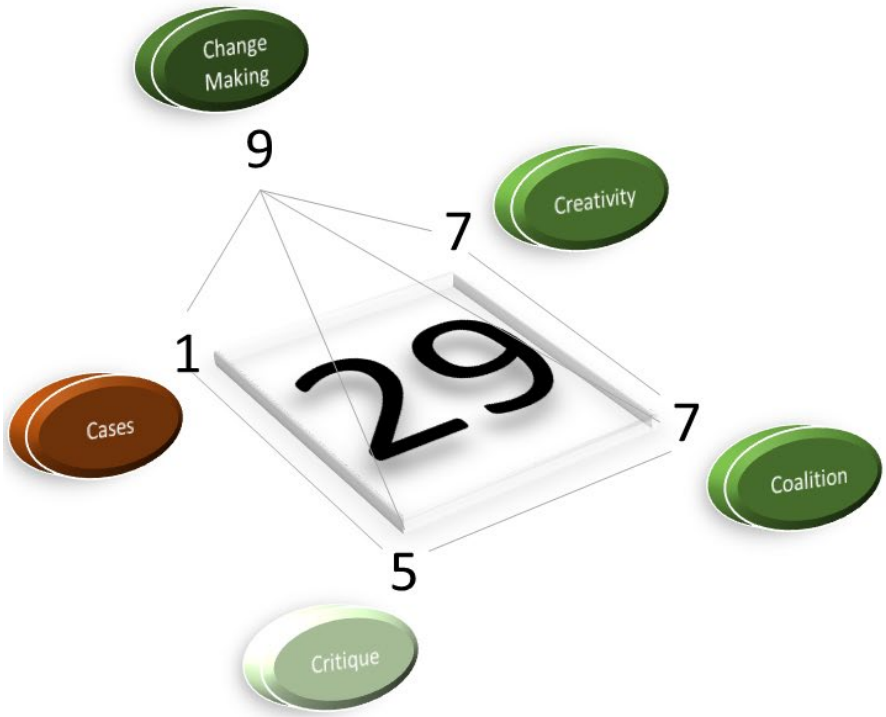
20

MSc. Earth Sciences - Environmental Sustainability

Ottawa-Carleton Geoscience Centre

University of Ottawa/Carleton University

8



environment

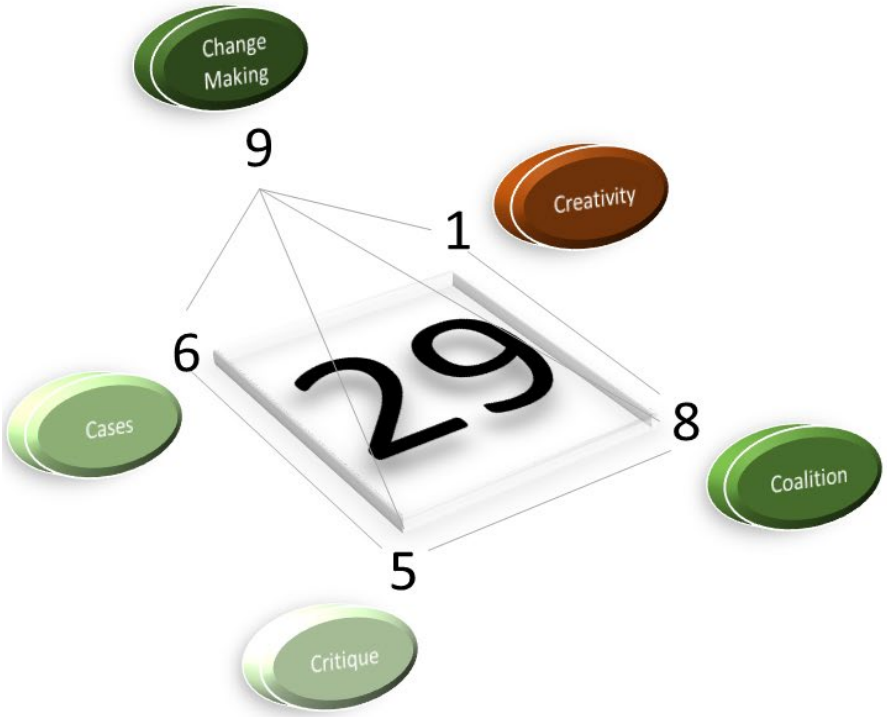
21

MA Sustainable Energy Policy/ MASc/ MEng Sustainable Energy

School of Public Policy and Administration and the Faculty of Engineering and Design

Carleton University

8



policy/ environment

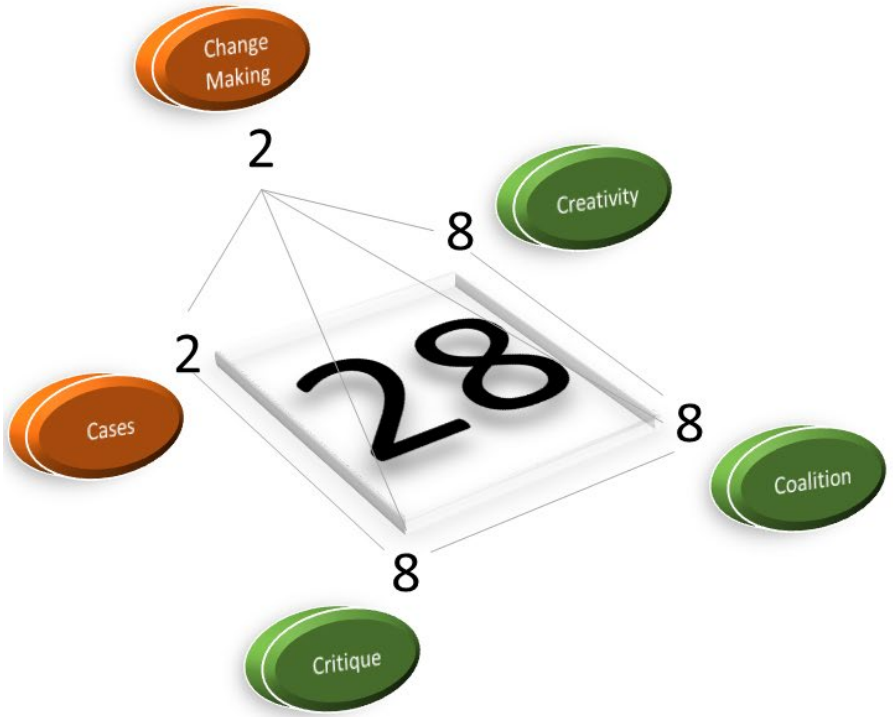
22

M Design

School of Art, Media, Performance and Design

York University

9



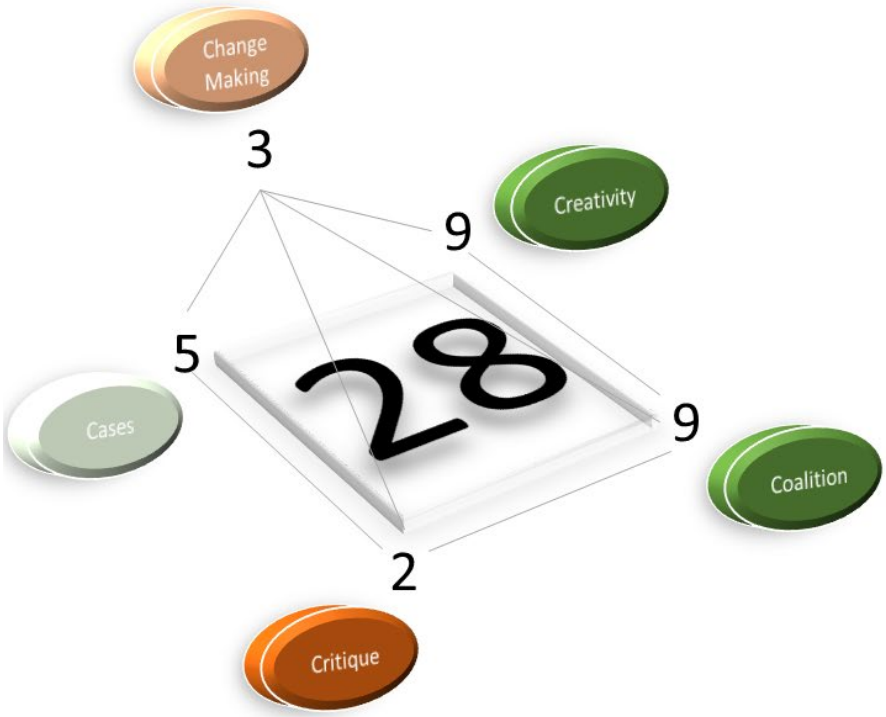
design

23

9

M Design

Emilly Carr University



design

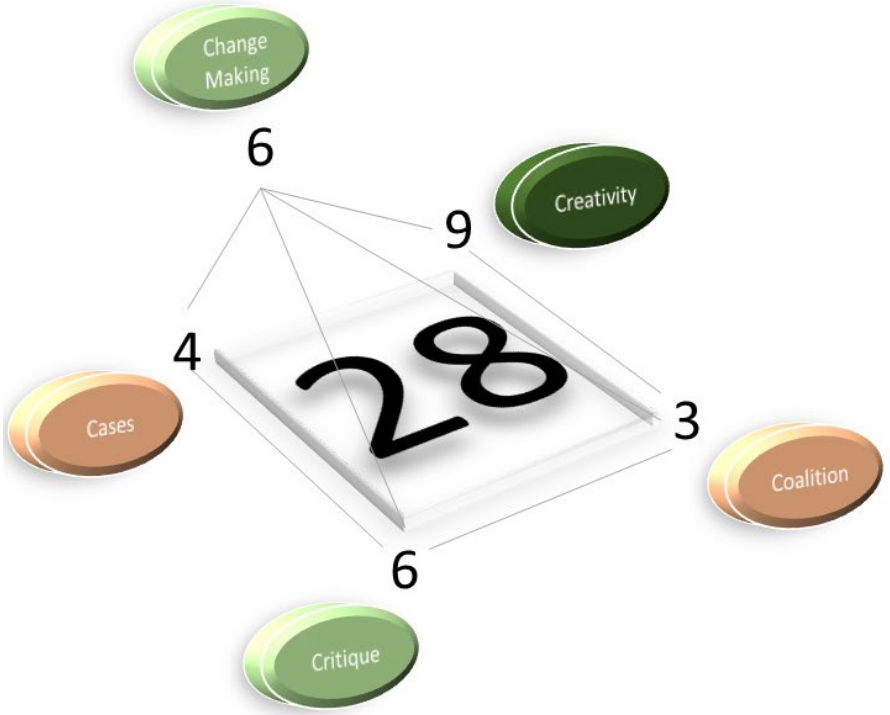
24

BBA concentration in Social Innovation

Bissett School of Business

Mount Royal

9



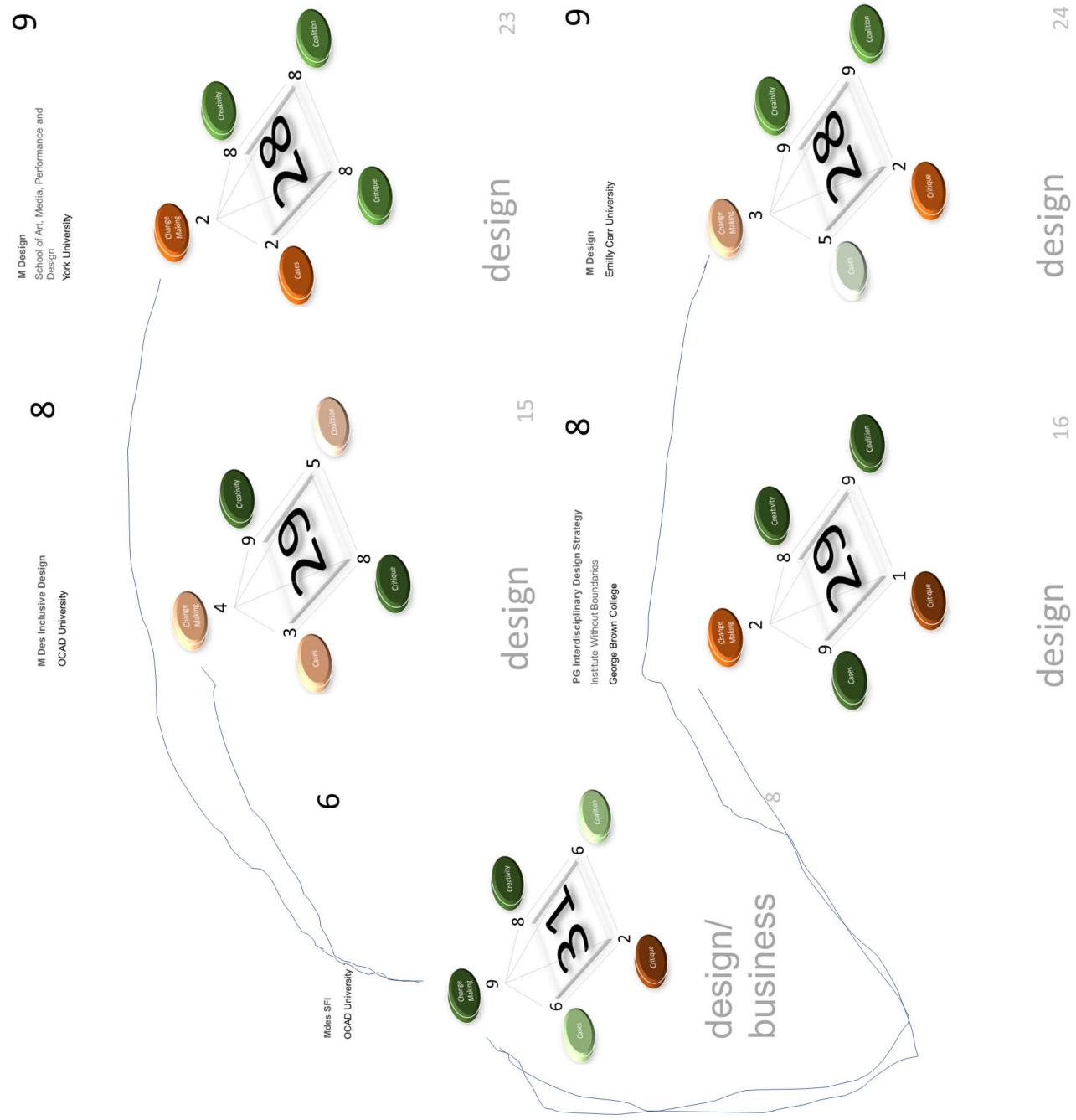
business

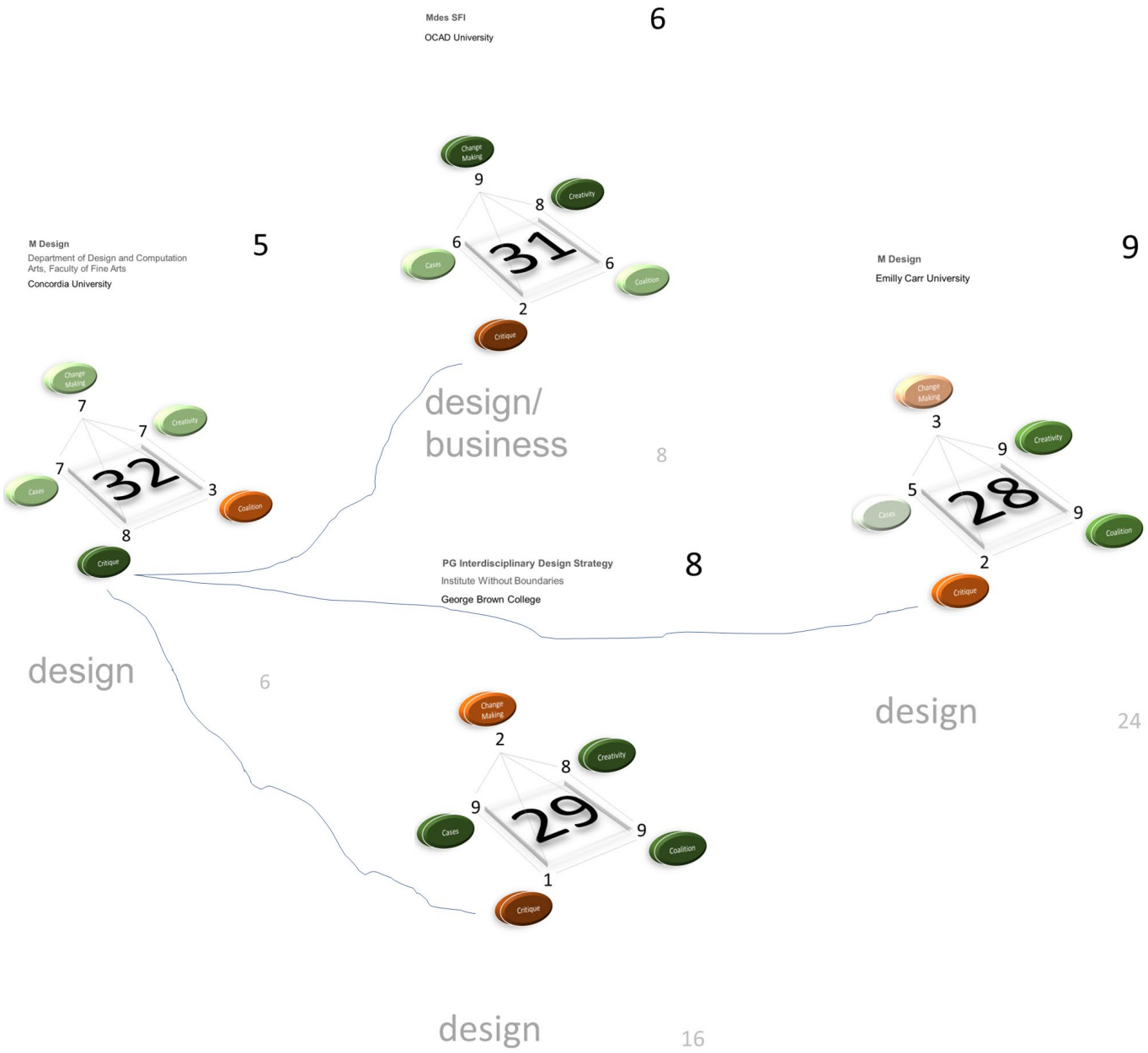
25

Design schools only
Different patterns:
Main config (6 links)
Feed-off 1, Feed-off 2, Feed-off 3
Average 29.5

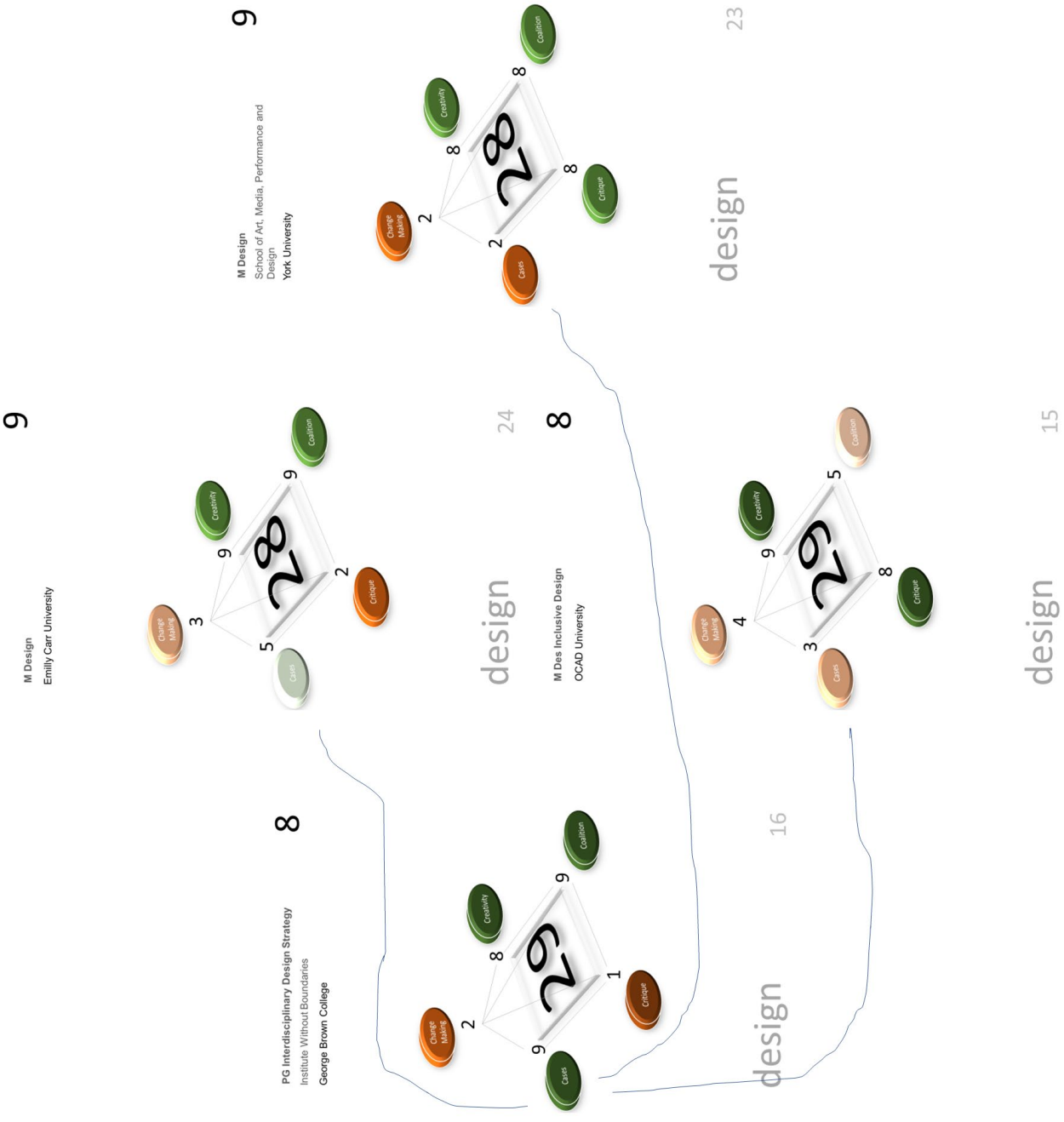
Appendix C: Combinations

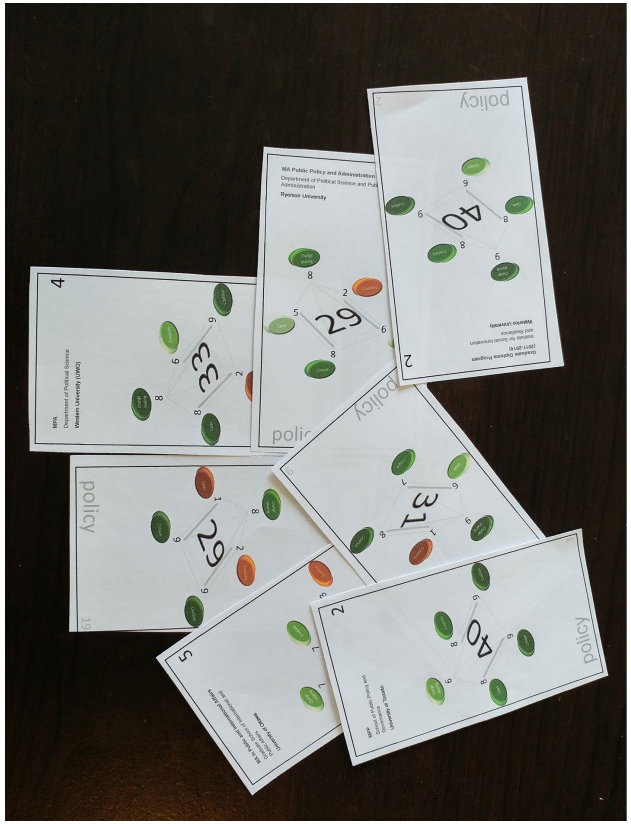
Appendix C: Combinations




Mdes SFI
OCAD University
6
Change Making
9
Creativity
8
6
Cases
31
6
Coalition
2
Critique
M Design
Department of Design and Computation Arts, Faculty of Fine Arts
Concordia University
5
design/ business
8
M Design
Emilly Carr University
9
Change Making
7
Creativity
7
7
Cases
32
3
Coalition
8
Critique
Change Making
3
Creativity
9
5
Cases
28
9
Coalition
2
Critique
PG Interdisciplinary Design Strategy
Institute Without Boundaries
George Brown College
8
design
6
design
24
Change Making
2
Creativity
8
9
Cases
29
9
Coalition
1
Critique
design
16

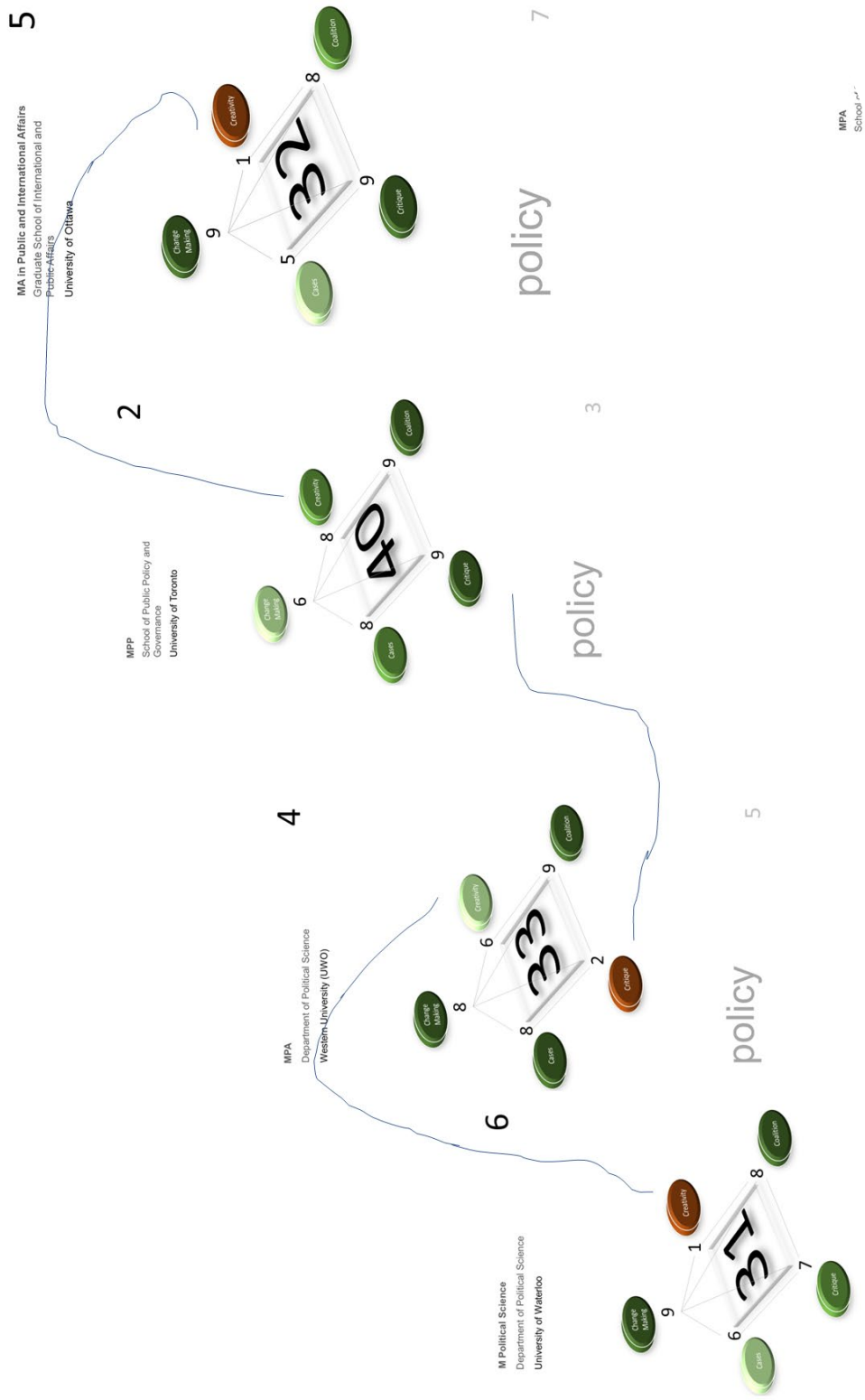
Appendix C: Combinations





Policy schools only
Links are linear (6)
To be noted is that this list contains two 40+ schools as well
Average 33.4

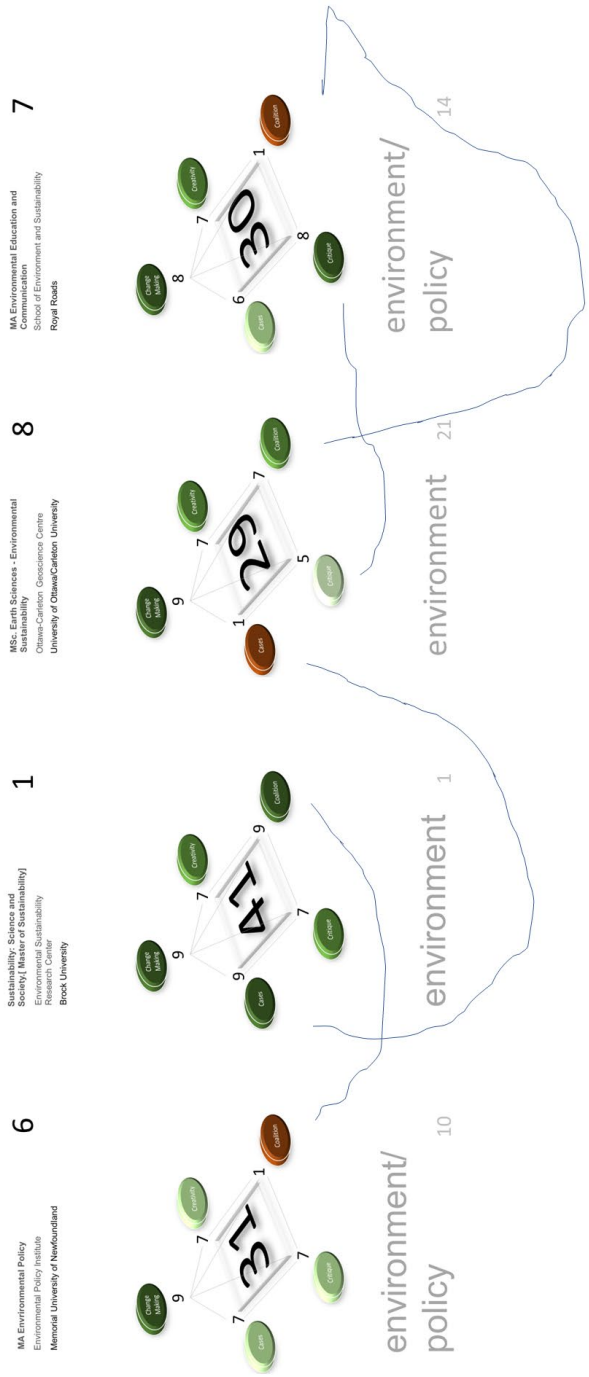
Appendix C: Combinations

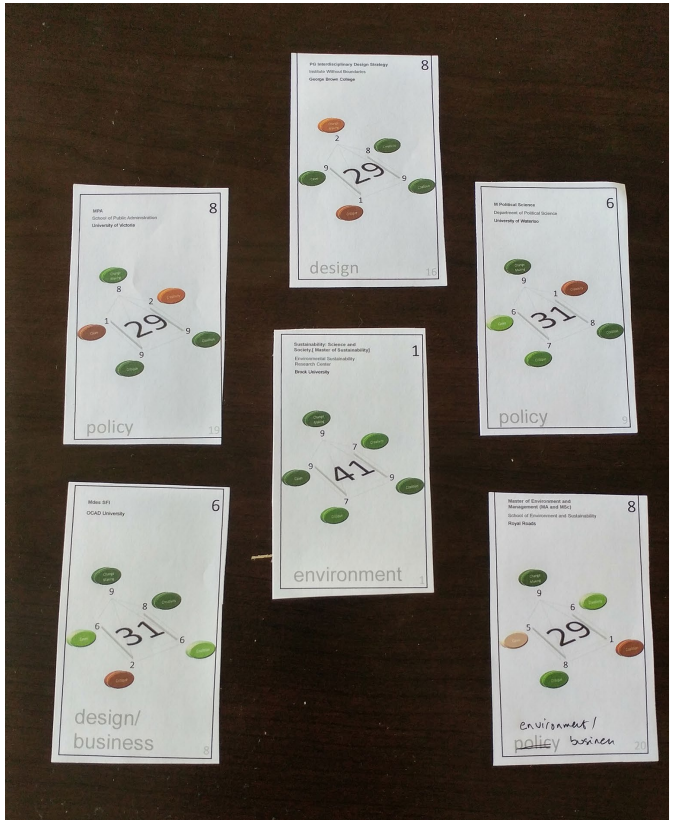


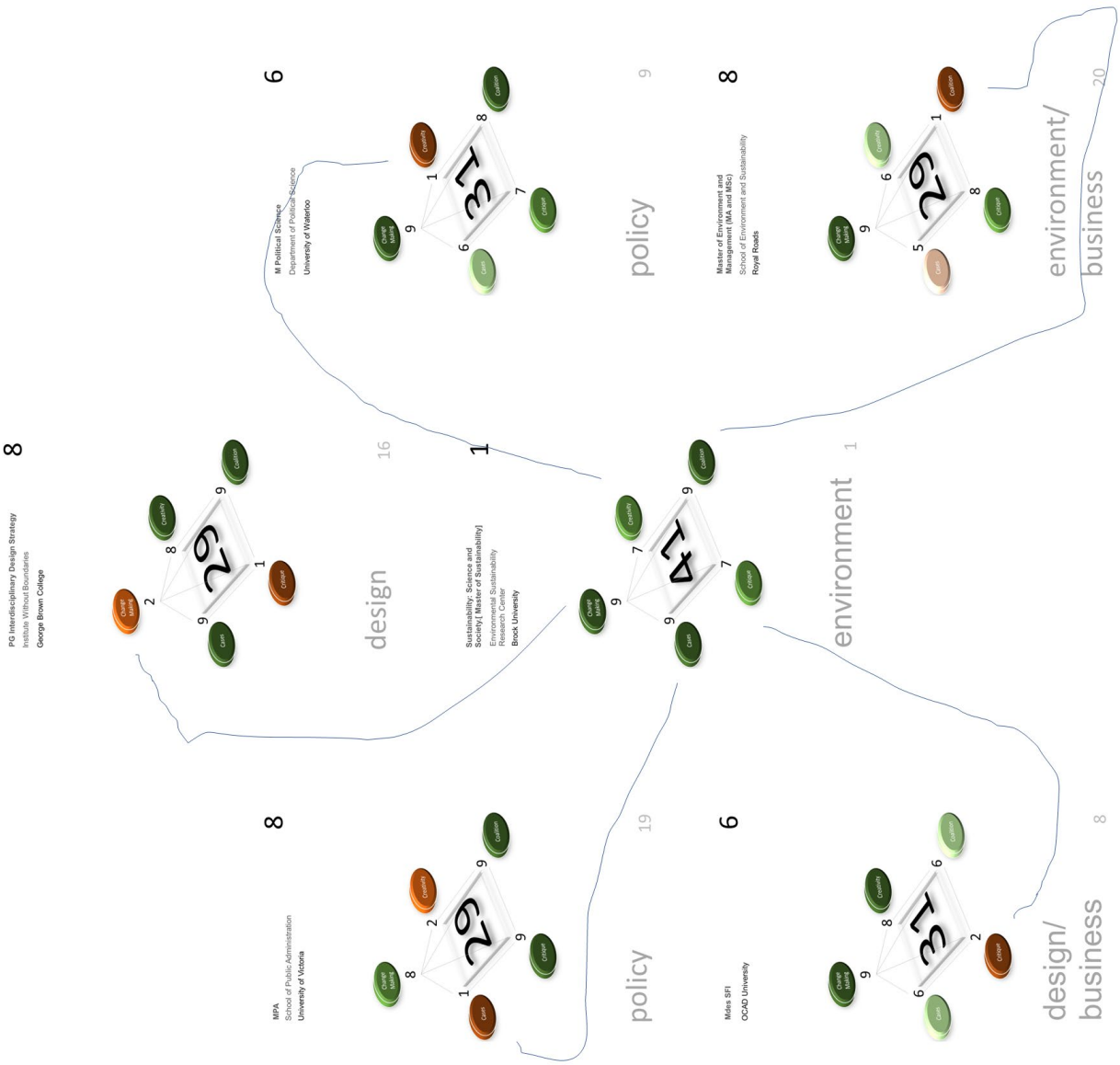
Appendix C: Combinations

Environment schools
Links are linear (4)
Linear connection
Average 32.75

Appendix C: Combinations





Deathstar
Links are in star format (5)
Average 31.7

Appendix C: Combinations