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MANDATORY FIELDWORK

Jörg Rekittke

Qualitative Research

The global scientific community seems to be split into two fundamental factions: There are the "hard" scientists, who invariably trust quantitative research, and there are the "softer" disciplines that likewise rely on qualitative research. Qualitative research is comprised of methods such as semi-structured interviews, observation studies, group discussions and the analysis of written documents. These methods are used and advocated by anthropologists, sociologists and educationalists in particular. In "Qualitative Research and General Practice," Britten and Fisher (1993) summarize the results of such methods: "The end product of qualitative research may be elucidation of a new concept, construction of a new typology, mapping of the range of phenomena within a subject area, generation of new ideas or hypotheses, development of an explanatory framework, or the basis for an intervention strategy."[1] We have to point out that while this excerpt reads like the words of a born and bred designer, it has not been written by designers and it deals with subjects that lie entirely beyond the design professions. However, the design disciplines do apply qualitative methods. Landscape designers may, in fact, make up the "softest" of all qualitative research-related professional groupings.

There is no denying that design work may be understood as a form of research. Research can be defined as: 1) a careful or diligent search, 2) a studious inquiry or examination (especially an investigation or experimentation aimed at the discovery and interpretation of facts, revisions of accepted theories or laws in the light of new facts, or practical applications of such new or revised theories or laws), and 3) the collecting of information about a particular subject.[2] Outside the design disciplines, in fields such as sociology, psychology and anthropology, a fierce battle is fought about the validity of qualitative research. In anthropology and sociology—both genuinely relevant disciplines for essential spatial design questions—, "participant observation" became the most prominent form of qualitative research. It is a form of field research or *fieldwork*. In quantitative research, conducted in a laboratory setting, research aims to perfectly control an

1 Nicky Britten and Brian Fisher, "Qualitative Research and General Practice," *The British Journal of General Practice* 43, 372 (1993), 270–271.

2 "Research," Merriam-Webster Online Dictionary, accessed on May 6, 2014, http://www.merriam-webster.com/dictionary/research.

experiment. Out in the field, however, in real life and real time, the researcher has to deal with an endless number of interconnected phenomena that are all in uncontrollable motion.[3]

In participant observation, the fieldworker acts as an instrument in the research process; personal interests, individual position, and potential bias influence the research outcome.[3] It is no surprise that apologists of hard science vehemently attack this vulnerable aspect of qualitative research ad infinitum:

> The most commonly heard criticisms are, firstly, that qualitative research is merely an assembly of anecdote and personal impressions, strongly subject to researcher bias; secondly, it is argued that qualitative research lacks reproducibility—the research is so personal to the researcher that there is no guarantee that a different researcher would not come to radically different conclusions; and, finally, qualitative research is criticized for lacking generalizability. It is said that qualitative methods tend to generate large amounts of detailed information about a small number of settings.[4]

This painful itemization reads—again—like a flawless characterization of all immortal demons, with whom every spatial designer has to brawl. Quite legitimately, hard scientists take pity on the "creative" draftsmen because their results can nearly always be falsified by almost anyone. Some results in regards to proposed "solutions" can be proven to be right, but most of them simply cannot. This is why designers are a kind of limited scientist: They might start their work in the most scientific way, but at a certain point they can no longer resist a personally fixed idea—this marks the point of no return, where the objective approach changes into subjective method, a form of obsession, which is inevitable—and successful—in design thinking. Designers consistently lose their scientific integrity and consciously gamble away the secure position of rational impartiality. As such, they are doomed to act as scientifically incorrect stand-alone empiricists.[5]

3 Maria P. Højlund Nielsen, "Fieldworking in an Interdisciplinary Perspective," *NIASNytt, ProQuest Social Science Journals*, no. 01 (Copenhagen: April 2007), 4.

4 Nicholas Mays and Catherine Pope, "Rigour and Qualitative Research," *British Medical Journal* 311.6997 (1995), 109–112.

5 Jörg Rekittke, ed., *Logbook Landscape Architecture* no. 01 (Norderstedt: Books on Demand, 2008).

It may be trivial, but it is still comforting that all research depends on the collection of particular sorts of evidence through the prism of particular methods, and that every method has its strengths and weaknesses.[4] In "Rigour and Qualitative Research," Mays and Pope (1995) cite a statement from an editorial by Britten and Fisher: "There is some truth in the quip that quantitative methods are reliable but not valid and that qualitative methods are valid but not reliable."[1] Mays and Pope describe strategies to ensure rigour in qualitative research—and at this point, designers ought to listen attentively because it affects them most directly: "As in quantitative research, the basic strategy to ensure rigour in qualitative research is systematic and self conscious research design, data collection, interpretation and communication."[4] The creation of an independent account of method and data, and the production of a plausible and coherent explanation of the phenomenon under scrutiny, will also allow other researchers to analyze the same data in the same way and to come to essentially the same conclusions.

The most important leaf that the design operator can take out of the anthropologist's, sociologist's, or, in this case, the medical scientist's book is the axiom of direct, in situ data collection. Only via firsthand observation and adequate time spent in the field, can the qualitative researcher become thoroughly familiar with the milieu under scrutiny—as well as the milieu of the researcher.[4] Even a deep understanding of the research setting can result in convincing outcomes. As Christophe Girot states in his essay "Four Trace Concepts in Landscape Architecture," "the designer seldom belongs to the place in which he or she is asked to intervene."[6] Such 'outsider' designers can only acquire a true understanding of place directly from the field of action. This is what will enable them to act wisely and knowledgeably.[6] In situ spatial and contextual data collection is the lynchpin of all landscape architectural design work. The essential qualitative research phases of fieldwork—Girot coined them landing, grounding, finding and founding—have to be taken by any landscape designer in the context of real world projects, in academia and in the profession. Fieldwork is not optional; it is mandatory.

6 Christophe Girot, "Four Trace Concepts in Landscape Architecture," in *Recovering Landscape: Essays in Contemporary Landscape Architecture*, ed. James Corner (New York, Princeton Architectural Press, 1999), 59–67.

Reconnaissance and Measurement

The act of reconnaissance is a fundamental part of the landscape design process. Its importance is often underestimated.[7] The sooner the designer is able to bring home (to the studio or office) a comprehensive set of information and data, the sooner he or she will be able to get an idea of the site of intervention, and subsequently, also a picture of the whole site. Rich site information protects the creative mind from making naive suggestions based on fallacious ideas. The contemporary designer has an increasing number of expedient tools at his or her disposal. And the achievement potential of these tools is expanding at a dizzying rate. The word “tool” has its roots in the Old English word *tol*, denoting an instrument or implement used by a craftsman or laborer. Originally, a weapon was also called *tol*.[8] Effective design fieldwork cannot be conducted without effective armament; the fieldworker greatly benefits from powerful tools for measurement and documentation. Pen and paper constitute the most basic hardware; they remain invaluable in the digital age. Next to drawing, digital photography and laser technology became the most powerful contemporary methods in landscape measurement, scanning and documentation. In contrast to the time-honored yet always forward-looking profession of land surveying, the profession of landscape architecture seems to be just waking up from a long Rip Van Winkle sleep in terms of recognizing the potential and application of advanced fieldwork tools. This may consternate the landscape historian because, of course, there were also famous landscape architects who were quite enlightened and truly forward-looking, vanguard thinkers. Humphry Repton (1752–1818), for instance, was an inno-vative landscape designer, not only in terms of the range of project visualizations he produced for his Red Books, but also in terms of marketing and handling technology for surveying and alignment.[9] In his article “Terrain Modeling with GPS and Real-Time in Landscape Architecture,” Petschek (2005) states that long before bulldozers, graders and

7 James Melsom, “Designing Processes – The Development of Design Methodologies for Evolving Landscapes,” *Rising Waters, Shifting Lands*, Pamphlet 16 (Zurich: gta Verlag, 2012), 46–50.

8 Douglas Harper, Online Etymology Dictionary, accessed on July 17, 2014, Etymonline.com.

9 George Carter, Patrick Goode and Kedrun Laurie, *Humphry Repton: Landscape Gardener*, 1752–1818 (Norwich: Sainsbury Centre for Visual Arts Publication, 1982).

other GPS-guided machines became regular landscape construction tools, surveying instruments such as the theodolite represented early high-tech tools in landscape architecture.[10]

Portable Armament

Conducting landscape architectural fieldwork in dense, crowded and often hardly accessible urban and mega-urban environments is an arduous undertaking, often done on foot. This intrinsic constraint necessitates primarily lightweight, portable tools. Landscape architectural fieldworkers must be prepared to roam as backpackers; they have to be able to carry all of their equipment into the field.[11] In the ideal case, every student or faculty member should be a kind of mobile, fully operational work unit, a fully-equipped team worker who could, in case of need, be able to function as a lone worker. In this respect, we can benefit from the mobile nature of standard survey equipment as well as from the trend toward a multitude of handheld digital devices for an ever-increasing range of applications.

The fieldwork that our team conducted in Southeast Asia demonstrates the potential and development of the tools and methods, which we had been investigating for the past five years, in the context of landscape design. All of the fieldwork was carried out in informal, urban environments in Southeast Asia and the results have been drawn up under the name "Grassroots GIS," trying to build on inexpensive technology, easy or free access to applied tools, geodata, georeferenced design data as well as open source, open standard and, whenever possible, cost-free software and data storage possibilities.[12] We have by now partially integrated more expensive and elaborate tools for our field operations on informal city grounds.

10 Peter Petschek, "Terrain Modeling with GPS and Real-Time in Landscape Architecture," in *Trends in Real-Time Visualization and Participation, Proceedings at Anhalt University of Applied Sciences* 2005, eds. Erich Buhmann, Philip Paar, Ian D. Bishop and Eckart Lange (Heidelberg: Herbert Wichmann Verlag, 2005), 168–174.

11 Jörg Rekittke, Philip Paar and Yazid Ninsalam, "Brawn and Technology under the Urban Canopy," in *Peer-Reviewed Proceedings of Digital Landscape Architecture* 2013 at *Anhalt University of Applied Sciences*, eds. Erich Buhmann, Stephen Ervin and Matthias Pietsch (Berlin: Herbert Wichmann Verlag, 2013), 12–21.

12 Jörg Rekittke and Philip Paar, "Grassroots GIS: Digital Outdoor Designing Where The Streets Have No Name," in *Peer-Reviewed Proceedings of Digital Landscape Architecture* 2010 at *Anhalt University of Applied Sciences*, eds. Erich Buhmann, Matthias Pietsch and Einar Kretzler (Berlin/Offenbach: Herbert Wichmann Verlag, 2010), 69–78.

Manila—Take One and Two

In 2010, in the context of a slum upgrading project in Manila, Philippines, a handheld GPS device of traveller standard and an ordinary, compact digital camera of amateur standard represented our only digital tools in the field. They were good enough for the generation of two design-supporting products: 1) a set of maps that we generated in the field and published on the public platform OpenStreetMap (OSM), and 2) a set of simple models that we referred to as handmade "Street View Surrogates."[12] Slum areas make up the least surveyed and least traceable parts of megacities and often constitute white spots on official maps and other planning materials. In order to breach the isolation and "addresslessness" of the people living in these areas, we started to publish online maps of their neighborhoods via OSM. Toward this purpose, we paced out all accessible streets, lanes and pathways within the project area using our GPS devices. The fieldwork data was then edited with the open source Java OpenStreetMap Editor (JOSM). The uploaded geodata from the slum upgrading project in Manila brought these hitherto undocumented and invisible neighborhoods onto a public map accessible worldwide. Particularly in informal settlements, it is virtually impossible to remember all the relevant details from the fieldwork without a detailed and complete photo documentation of the project site. Google Street View is not available for many large cities in developing countries, thus a sufficiently detailed working model had to be built by hand. With a simple digital camera—a suitable handheld tool—we photographed every relevant façade, front garden, public space and street. Back in the studio, we then draped these photos onto a basic Google SketchUp model, which resulted in a handmade "Street View Surrogate," that is, a sand box model suitable for the landscape architectural design process.[12]

The next year we invested in a slight rearmament: We bought iPhones 4 and downloaded some relevant apps for our fieldwork; a digital reflex camera also made it into our luggage. We devoted our research to the appropriation of a pragmatic, simple, design-oriented basic service that every student can learn to provide. We were not trying to cheaply copy the work of professional geodesists, who have far better methods and tools.[13]

Aviators and Foot Soldiers

In year three of our investigation, we began to distinguish between two main groups of users.[14] The first group we referred to as "aviators"—colleagues who profit from satellite data and all sorts of sophisticated aerial imagery. Their fieldwork was fueled by an armada of flying devices, including drones and copters. Aviators carry high-capacity cameras and scanners that deliver image and geodata for 2D imagery, mapping and 3D modeling. The second group we referred to as "foot soldiers." The equipment of the foot soldier is related to satellites, radios, as well as data networks—these, however, must be light and portable. Their mission is to provide information that cannot be gathered by any aviator. Despite all technical progress, the direct contact to ground and detail will remain indispensable to the disciplines of landscape architecture and urban design. The laborious craft of the foot soldier delivers unique results concerning detailedness and genuineness.

In order to transform our precise, raw material from rough terrains into sophisticated 3D models, we experimented with free software to develop suitable methods. Site specifics play an important role in our work; we are interested in taking on challenging urban areas in the context of very large cities, as for example Jakarta, Indonesia. In the case of Jakarta, we embedded our research from the National University of Singapore into the module Landscape Ecology offered by the interdisciplinary research program Future Cities Laboratory (FCL), under the aegis of the Singapore-ETH Centre for Global Environmental Sustainability (SEC).[14] An excerpt from "Daring Down the Plastic River in Jakarta" describes the site:

> The urban catchment of Greater Jakarta, this metropolitan Moloch, has reached a population of about 28 million today and is expected to reach 35 million by the year 2020. But the exact figures are

13 Jörg Rekittke and Philip Paar, "There is No App for That – Arduous Fieldwork Under Mega-Urban Conditions," in *Peer-Reviewed Proceedings of Digital Landscape Architecture* 2012 at *Anhalt University of Applied Sciences*, eds. Erich Buhmann, Stephen Ervin and Matthias Pietsch (Heidelberg: Herbert Wichmann Verlag, 2012), 66–75.

14 Jörg Rekittke, Philip Paar and Yazid Ninsalam, "Foot Soldiers of GeoDesign," in *Peer-Reviewed Proceedings of Digital Landscape Architecture* 2012 at *Anhalt University of Applied Sciences*, eds. Erich Buhmann, Stephen Ervin and Matthias Pietsch (Heidelberg: Herbert Wichmann Verlag, 2012), 199–210.

> irrelevant; one senses overpopulation and its consequences everywhere one looks. [...] The city is quite literally a sinking ship, as some parts of Jakarta sag almost 25 centimeters per year. This extreme subsidence rate is due to abusive groundwater extraction, with the ground giving-in to the city's sheer weight. Jakarta is also prone to cataclysmic flooding, which has become a major annual problem for the city. The worst flood in the history of the Indonesian capital happened in February 2007: it covered almost 60 percent of the total urban area. In Kampung Melayu, one of our areas of study, the water level of the Ciliwung River reached a height of more than 10 meters over the valley floor.[15]

For the first Jakarta fieldwork mission we came prepared with our common handheld digital cameras. They served as quick and easy imaging devices. We started to experiment with consumer-based photogrammetric 3D reconstruction software. The free software and online service 123D Catch from Autodesk Labs Technology (Autodesk 2012) allows for the creation of 3D models from digital photographs, usable for accurate measurements on the basis of the models. The software was developed primarily for single object photography and corresponding modeling, rather than for complex spatial entities. While free-standing objects allow the photographer to revolve evenly around them, the catchment of an entire space necessitates the inversion of this principle: The middle of the space has to be regarded as a kind of see-through object that is scanned in a shoebox-shaped manner. Since even many alleys are too narrow for the application of the foot soldier's shoebox image-capturing method, we also experimented with semicircular camera movements around the opening of the alley, trying to capture as many overlapping image instances as possible.[14]

Jakarta—Take One, Two, Three and Four

In January 2012, we likewise advocated the utilization of inexpensive, ordinary tools and technology. But we saw the writing on the wall and understood that there would be no way around more expensive

15 Christophe Girot and Jörg Rekittke, "Daring Down the Plastic River in Jakarta," *Topos* 77 (Munich, 2011), 55–59.

and sophisticated tools such as 3D laser scanners for detailed terrain measurement and documentation, as well as flying devices to carry our cameras. We had to become foot soldiers and aviators concurrently. Our fractional abstinence at that time was partially driven by monetary justification but primarily by security issues concerning the laser beam—we do not conduct our work in beautiful, empty landscapes or deserted, suburban bourgeois living environments, but rather in crowded and super narrow city layouts, where the growing number of exclusion zones is virtually unthinkable.[14] Standing by our claim that direct contact to ground and detail remain indispensable to the process of building complete and highly detailed digital 3D models of complex terrain and urban territory, we became certain that our scientific and methodological niche is located within the urban canopy and in urban canyons, where remote sensing technology is proven to be blind and ineffective. Our contribution to the design studio became a new kind of high precision, three-dimensional puzzle, which makes widely inaccessible and undocumented urban environments and places visible, understandable and designable.

For the second Jakarta mission, begun in August 2012, we added new, easily accessible and still comparatively low-cost tools to our backpacks—we still had to be able to carry all of our equipment in the field. One of these tools was the GoPro HD HERO2 action camera Outdoor Edition (video cameras fitted in waterproof housings and attached to three-way pivots on a telescopic mast). We also experimented with toy drones, featuring inbuilt cameras. These marked the approaching armada of flying devices for the purpose of image data gathering in science, research and design—iPad-controlled Parrot AR Drones 2.0, remote controlled by the free AR.Free Flight App. These inexpensive toy quadrocopters are equipped with a built-in onboard video camera for wireless video recording and transmission via a picture resolution of 1280 x 720 dpi. They enabled us to visually illuminate completely inaccessible or hidden spots of our site context. We also carried Leica Disto D8 laser meters as well as Garmin GPS-MAP 60CSx handheld tracking devices. Our iPhones and iPads served as multifunctional navigation and measuring instruments. For the refinement of our photographic work, we always carried high-capacity DSLR cameras.[11] In addition, two new accruals turned out to be extraordinarily useful for our research: The first was a six-meter long telescopic GFK camera mast weighing only 850 grams (the Kamkop GoPro model, made in Germany). This tool allowed us to generate unique image material from the bird's eye view that almost surpassed that generated by flying devices in terms of precision and ease of handling. The second tool was a Challenger 4 inflatable rubber boat purchased offhand. As the mother of all consumer-grade dinghies, it transformed us into river rafters, thereby changing everything.

During the field trip we tested miscellaneous terrain capturing techniques and ultimately disproved what had been our hypothesis concerning the photo-based approach up to this point: "the more the merrier." For the post-processing of our field data we experimented with a combination of the free programs VisualSfM version 0.5.20 and CMPMVS version 4.0. VisualSfM is a graphics user interface (GUI) application for 3D reconstruction using Structure From Motion (SFM).[16] CMPMVS is a multiview reconstruction software, which generates a textured mesh and reconstructs the surface of a final 3D model.[17] After Jakarta—Take Two, we concluded the following:

> The quality of image and data material is key and time is on our side. The craft of an earthling's fieldwork will continue to require rolling up their shirtsleeves, however precision, accuracy and dependability of available equipment will rapidly advance. Coherence as well as complexity of our technique and technology will have to be increased. The next generation of outdoor action cameras and camera carrying flying devices is in the stores yet. Our lowbudget approach sets us certain financial limits but we begin to leer at portable 3D scanner systems with real-time 3D re-construction capability and will have to decide if such technology will be part of our future baggage. [...] Another future standard for the work in data poor environments will be made up by extremely precise portable satellite

16 Changchang Wu, *VisualSFM: A Visual Structure from Motion System*, accessed August 6, 2014, http://ccwu.me/vsfm/.

17 Michal Havlena, Akihiko Torii and Tomas Pajdla, "Efficient Structure from Motion by Graph Optimization," *Computer Vision – ECCV 2010* (Berlin/Heidelberg: Springer-Verlag, 2010).

> navigation systems with global coverage (GNSS) and enhancements by Differential Global Positioning Systems (DPGS). [...] We undertake not to reduce our commitment in brawn but we might have to increase our investment in technology.[11]

For the third and fourth Jakarta fieldwork missions, undertaken in January and August of 2013, respectively, our technological arsenal turned out to be both rather heavy and expensive. We took with us the newest GoPro HD Hero 3 action camera Outdoor Edition, a powerful remote controlled DJI Phantom quadrocopter, which can carry GoPro action cameras, a FARO Focus3D high-speed 3D laser scanner, a Trimble GeoXH handheld GNSS for georeferencing, as well as a PrimeSense 3D depth sensor/camera. In addition to this, we had, of course, with us a growing package of mounting equipment, accessories and spare parts.[18] The described toolset was used for our field experimentation that focused on diverse vertical levels of urban landscape recording rather than the planar coverage of a site, as represented by the 1968 documentary short film *Powers of Ten* (rereleased in 1977) by Ray and Charles Eames.[19]

Trial and Error

All landscape research teams that work with digital tools in the field share the ability to generate three-dimensional documentary information, which is precise and viable but also incomplete. None of these teams—we are not exempt—chases after a would-be perfect portrait of the real world; they strive instead for a pragmatic representation of space and materiality with the goal of understanding or anticipating change. The imperfection and coarseness of the gathered spatial data still allows the abstraction that is indispensable to any design process.[18] Additionally, any work undertaken with any technology is subject to an axiomatic principle: it can fail. Our most

18 Jörg Rekittke and Yazid Ninsalam, "Head in the Point Clouds – Feet on the Ground," in *Peer-Reviewed Proceedings of Digital Landscape Architecture* 2014 at ETH Zurich, eds. Ulrike Hayek, Pia Fricker and Erich Buhmann (Berlin: Herbert Wichmann Verlag, 2014), 198–207.

19 *Powers of Ten*, short film, directed by Ray and Charles Eames (USA: IBM, 8 min. "sketch" version 1968; 9 min. "final" version 1977).

traumatic experience in this respect was the loss—the aviation industry would call it a "total loss"—of the DJI Phantom quadrocopter. The remote control system lost connection and the copter flew away and completely vanished from our field of vision. This was in the middle of the crowded megacity of Jakarta and we never found the copter again. We immediately thought of an alternative for our unfinished aerial photography—we found a shop selling helium-filled party balloons. The competent saleslady quickly calculated: one balloon can carry two lollipops... In the end, our GoPro Hero3 camera was lifted into the air by two Superman balloons, a Batman balloon, a Tinker Bell balloon, a Nemo balloon and a Captain Sparrow balloon. Improvisation, tinkering and experimentation with tools are not optional activities during fieldwork missions; they are mandatory.