PREPARING UNDERGRADUATE DESIGN STUDENTS FOR COMPLEXITY: A CASE STUDY OF THE JOHANNESBURG ART GALLERY PROJECT

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Abstract

This paper argues that preparing undergraduate design students for working with complexity, by requiring them to undertake discipline-neutral, indeterminate problems, is altogether manageable, appropriate and additionally, highly impactful on the student’s own practice and conceptualization of design.

Key theories that will be introduced include Neil Johnson’s definition of complexity (2003), Richard Buchanan’s description of complexity in design and the corresponding restrictions assumptive design solutions place on innovation (1992), and Barry Wyllant’s (2008) characteristics of innovative design practice.

In order to exemplify the applicability of the theoretical framework this paper reflects on a complex design project that students from the University of Johannesburg’s Department of Multimedia undertook from June-September 2012. The design project sought to resolve many of the issues the Johannesburg Art Gallery, a municipal art gallery in downtown Johannesburg is faced with, as it strives to remain relevant to the city and people of Johannesburg. Issues include: communication approaches; building degradation; accessibility; operational concerns; social relevancy; politics; and economic sustainability.

Key words: Complexity, Design Education, Innovation, Human centered design, Indeterminacy, Johannesburg Art Gallery.
INTRODUCTION

This paper argues that preparing undergraduate design students for working with complexity, by requiring them to resolve discipline-neutral, indeterminate problems, is altogether manageable, appropriate and additionally, highly impactful on the student’s own practice and conceptualization of design.

Initially, a brief review of the literature will frame a range of the key characteristics and repercussions of complexity and indeterminacy in the broader field of design. This framework will focus on the affordance that complexity and indeterminacy can offer towards the generation of innovative and impactful design solutions. Key theories that will be introduced include Neil Johnson’s definition of complexity (2003), Richard Buchanan’s description of complexity in design and the corresponding restrictions assumptive design solutions place on innovation (1992), and Barry Wylant’s (2008) characterisations of innovative design practice.

Fundamental aspects of the theoretical framework will then be exemplified in an account of a complex design project that 3rd year Interactive Design students undertook between June and September 2012 that sought to resolve many of the issues the Johannesburg Art Gallery, a municipal art gallery in downtown Johannesburg is faced with, as it strives to remain relevant to the city and people of Johannesburg. Lastly, a concise description of the students design outcomes is presented with a brief discussion as to the type of innovation evident in the final projects.

Design in developing countries or new emerging economies, especially in Africa, is seldom recognized as a driving force for developing alternative socio-economic opportunities. By positioning design as a discipline that actively seeks to solve the problems that affect human beings in impactful and innovative ways, within the existing design education institutes in Africa, design can begin to be seen as a driving force in this area. Human-centered approaches to design that offer meaningful and relevant solutions to existing and emerging problems will be essential to this process. A natural result of human-centered design is complexity, which while often difficult to negotiate does offer many advantages not least amongst them the ability to ideate innovative solutions for local contexts. It is within this framing that we offer this paper in the hope that it will be helpful to those grappling with how best to prepare the current generation of design students.

Complexity and Indeterminacy in Design

Since the early 1970’s design theorists including Horst Rittel (1973), Mervin Webber (1973), Richard Buchanan (1992), Nigel Cross (2006), Klaus Krippendorff (2007), Nathan Shedroff (1973), Donald Norman (1998), Richard Wurman (1997), Alan Cooper (1973) and Mike Kuniavsky (2003) amongst many others have advocated a human-centered approach to design practice. The core belief behind a human-centered design (HCD) approach to design is that in order to design products and systems for particular groups of people, it is valuable to

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1 See Fenn & Hobbs 2011, 2012.
understand the life experiences, values, beliefs, behaviors and relationships of these people and their societies.

While traditional design education tends to focus on the art and craft of artefact creation (Hagen and Robertson 78: 2012, Brown 86: 2008), fields of design that practice HCD are problem focused and accordingly aim first to understand the complexities of the identified design problem by apply modes of research enquiry\(^2\) that originate from the social sciences. The outcomes of these ethnographic enquiries, as will be described in further detail in the following sections of this paper, are two fold: firstly, this form of enquiry results in complexity, and secondly that within response to complexity, radical innovation often results.

Social reality is described by Pierre Bourdieu as a “‘field of regulated improvisations, that within which, practice feels spontaneous but is actually ‘regulated by the proclivities and dispositions, the abilities, practices and understandings’ that are often only tacitly understood (Highmore 2009:73). While Bourdieu refers to these social systems as the Habitus, John Searle refers to the same phenomena as the Background of social reality (1999:5). Regardless of terminology, these highly complex social systems, that contain shared connotative and denotative meaning structures that orientate cultural logic, guide the social acceptance of usefulness and purpose. In Simply Complexity: a clear guide to complexity theory, Neil Johnson defines the key components of a complex system as:

- The system contains a collection of many interacting objects or "agents"
- The objects behavior is affected by memory or feedback
- The objects can adapt their strategies according to their history
- The system is typically open
- The system exhibits emergent phenomena which are generally surprising and may be extreme
- The emergent phenomena typically arise in the absence of an "invisible hand" or central controller
- The system shows a complicated mix of ordered and disordered behavior

A social system can be described as hyper- complex as it compromises many interwoven networks of meaning that meet Johnson’s description of complex systems and Bourdieu’s Habitus. To put this notion of hyper-complexity into perspective, perhaps try and exhaustively explain what is the meaning of a Coke can in reference to social culture. Can it be described only as a thirst quencher, or as a brand, or a political intrusion, or as a trade secret, or as a reminder of Father Christmas... Naturally, a coke can could never exhaustively be explained however understanding even a limited range of these extended conceptual connotations of Coke, informs our understanding of what Coke can mean to people. This same logic is the bases of the ethnographic exploration that is applied in HCD in order to attempt to understand how problems manifest and affect societal groupings.

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\(^2\) Examples of HCD design research could include user interviews, user observation, photo journeys, amongst many others
In design theory, a clear link has been established between understanding design problems in order to solve them (Rittel and Webber 1973: 161; Buchanan, 1992:10; Cross & Dorst, in, Cross, 2006: 79) and many of the cognitive requirements needed for resolving complex design problems have been identified in mature design practice (Lloyd and Scott in, Cross 79). However many tertiary design courses still approach the teaching of design as fundamentally mono-disciplined. In this approach the design product is often privileged over the design problem. Categories of design solutions are automatically applied to problems, without a rigorous investigation into the nature of the problem. This approach to designing implies that problems are generically similar. This form of teaching often equates good ‘design’ with notions of best practice and craftsmanship and tends to assume that design problems are always determinate within the product range of the discipline.

A constant re-styling of existing design products utilizing a form of innovation that Thomas Robertson (Wylant 2008:4) describes as continuous innovation. While continuous innovation does have a role within design education, particularly in respect to the learning of the various crafting aspects of the design disciples, design problems that originate in social complexity rarely yield design solutions that are so neat as to be resolved by a slightly improved version of an existing design solution.

Van der Merwe (2010:8) and Buchanan (1992:12) argue that as societal problems are situated in unique situations and contexts, their resolution should always be constructed in reference to their uniqueness. The result of constructing solutions in reference to the uniqueness of the problem allows for forms of innovation that extend beyond stylization. The connection between radical innovation and problem-led design solutioning is articulated by Barry Wylant in Design Thinking and the Experience of Innovation (2008:12-13). Wylant describes the process involved in the practice of designing solutions that emerge from complexity as a cognitive game, in which ideas are constantly related back to problems thus raising new problems, ideas and considerations (2008:14). It is against this ‘play’, Wylant observes, that radical innovation occurs (ibid). While radical innovation describes a form of innovation that involves the introduction of significantly different technology or infrastructure and leads to unprecedented uses and functionalities, in this text, we use radical innovation to also refer to any ideation that questions any status quo. This may include questioning and challenging accepted disciplinary practices and solutions as well as teleological concerns, particularly those that routinely equate newness, production and non-sustainable profiteering with progress.

See Richard Buchanan 1992:10-12 for a description of what he terms a categorical approach to design.

In addition to continuous innovation, Wylant also describes dynamically continuous innovation which refers to innovation in which an existing functionality can be dramatically improved, such as the introduction of flat-screen monitors over older and larger cathode ray tube monitors (Wylant 2008:4). In this text continuous innovation, is used broadly to describe both terms.

In this account, we use the term radical innovation to have the same meaning as what Thomas Robertson describes as discontinuous innovation (Wylant 2008:4) and Wylant (Wylant 2008:4) additional refers to as disruptive innovation. All three terms refers to a type of innovation that involve the introduction of significantly different technology or infrastructure that, in turn, leads to unprecedented uses and functionalities.
While students of design naturally have a deep and meaningful experience of the world, their experience of design is primarily informed by their exposure to design education. Therefore how they are taught design and what they are taught design is, forms a large part of their ‘unconscious knowledge’ of design and their subsequent ability to formulate new design knowledge. Therefore the disposition of their design education enforces the student’s ability to formulate design solutions that in turn assist in formulating and understanding the design problem.

Unfortunately many tertiary design courses in Southern Africa tend to view the teaching of design as akin to the teaching of design product making and largely require a level of innovation that is at best continuous. Briefs that focus on producing discipline specific design products such as websites, posters or magazines tend to be the normal practice in undergraduate teaching. In many cases in Southern Africa, in the field of Design, a three or four year undergraduate degree is the final degree in the designer’s formal education. Thus there is the imperative for design educators to introduce students to the notion of complexity in undergraduate courses. By framing design as a problem-led praxis situated within, and constrained by, complexity, students learn skills that will allow them to enter the working world, and society, as aware innovators. However as early as 2002, Neil Brown, recognised the difficulty of re-purposing design education as focused on the systemic enquiry of design problems. Brown declares: “This problematises practical education insofar as practices present curriculum with no step-wise structure.” however he maintains that there is no alternative to conceptualizing design as a transdisciplinary, socially constructed activity as in reality there can be no functional separation between design practice and the cultural consumption of the design (Brown 2002).

It is in respect to this dilemma that we offer, as an example in practice, of a design project undertaken by third-year interaction design students and facilitated by the authors that was both; highly complex and resulted in radically innovative solutions.

**The Johannesburg Art Gallery: A Complex Problem**

The Johannesburg Art Gallery designed by Edward Lutyns and opened in 1914, is situated in downtown Johannesburg and is after years of underfunding and municipal neglect in a poor state. In August 2011 a workshop, JAG Snag\(^6\), was facilitated by Stephen Hobbs with the aim of gathering a variety of perspectives on a set of problems facing the Johannesburg Art Gallery (JAG). The workshop brought together artists, journalists, architects, art historians, designers and staff from the Gallery.

The problems presented were further documented by the Chief Curator, and Director of the Gallery, in a letter to the Mayoral Committee of Johannesburg on the 28\(^{th}\) of March 2012 (Murdock 2012) and covered the following topics: damp, leaking and water damage due to flaws in the roofing of the north wing extensions to the original Lutyns building in the 1980’s; various instances of restoration required to the original building; additional and effective storage space for art.

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\(^6\) The JAG Snag, open session and workshop conducted at the Johannesburg Art Gallery, 20th and 21st of August 2011
works in the collection; replacement of the lighting and air-conditioning systems; upgrading of plumbing; and various improvements to the surrounds of the Gallery.

Important implications of these problems include: the Gallery failing to meet with International Museum Standards (IMS) such that works from the Gallery are able to be lent out to other galleries however due to the high cost of insuring works for borrowing and display in exhibitions in the Gallery become prohibitive; works in the current collection are at risk of being damaged and a large portion of the Gallery exhibition space has had to be closed; and the poor quality of the surrounds (including problems of litter) are believed to contribute to a sense of insecurity by visitors to the Gallery who are not familiar with the inner-city where the Gallery is situated.

As a municipal gallery and following the conditions of its donation, entrance to the JAG is free to the public and it thus relies on municipal funding. It has been noted by the Director (Hobbs 2012) that on a yearly basis the seven million Rand annual budget (which has not increased over the last ten years) is rarely made available in full and on average the Gallery sees around half this amount as funds tend to be diverted to other City projects. Additional revenue streams include rental of space (to other bodies such as the Johannesburg Development Agency or for photographic or film shoot locations) and sales from the Gallery shop where books published in association with the Gallery are sold (amongst other items) (ibid).

Nonetheless, the Gallery suffers from a lack of funds. The JAG currently operates with a staff compliment at 56% of that required to operate effectively and some of the staff lack the required capability to perform their duties (for example, knowledge and skills in marketing via digital channels) (ibid). The staff has also been observed to be demotivated and disillusioned because of unfulfilled promises over a long period of time (Hobbs 2012).

The Friends of the JAG (a Section 21 non-profit organization) is disorganized, lacks a clear mission, has few members and is representative of an older generation of predominantly white members that are conflicted as to whether the Gallery should be more museum oriented (only displaying works from the collection) or more Gallery oriented (displaying exhibitions of contemporary artists from outside the collection). – (ADEC 2012). Unlike instances of such organisations elsewhere in the world, the Friends of the JAG, is an ineffective fundraiser (ADEC 2012).

For some time the Gallery has managed to draw less than 1% of the overall population of Johannesburg (Murdoch 2012 b). This is well below the international average of between 10% and 20% for municipal galleries (ADEC, 2012). Besides key niche audiences required by the Gallery to attract (schools, the aged, etc) the vast majority of potential visitors fall into two categories – the unaware and disinclined – both of which the Gallery fails to attract (Hobbs 2012). Current visitation is largely comprised of Friends of the JAG, those in the local art world / community, art lovers and a small but new emerging audience of young, largely black urban people (Ibid). This latter audience is felt to have a somewhat new perspective of the value of the JAG, this being the social value of being associated with culturally oriented events (Hobbs 2012).
The JAG is felt to suffer from inconsistent political support at the local government level (Hobbs 2012). The feeling articulated by various stakeholders is that politicians are quick to use the Gallery to garner support when it is felt necessary however looses interest when it does not serve those purposes. Sustaining consistent, ongoing, interest and support from politicians is currently not occurring.

Perhaps the most contentious issue surrounding the JAG is its position in the inner-city of Johannesburg. In the 1980’s there was a migration of businesses out of the inner-city, largely north into the Sandton region (where the Johannesburg Stock Exchange moved to from the Central Business District). Subsequently the inner-city has experience a slow degradation. Post-Apartheid, the inner-city has become home to a very large foreign African national community. The combination of these factors has lead to many considering the inner-city to be dangerous and alienating. In additional to many people simply not visiting the inner-city it suffers from a very real problem of perceived in-accessibility (Hobbs 2012).

Lastly, the JAG is struggling to effectively use channels. There is a particular lack of capability in the use of digital channels (Resmini 2012). Although the JAG does have a website (within the larger joburg.org.za domain), a Facebook page, Twitter account and digital email list (with roughly 1500 unqualified email addresses) they are all hard to find either via search or from within the websites, use inconsistent language to assist in search, publish sporadically and generally lack a cohesive strategy and communication plan.

In summary, the Johannesburg Art Gallery presented itself as a classic complex problem, characterised by conflict, contradiction and paradox. Solving the problems the Gallery as a design project offered would require both the cognitive ability to manage the complexity while constructing solutions that were neither clear nor existing.

**The Student Design Process**

Over the course of the student project, the students were taken through a process of research, strategy, design and implementation. The crux of the shift in approach (from product-led to problem-led) presented some challenges since the Interaction Design course required that students produce at least one work that would exist in digital channels (a website, mobile app, etc). However, being problem-led meant that neither we, nor the students, would know what the artifactual outcome of the process would entail. For this reason the only channel-based requirement of the project was that students would be expected to develop multi-channel journeys that needed to consider an array of non-digital and digital channels.

However, regardless of artifactual outcome, our primary objective was to have students engage with a problem of an indeterminate nature, to research the problem and conceive of solutions that did not presuppose a digital outcome and viewed solutioning from a holistic perspective. For example: knowing that the JAG has a problem with a lack of skilled staff to manage digital channels and a
The lack of funding to hire new staff for this (or manage additional channels) would mean that at the minimum any digital solution proposed by students would require a response to this constraint. The methodology of the project followed a broadly HCD approach that utilized many of the design tools, techniques and procedures used in user-experience design (UXD). Students were expected to conduct their own research, analyse existing research, develop a design strategy, develop design ideation and lastly construct high-fidelity prototypes. It is worth noting that the focus of the course was teaching the students the fundamental aspects of UXD and complex problem solving and that the level of innovation obtained in the final designs where outcomes of the process rather then preordained objectives.

The project began with an introductory talk and walk-around the Gallery and Joubert Park surrounds with Stephen Hobbs. The talk covered the broad issues facing the JAG, issues relating to the inner-city and the history of the inner-city until present times.

Shortly thereafter the students received a lecture from art historian Jillian Carmen who has written extensively on the Johannesburg Art Gallery.

Further contextual research conducted by students included: the creation of photo essays pertaining to the Gallery and surrounds; observational studies of the Gallery and surrounds; visual mappings of the interior of the Gallery space and related content and functionality inventories; mappings of the Gallery surrounds; documentation of various generations of signage for the JAG to be found around the Gallery premises and in and around the surrounding Joubert Park and mapping of flows of foot traffic into the Gallery from Joubert Park.

![Figure 1: An area map of the JAG/ Joubert Park precinct (Department of Multimedia, University of Johannesburg)](image)

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7 In addition to facilitating the JAG Snag workshop Hobbs, a Johannesburg based artist, has a career that spans over 20 years producing work, running galleries and producing commentary on the contemporary state of the inner city of Johannesburg

Collectively the students produced a SWOT analysis. Each student was required to list the five key strengths, weaknesses, opportunities and threats facing the JAG. This data was then aggregated from across students, ranked and presented as a final piece of data analysis. Based on this data students were then required to present the information through visualisations that effectively communicated the corresponding weighting of key observations within and across the categories of strengths, weaknesses, opportunities and threats.

Figure 2: Mapping of the physical measurements of the external facades of the Gallery (Department of Multimedia, University of Johannesburg)

Figure 3: SWOT analysis using photographs and observations (Department of Multimedia, University of Johannesburg)
Students also conducted an analysis of artifacts that currently exist across channels used by the Gallery. For example, printed exhibition invitations and the JAG website.

Additional research reports and information were also provided to the students. This included documentation of the interview conducted with the Director of the JAG on the 16\textsuperscript{th} March 2012 (Hobbs) and secondary research that explored developments and initiatives currently underway in the inner-city (for example: the recent appearance of the Bus Rapid Transit system in the city and a related bus stop now positioned at the East entrance to Joubert Park).

At a second meeting with the Director of the JAG the target audiences of the Gallery were established. Figure 5, presents these audiences.
A generic model was established for the students that would outline the relevant human factors for exploration in user interviews and further personae development.

Based on this model Hobbs and Fenn developed the questionnaire and relevant stationary for use in conducting user interviews. This included the questionnaire...
divided into sections for use across the different target audiences. For example, questions regarding the inner-city or the JAG would not be relevant to subjects who had never visited the inner-city or the JAG. Naturally these sections could be skipped when conducting the interviews.

Students were then trained in conducting user interviews and conducted one pilot interview each. Based on the results further collective and in some instances individual tutoring took place to both assist students in conducting interviews and the correct ways to capture data.

Excluding the pilot interviews, students then completed an additional six interviews each from a spread of the target audiences. The combined data from all the students’ interviews was captured on a single Excel spreadsheet, so that students could further analyse the data to compile their personae.

Personae were developed from the interview data. The theory and purpose of personae were shared with students and examples of the ways in which the human factors could be applied as a basis for the information design of the personae were provided. On average students produced three personae each for their projects.

Figure 7: A student example of a persona depicting the ‘Unaware’ user segment (Department of Multimedia, University of Johannesburg)

Completion of the personae marked the end of the research phase of their project. Students were then tasked with synthesizing the research data and developing two deliverables that together would constitute their strategic design approach: the creation of a ‘strategy statement’ and cross-channel user journey development.
The strategy statement is intended to focus students on articulating their synthesis of key concepts from synthesis and their response. In conjunction these concepts were explored in cross-channel user journey design where these concepts would play out.

Figure 8: An example of a student strategy statement, which eventually evolved into a ‘sculpture in the park’ type event (Department of Multimedia, University of Johannesburg)

Channels available for use in the journey design included: the physical surrounds and Gallery (including the building exterior and interior, signage and exhibitions), newsletters and invitations (both printed and digital), the JAG website, Facebook page and Twitter account, books and the bookshop, phone, Friends of the JAG, staff, available systems, public speaking and educational channels.

Further, the students were provided with a relationship model for use in their user journey design. Each stage required a corresponding journey that would reflect both their concept at play and the ideal experience the user would have in moving through multiple channels.
Figure 9: Relationship model provided to students as an example or for use in their cross-channel user journey design (Fenn & Hobbs)
Completion of user journeys marked the end of the strategy and ideation phases and was followed by designing and prototyping the digital aspects of their holistic experience design.

Prototype development was born of detailed design concepting within the chosen channel (website, social media, mobile, etc) and in some cases students created channel specific user journeys (which referenced the larger cross-channel user journey) with supporting task-flows. Paper prototyping and interface design followed with a collective discussion of each student’s early work with feedback provided. Each student was encouraged to present three alternative interface concepts and then select one, a hybrid or a totally new concept to move forward with after feedback was provided.

Having completed the design of the digital object blueprints and graphical executions students then programmed their solutions to the point of high fidelity prototypes either in HTML or Adobe Flash.

While the characteristics of the design problem embedded in the Johannesburg Art Gallery are evidently complex and student design were, as described, constructed uniquely in reference to insights gained from human-centered design research, the argument remains to be made as to whether the resulting designs meet the criteria of radical innovation.
As introduced earlier, the key aspect of radical innovation is that it is non-continuous with earlier solutions used in the solving of similar types of problems. The introduction of new originality can take on multiple forms such as the introduction of new concepts, technologies, infrastructure, services, practices, application, affordances and appearances. Importantly these new forms of innovation are in themselves not necessarily new but rather new in reference to the context of the specific problem.

As this project was undertaken with 3rd year design students as opposed to design professionals, we felt it was fair to assess the level of innovative originality in terms of the student’s life and design experience. Therefore this short analysis identifies and describes evidence in the students work that we feel can be considered as radical innovation as student design work. The key criteria used to make this evaluation were:

- Are major aspects of the concept of the design solution distinctly original to the circumstances of the problem?
- Does the design present a consideration of services, practices and application that extend beyond the students experience and knowledge of their own discourse (of Interactive Design)

The nine final projects completed in the course are briefly described below:

- A portable, digital ticket vending application for selling tours of the Johannesburg CBD that include JAG as the main inter-route node.
- A mobile application that runs a guided tour of the art work in the gallery in the home languages of surrounding immigrant population. The translator also includes a training guide to enable local people to volunteer and work as gallery guides.
- To extend the art exhibition space into the surrounding Joubert Park through the annual hosting of a ‘sculpture in the park’ exhibition. Included in the design is a website that utilises crowdsourcing to vote and create interest in the event.
- To hold a series of music concerts in the JAG building. The ticket purchase, information and relevant merchandise sales would be available online and in the gallery shop.
- A monthly digital video magazine that showcased the JAG collection and current and future exhibitions. The magazine would also publish academic articles and revues that focused on South African art, thus advertising JAG while simultaneously positioning as integral to the Johannesburg art world.
- A web site application that utilizes social media and networks to converge and distribute content related to specific exhibitions to enhance community interest and participation.
- Integrating Jag within the broader BRT transport system through advertising, signage, and online presence. This approach positions the BRT service as a one-stop service for visiting Constitutional Hill, the Sci-bono Science and Technology Museum, Museum Africa, The SAB World of Beer and JAG.
• An online participatory design application that allows users to create their own art/design, vote for their favorite submissions and view the winners in an exhibition held at JAG. The intention of the project was to firstly make JAG attractive to ‘digital natives’ that frequently co-create content on the web but never see their creations transcend the digital realm and secondly to encourage the curators at JAG to start exhibiting more design focused work.

• An art competition for all ages that concluded with a final event night that used JAG as an exhibition space for all the finalist entries.

Each one of these examples in various degrees can be considered to demonstrate evidence of design ideation that can be described as radically innovative as they offer solutions that are original to the context of JAG, to a large degree original to public galleries in general, original to each other and extend beyond the disciplinary concerns of an Interactive Design course.

Figure 12: (above) Online participatory design application (Department of Multimedia, University of Johannesburg)

Figure 13: (above right) JAG tour guide mobile application (Department of Multimedia, University of Johannesburg)
CONCLUSION

In line with the broader aim of positioning design as a driver of socio-economic opportunities and due to the common occurrence of the undergraduate degree often been the one and only qualification obtained by designers in Africa, this paper argues that undergraduate students who seek to practice design with a human-centered ethos need to be prepared to confront and resolve complex problems, so as to produce solutions that are original and effective.

While the difficulty of resolving complexity has been long established this paper describes how relationship between HCD, complexity and the generation of design solutions that yield a high level of innovation. Importantly, the resulting innovation is not superficial but closely linked to purpose and contextual needs reflected in the design problem.

This paper by way of example, illustrates how it is possible to expose students to complex problems that in conjunction with a clear and systematic design methodologies can generate sophisticated and highly innovative design solutions

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