A system approach to design learning.

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For the last few years some design studios at the Oslo School of Architecture have explored a system-oriented perspective to design. The background and ultimate motivation is caused by globalisation. The human world is becoming increasingly entangled in networks of complex interdependencies and relations. An intervention or systemic change in Europe can have critical impact somewhere else on the planet. Even seemingly insignificant artefacts have an influence on the systemic context they are embedded in. If we want to solve the resource situation for the future and avoid the destruction of the planet we need a consistent concern with the systemic influences of our artefacts and actions. More than ever it matters what we do and how we do it. Today we talk of sustainability in a much more inclusive way than before. The social, political, material, and technological sides of sustainability are interlinked.

We believe that design thinking can play a crucial role in engaging with difficult problems in complex and fuzzy situations with many crossing interests and involved stakeholders. This belief is shared by an increasing number of experts from other professions like management, engineering, and politics. This opens a golden opportunity for design to be heard and to make a difference. But to do so requires a more intensive research into these special aspects of design. It also requires the training of designers to engage with a growing number of aspects. The involvement needs to be both deeper and wider than what is normal in design education today.

Especially there needs to be focus on the relations between different actions and their consequences, between forces at play, between politics and consumption, democracy and production. It is maybe the only way for design to move from the production of garbage to becoming an important contributor in the solving of the most pressing issues.

This way of thinking is generally associated with system-oriented approaches. These approaches are recently by several theorizing professionals and professional researchers understood more as a skill than as consistent theories. These skills of managing and designing for hyper complex situations, needs to be learned as a practice. The ways this is learned and practised needs to be researched by practitioner researchers who are able to develop it further from within the professions. The result will be new generations of managers, politicians, engineers, designers, urban planners and architects, able to respond in a more intelligent way to the effects of globalisation.

The project presented here is an example of a system-oriented approach in design education. It is a collaboration between the Deichmannske Library in Oslo, two student groups at the Oslo School of Architecture and Design and the HFG Offenbach, the design research network OCEAN and professionals from the company YNOR in Norway. Its main goal was to design and construct a number of media stations for the library. From the Oslo perspective it had a second intention; to train the skills needed to involve in very complex design projects. The project created a learning environment that was highly complex and challenging for the students and researchers involved. The intention was to learn the skill of a system approach in design and to research better ways of doing this. This was only partly successful and there are

some important lessons learned from the experience that could contribute further in the development of a system-oriented approach in design education.

System thinking revisited.
System thinking has gone through several generations, from being by many regarded the new meta theory, the theory about everything, until it is almost invisibly integrated in everyday design work. There has been a subtle change in many schools from a lacy interpretation of the Bauhaus pedagogies to a more research-based approach. Actually the Bauhaus did implement an idea of interaction with the world and its pedagogies were complex and advanced. The unfortunate simplification, only implementing one aspect from the Bauhaus, the idea of the "tabula rasa", was a later trend. Very simplified beginning from scratch and the idea of the "tabula rasa" was meant to disregard historical forms and styles, but nurture a design intuition based on contemporary social, economic and technological forces. (Wick, 2000) This is very much related to contemporary system-oriented approaches.

Today most design processes contains a quite extensive research phase where the students or designers try to understand as much as possible of the task and its implications. Also the idea of an ideal design solution has long been replaced with ideas of negotiations between stakeholders and agents influencing the "field" in which the design is embedded. In this complex field of cultural, political, material, technological, and economical forces the design has to prove itself.

Though this quite normal way of thinking is a true child of the system thinking era that started in the 60ties, it is today taken for granted and implicit to a degree that it is partly neglected. Designers in general do not have a great attention to system thinking as such. Christopher Alexander demonstrated the difficulties a designer faces when all aspects of a design task and their interrelations are mapped out.(Alexander, 1964) Though he attempted to create mathematical modelling of these complex relations this attempt was rejected by him; and later he moved on to the concept of patterns to explain an operative way of designing.

The reason for the lack of attention to system thinking in design might be that system thinking has gone through several crises, stemming from the failure of prescribing a methodology for synthesis. In other fields like meteorology and ecology, the discovery and registration of relations in very complex fields and their computer simulation and modelling has brought science miles forward. In design and similar professions and sciences we face much more severe difficulties because descriptive simulation is not the end. The research, building a deep and broad understanding of complex interrelated issues in a design project, is only the first step. This research is also not only descriptive but it generates its own material in the form of possible design solutions.

From the descriptive and generative research, before it and during or after it, there goes a parallel, intertwined and overlapped process of synthesising the myriad results from the investigation. The relation between the descriptive, generative and the synthesis is sometimes so complex that we are looking at a model of heuristic spirals rather than phases in a design process. We deliberately leave out the term analysis here following Gedenryd's critique of the classical model of analysis and synthesis. (Gedenryd, 1998) Gedenryd criticises the different ways the design process is separated in current design thinking. Instead he suggests that the design process is much more dynamic and holistic and that synthesis and analyses are intermingled through out the process.

Holistic synthesising is not possible to compute since relevance is impossible to compute. Only recently these problems have been addressed in the last generation of system thinking. The new system thinkers compare this synthesising process with an art and with the activities of an architect. (Maier & Rechtin, 2000) They constructed the term System Architecting to define this new role. (Rechtin, 1999) The emergence of a new role or profession of System Architects has happened within different professions which all have in common that they are concerned with the creation or construction of something new. Maier and Rechtin in management and organisational building, Mariussen e.g. in politics (Åge Mariussen, 2006), in engineering, my example is the project leader of the advanced marine weapon systems at the Norwegian Defence Research Institution Jon-Mikhal Størdal (Størdal, 2003) In politics, engineering or in management the modification of existing and the building of new systems reach beyond the descriptive state. There is a growing interest from management theory to design thinking.(Boland & Collopy, 2004)

These new generations of system thinking embraces the artistic and intuitive as a main approach to synthesis. The terms System Architect and Architecting adapted by management and others honour the architect and his or her assumed intuitive creativity, their holistic approach and ability to manage very complex situations. Ironically, the new awareness to system approaches and the new methods for navigating in very complex projects developed in these fields has not received much attention in the design professions and they have partly fallen behind.

Early system thinking regarded systems as something mechanical, cause – effect driven. The system was defined by its borders and its structure was regarded to be hierarchical. Systems were sorted hierarchically into suprasystems made up of several systems and them again of subsystems. (Skyttner, 2005) This is an unsatisfactory model since, though admitting that the borders of a system are hard to define and that there is always an input and output crossing these borders, the definition underemphasises the importance of cross relations between what we still might want to define as subsystems embedded in vast fields of interactions. The hierarchical ordering also makes less sense when regarding phenomena like the butterfly effect, were small changes in seemingly unimportant sub- or micro systems might have a large impact on the big field. Systems today are rather described by their interactions than defined by their borders.

Christopher Alexander already in 1964 demonstrated a system view that is more focused on the network of relations and interactions expanding infinitely, than defining the systems by its borders. He also described already then these systems forming patterns of forces and emphasised their diagrammatic aspects. (Alexander, 1964) Contemporary system thinking realises the complex relations and the blurred boarders between what can be identified as systems. We have a more explicit understanding of the artificiality of these entities and their borders. We realize that they might be of a semantic nature like the human body or institutional nature like the Deichmannske Library in Oslo. The boarders of these entities are real at the same time very much perforated and fluid and often more semantic or institutional than substantial or defined by the transitions between systems that co-operate. Neither the human body nor the Deichmannske library is able to exist by them selves. Their in- and output is so complex that it is hard to really distinguish the entities' border. They are integrated into much larger systems of social, cultural, physical and economic interactions to a degree that if one really zooms in to a micro level the borders blur. This is relevant for the physical existence and interaction of the body with other living matter (other people, organisms, metabolism and microbes) but is also relevant on a cultural or cognitive level

where it is hard to distinguish really unique ideas. In contrary if it would be possible to really see ourselves from the very outside of our existence we might appear having a sort of hive-mind. It is therefore difficult to understand these entities isolated, the man as a physical body or singular creative individual only and the library as a building. But this is what we normally do. It is not a wrong conception but it is incomplete. This does not contradict the idea of a self-conscious mind and the existence of a free will. Individual or collective creativity might be essential to make an interrelated system adapt and survive in the long term. Creativity is hence described as a complex phenomenon influenced by social, political, professional and individual conditions.(Sternberg, 1999)

Modern system thinking works along a much more holistic and intuitive understanding of entangled systems than before. These new approaches regard them selves as dealing with the "unmeasurables" using non-quantitative tools and guidelines based on practical lessons learned. System architecting is regarded to be an inductive process. Several of the new system thinkers are talking of system architecting as a speciality, almost a profession equal to e.g. engineering . " Engineering is more of a science, architecting is more of an art" (Maier & Rechtin, 2000).

The Library is not a building.
In the Deichmannske project, system thinking was involved on several levels. It was a back drop, a way of approaching the library and a way of understanding it in depth. It was also seen as an approach to the learning environment the studio created, and how this environment, though complex, partly chaotic and with an uncontrollable group dynamic was able to solve an overwhelmingly challenging task in a very short time. The studio was in this sense as much an experiment in social group dynamics as it was a design studio. We will return to this aspect in the end.

In the beginning the Oslo group was given the task to do extensive investigations of the library. The task was not to find the truth of the library and come up with one more or less agreed and consistent description, nor was it the task to create a design brief for the media pods. The task was, regarding the library as a very complex organism, to produce numerous different interpretations. It was to understand Deichmannske beyond the cliché and archetype of a library. It was to "rediscover" what was really there, to unlearn the schematic preconceptions and to explore it with fresh eyes. Earlier teaching experiments at the Oslo School of Architecture and Design used observation as a technique for rediscovery and breaking schematas to arrive at new innovation.(Sevaldson, 2004). To understand the library as a complex organism had its own value, independent of the media pod project and was regarded as a partial result of the project. The investigation was done with an open ended starting point. The idea was to capture the unexpected events that take place at the library. Without knowing the library one could also not know what was relevant for the project. The filtering of the collected information according to relevance to the media stations was done later.

The question of relevance is a very difficult one. Normally in a design brief one only includes the information that one immediately can see has a direct impact on the final design. In this way one might exclude the more uncertain points and also the backdrop of the whole scenery or the ambience of the project. A design brief normally is written as points and the final design is often evaluated according to the design brief. The design brief can only hold a

limited amount of points and it is difficult to maintain a priority between the points which tends to even out the design solution while low priority points that can make a difference, tend to get lost. As long as all fairly important points are met in a satisfactory way the design solution is approved. Subtle and more unclear qualities tend to get lost in the design brief.

The complexity of the library would be partly captured and represented by doing many different readings and interpretations. Any collection of facts, information, and patterns of usage would be regarded as incomplete since it only looks at a limited perspective using a specific filter. In any case a description is a reduction of the real world. By interpolating several different and incomplete readings it might be possible to intuitively grasp a more holistic understanding of the library. The different readings of the library were done in parallel, and together they form an overall picture of the library as an organism. Observations of usage patterns and registering of unique phenomena and events, video of chosen sites, the drawing of diagrams that clarified interpretations of the important issues, results from workshops on and off site were collected produced and presented.

This complex information backdrop that the open- ended investigation created would produce a different kind of sensibility towards the library and its context than the information in the design brief. It is not summed up in points but as a rich visual textual and diagrammatic material and a deep knowledge of the whole library by the students who participated in the research. When the research reached its completion it was combined with a traditional but extensive design brief created by Reinert Mithassel our collaborator at the library.

 The research and observations were limited to the public side of the library and mostly the interior of the building. One could imagine them being expanded to include the "back stage" the storage, all the different supply systems for energy, materials, food, electronics, data, ventilation etc. Also one could imagine an analysis of patterns of traffic and usage seen from the outside, the surroundings in different scales all up to the city scale or bigger. One could also imagine analyses of the library as a supra system, the Deichmannske main library being the head of a bigger body of smaller local libraries spread all over Oslo. Or one could try to understand the library in a cultural context looking into the reading habits of the different social and ethnic groups in the city, or looking into how the library supports the spread of knowledge and reading culture. Another aspect would be political, how the public library has been a tool for giving equal access to knowledge to the whole of the population in a social democratic society. In this way the magnificent complexity of the library could be unfolded.

The different possible readings of the library demonstrate that what often is identified with a building is much more than this. The library is not a building. The non-material or unsubstantials of the library are actually what constitutes it on a much larger scale, and having a wider- reaching impact than the building itself.

Looking at all these possible readings of the public library it is easy to agree that these studies would exceed the time and resources available in the project and the above mentioned limitations to the actual building and its interior are well justified. Even so, the reading uncovered many interesting aspects. These included the social dimensions of the library. Many people use the library as a meeting place. A substantial amount of people use it as a workspace, benefiting from the free internet wireless access and silent workspaces without using the other services. Others use it for very specific activities e.g. for watching films or they establish their own territories by occupying specific places repeatedly during the opening hours.

The lobby space where the media stations were to be sited was observed especially on a more fine grained scale than the rest of the library. A whole day video of the area was produced. Different video techniques were used to give an overall picture of the patterns of usage. Amongst them were time manipulations, speeding up the video and graphic filtering, blurring the singular users but clarifying the global patterns of use.

The idea for the whole lobby area was to approach it in an inclusive way where the different social activities registered on this special spot were preserved and giving space to potential new ones. Amongst these were waiting for people, waiting for access to internet stations, browsing, watching movies, conversation, information, eating, drinking coffee, etc. For the overall new layout of the whole area the social part was emphasised.

Doing this sort of research and synthesis of a new intervention is a skill that needs to be rehearsed and trained. It is to a large degree a tacit knowledge. Especially the ability to generate an inclusive and rich holistic picture and to continue into a creative process where new solutions are synthesized is challenging and we can frequently observe in many schools that there is a lack of continuity between the research and the design outcome. This is partly also the case in this project but for different reasons than normal. The research had not only to be transformed into a practical result but this had to happen across two separate student groups which were located in different cities and in different cultural and language contexts. The research findings had to be communicated from the Oslo students to the Offenbach students on a stage when the research was finalised. Keeping in mind the nature of the research, that it was very rich and partly only accessible as a tacit feel for the ambience of the site, the challenges of communicating this type of information was underestimated. Though the information was transferred in what traditionally would be a good way it was far from sufficient to bring the German group really into the "thick of it". The situation then in periods became more of a negotiation between different interest groups than a collaboration based on a shared perspective.

Despite these difficulties the filtering down of the results to the final media pods is there, though subtle and partly invisible. As an example there were lengthy considerations of the issues of privacy contra being in a social space. These discussions would hardly have been so substantial without the research. The media stations were designed so that they gave a good enclosure for privacy without totally cutting them off from the surroundings or without making them into totally individual territories. Many other issues had to be sacrificed because of the time pressure to finalise the product. A longer design period giving space for a deeper communication between the groups would have been needed to implement more of the different issues that were brought up by the research.

There are many other aspects to the design, and the design process but these are to a large degree covered elsewhere in this booklet.

The learning environment and social dynamics. To expose students to a high-risk situation which is socially, logistically and communicative very challenging was in the tutors' view of high value. In fact, this is actually what draws the attention from e.g. management to design thinking; the assumed ability in design to act and work in the world and synthesize a solution from such a difficult starting point. Though there is a truth in this, that designers practice can be a valuable inspiration for other professions like management, from my point of view the

systematic exploration and development of these abilities largely have been neglected in design education. A typical studio project often prefers to work with idealised and framed design tasks rather than throw students into the complexity of dynamic design work, to train the skills needed to act, negotiate, and interact.

The concept of Thrownness (Weick, 2004) derived from Heideggers "Geworfenheit", suggests that we are thrown into and immersed in the world to a degree that any idea of detached action or planning is illusive. In contrary we need to understand and act under constant influence and in interaction with the world. "Thrownness" e.g. as an incident commander at the scene of a disaster will experience it, suggests that you can not fully predict the effects of your action. You cannot avoid acting because doing nothing affects the situation as well. Every representation is an interpretation and language is action.

Other writers suggest open planning, tolerance of ambiguity, maintaining multiple models through long periods of the design process, reducing the need for coordination (Boland & Collopy, 2004) These are skills which are assumed to be typical for designers. But we are as designers less aware of it, and there is a need of researching, developing, and cultivating these skills especially.

The studio was such an attempt to train these skills. Though this was communicated in the beginning it is still a challenge how to really prepare the students for such situations. As mentioned, they are used to a more traditional approach in design education, which is to expose them for fairly well-framed and idealistic design projects. The learning environment in the studio consisted of two unequally large student groups at different locations in Oslo and Offenbach, with different languages and cultural backgrounds, starting and ending the project at unequal times, the two schools and their environments and the boat builder company YNOR in Kragerø Norway, communicating over distance partly by a limited amount of travels and by electronic media, email, a blog, and web conferencing,. It could hardly get more complex.

The understanding of group dynamics in the project is in itself a system analyses. From the beginning we were aware of the difficulties such a project would generate regarding the group dynamics. Different individuals, some of them having stakes already in the project (two students working with the technology from earlier), the tutors being involved in the idea generation and the global concepts, the network OCEAN that was the crucial precondition and background of the collaboration and a guarantee for the quality of the result, the expectations from the library and the different student cultures meeting in the project all rendered it to be a pretty high risk endeavour. The project then also did not go without some friction. As a result, some of the Norwegian group decided to split and do their own project after the system analyses of Deichmannske was finalised. This was a calculated risk and was foreseen by the tutor.

Another aspect was the very high ambition in the realisation of the project where the construction phase had to be reached very fast. In this phase we involved the professional boat builder Ronny Andresen and his company YNOR. This was again a risky thing to do because it put new challenges to communication between the German student group and the Norwegian professionals. The Norwegian group had at that time finished their part of the project.

The selection of the company turned out to be a really lucky choice. The company supported the project and Ronny Andresen turned out to be an enthusiastic and energetic tutor with a big talent for teaching and to spread enthusiasm and to share his deep knowledge on composite production with the students. He was greatly appreciated by the students. Without his support the project would not have reached its goals in a proper way. The involvement of YNOR ensured a highly professional finish and production and an intense learning period for the involved students who for two longer periods lived in Kragerø and worked long shifts at the production facility. The group, in this period, learned much about production technologies for composite production. The group dynamic during this period was highly energetic and this ensured that the over ambitious design solution was finalised. There were not unexpected frictions in such a high intensity working period and Andresen turned out to have good leader skills in these situations. In this way the learning environment expanded into the ship yard in Kragerø and the experience of a foreign country for the German students.

Looking at all the different periods and parts the project itself weaved a complex pattern of relations, frictions, failures and successes. Within this arena each individual had to find a breathing space, something that was not too easy for everyone. The potential outcome was a learning experience that was unique. Being exposed to a complex project with many stake holders, experiencing the fear of loosing control and some times not being heard while other times getting the reward of pulling difficult problems to a successful solution.

The relations and interconnections in the project were analysed by the Norwegian student group as a system in itself. The diagram shows the rich interweaving of the relations and interactions in the process.

Diagram:::Achim knows which, if it is not found take out this text

Image text: Diagram showing the different relations between actors in the project evolving over time. The diagram reads clockwise.

A rich design space
This kind of very complex design projects I have called Rich Design Space. (A more elaborate discussion on this is under production and will eventually be published in the fall 2008) This concept refers directly to the concept of Hybrid Processes derived from digital design, studied and described in my earlier work. (Sevaldson, 2005) The Rich Design Space is a system- oriented approach to creating a specific design environment. The core idea of the Rich Design Space is to provide a richness of media, material representation, and interaction creating the ambiance of a process so that students first learn to act in a state of "thrownness", secondly will train the skill to keep a larger amount of issues up front and in shifting play over a longer time during the process, third, rehearse the ability to synthesise from this large amount of issues. The more complex and difficult the design task the bigger is the need to keep many aspects, ideas and representations upfront and in play over long time and between large numbers of involved parties. I use the term issues here and not variables. Variables is a numeric term and does not fit to what is the question here. The issues are represented in different ways more as visual material texts and other registrations and interpretations. The techniques used to keep them up front involve drawing, protocols and square meters of walls to pin things up or to project on, big tables to collect materials, all kinds of digital representations etc. The material must be very easy accessible. The preconditions for synthesis are to keep these issues in play. How synthesis actually happens is hard to explain

other than observe it e.g. as Csikszentmihalyi has done it in his studies of creativity (Csikszentmihalyi, 1996)

Synthesising is often an individual process or one between limited numbers of people. Gehri (Boland & Collopy, 2004) and others like the artist Paul Kaiser (Kaiser, 2004), who worked frequently with Merce Cunningham, have described the problems of how intense coordination of collaborations can result in the loss of intensity in the project. The need to reach a common ground and interpretation is growing as the projects grow in complexity and involved partners. The effort put into coordination can kill the project. Artistic synthesis of rich and complex design tasks is typically maintaining intensity and reaching overarching solutions that are full of synergies, flexibility, and openness. The Rich Design Space provides a means of generating a shared "image" of the process. It should lessen the energy put into coordination and it should encourage individual interpretations though maintaining a common feel, ambiance and image of the project that is more detailed, visual, "tasteful" and "smelling" than what would be the case in coordination based on formal agreement. Coordination is done in synergy with designing.

Though the synthesis is largely dependent on individuals, it is not necessarily appearing in one big step but happens regularly and incremental and can happen in chain reactions between individuals. How to balance the design collaboration with the individual, especially in student groups where everybody wants to make an impact, remains to be explored. In this project it was done by introducing to the students the idea of the value of the intermediate result and the "ghost project". Any result during the process was valuable and would potentially be useful at a later stage if it was not implemented in the project. If very valuable concepts were found which could not be included in the final result a parallel project ("ghost project") should be maintained by the student. The part results should be documented and collected for later. This was only partly successful.

Lessons learned
From the perspective of the tutor there are four questions that stand out as the most important issues to discuss further and to solve better in future similar projects:
Questions about communication, output and results, risk taking, and creativity.

For future projects an individual delivery form each student in the form of a systematic diary or protocol would be useful. It should include registered experiences, sketches, and solutions that didn't make it to the final product but that have great potential for future development. Central in this diary is the individual reflection of the student. The diary ensures the individual learning outcome and its evaluation. It also is a central tool to nurture individuality and each student's creativity. Here follows a short discussion on the four main questions that need to be addressed in a similar future project.

1) How can we most efficiently communicate deep knowledge from researchers to larger project groups, across distances and cultural barriers, and across different time spans and periods of involvement?

Though there was an extensive usage of blogs, video conferencing and also travelling to participate in common workshops it was very difficult to maintain a shared understanding over the distance between Oslo and Offenbach. The issues with slightly different tasks did not make it easier, either. While the Oslo group was working with the system analyses and the

beginning of the project, the Offenbach students where focussed on the design and construction. The experience of lack of reaching through was partly real and came also from the big pressure put on the Offenbach group to realise the project within the time frame.

The difficulties to transfer knowledge from the research group to the Offenbach students were clearly underestimated. There was too little time set aside for the knowledge transfer, and the German students were only engaged as passive listeners. In future projects there needs to be more time to do this and the receivers of the knowledge need to be activated in knowledge generation from the collected material rather than being passive listeners. They need to reach a feeling of ownership to the back ground information. Ideally, the knowledge transfer would happen on the site and over a few days where the students could shift between presenting and discussing the collected material, exploring it on site and doing quick additional observations and notations. In addition it would be useful with setting up workshops to interpret the material and go through it in detail were the new student group has a more active role.

2) How to communicate that the result is not only the final product?

When doing this kind of projects one has to understand that the learning for each individual student is different than in the normal design studio where there are individual projects or small consolidated groups. The student has to deal with the fact that most individual views and suggestions will not be filtered through to the final result. Also they have to tackle that the feeling of ownership and degree and type of contributions will vary. The students have to look at the end result of the project in a different way. All material produced during the studio has its own value and contributes to the end result. The individual contributions and sketches, models and prototypes that didn't make it to the final product might be as valuable as the end result it self. Some of these sketches contain concepts that are more valuable and deeper founded than what was surviving through to the end. The reason is that while the project is forced forward by the strict production deadlines, some issues which would take longer time to fully develop, because they are more complex or innovative have to be sacrificed. This does not mean that they are lost, but they can be used in the next round.

Understanding this situation for the students is challenging and it demands a small cultural change how one regards the results of such an experimental research by design project. The students need to harvest results through the whole project period and collect what they have produced and reflect on the experiences they made. Some students only managed to do this later when there was some distance and they were able to look at it in a more reflexive way.

There has to be made a big effort in the beginning to prepare the students for this situation. Though the Oslo students were given the opportunity to select their own way the preparation to face the challenges and responsibilities in a dynamic group work were underestimated. Personal detours and small side projects should be encouraged and discussed seriously. Guiding them to hold individual protocols and build their individual collection of samples partial results and findings is crucial. The continuous and conscious harvesting from the rich design space is important to gain a satisfying individual outcome. It could also be useful to repeatedly remind them about the importance of their personal reflection and documentation of this reflection through out the process. The personal diary should be the individual end result and delivery for each student.

3) How to prepare students for risk taking?

Involving in situations which are out of control because of other stakeholders, group dynamics and fuzzy tasks is risky. But it's the normal situation the students face after finishing school.

The studio did not attempt to simulate a real-world professional design experience. It was a research by design project in an academic context. Nevertheless it created a more life-like situation than what the students normally achieve through student – business collaboration where the relation and collaboration normally is quite relaxed because the student project is framed and ideal and it operates normally as a side track for the company. The students were exposed to conflicts and negotiations, to workshops, distant collaboration and the need of reaching decisions that is normal in any complex design task. Though being a research by design based studio the result was more life like than in a normal studio. This shows that simulating a design situation engaging an external company etc. is not always creating the most realistic situation. While lifting the design studio into an innovative academic and research-related modus will eventually trigger a lot of these issues we normally think are only found in "real design commissions".

Again the individual diary and individual reflection might be the most important means to buffer up frustrations and to really accumulate knowledge and skills from the experience. The individual learning experiences should be externalised and discussed with the tutors and the group and should be part of the individual delivery.

4) What about individual creativity?

One can ask if these types of projects are about democracy and the group is set over the individual. The answer is definitely no. Individual creativity is essential to such complex group dynamics. Without them the result will not be of any new value. But the decisions made in such group dynamics are often not democratic in the sense of majority decision. There might be external or internal forces that will trigger decisions that not everybody is happy with.

The individual should be taken care of in a more systematic way. It is crucial that we are able to create an atmosphere where the individual student is encouraged to come forward with ideas and sketches. Again the personal protocol and material collection needs to be given great emphasis.

The Result
The result of the studio in the form of the media pods is reaching beyond our expectations. They will stand out as an example of excellent student work.
The experience gained and lessons learned are another less visible result which will need more analyses and publication to be fully understood.
I hope the studio can contribute to a much- needed change in design education and profession, where the designer will have a bigger impact on the things that really matter. I also hope that it contributes to the current discussion on system thinking and the inspiration designing has on a larger field of professions.

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