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Communication Design Futures: A pilot user interface course case study at the University of Johannesburg

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Abstract

Following a query in 2018 by the University of Johannesburg's (UJ) alumni office to establish in which industries or companies UJ alumni were predominantly employed, information was gathered by members of the department of Graphic Design and data accumulated on a large number of alumni from the Department of Graphic Design.

It became apparent that, while many alumni do indeed manage their own design firms, act as successful freelancers or are employed as designers at various agencies in accordance with their field of study, a growing number have migrated to user experience (UX), Interaction and user interface (UI) design. This shift illustrates the need for graphic design curricula to remain relevant and keep track of new developments pertaining to the so-called fourth industrial revolution or Richard Buchanan's fourth order of design (Buchanan 2015, p.11).

In consultation with UJ's Department of Multimedia, a focused user interface course for second-year students in Graphic Design was therefore developed and tested during February and March 2019. Its main purpose was to enable students to apply their knowledge of UI design to the solving of design problems and to use various design methods, processes and techniques to create professional UI designs while promoting a better understanding of designing functional human-centred systems.

The project was reviewed internally via anonymous student questionnaires and externally by various alumni working in the field of Interaction Design. This paper reports on the findings of the reviews and suggest ways to improve Graphic Design education to remain relevant in a changing creative industry. The paper introduces the project, clarifies key concepts, theoretically grounds the subject matter and provides student and industry feedback with regard to the project.

This project has opened the door to a closer relationship between industry and UJ Graphic Design, stimulating continued research and insight in real-world inspired practical projects. The process was highly rewarding, especially in developing a model of practice and, in the process, updating a module to improve the UJ curriculum. The new skills required of graduates are

indeed "setting the base for a different kind of designer, not primarily concerned with the process of form-giving, but with the understanding of complex systems" (Ferrari 2017, p. 4).

Keywords: Graphic design, user experience design, user interface design, creative industry, media and communications design

Introduction

In 2018, the University of Johannesburg's alumni office requested that academic staff provide information with regard to the industries in which alumni are predominantly employed. The query, while interesting and relevant, could not be answered easily, so few colleagues responded. However, through social media and networking sites (e.g. LinkedIn and Facebook), I accumulated data from my personal network of graphic design alumni to answer this question.

After six months of gathering information, a picture started to emerge, pointing to a shifting creative industry. Of the 552 alumni identified, the majority was successful freelancers, business owners, or were employed as designers and art directors by various agencies within the industry in accordance with their training, but 19.7% had completely shifted career paths, listing their careers as user experience (UX), Interaction and user interface (UI) designers. This can be understood as a natural progression for graphic design alumni, aligning their careers with the so-called fourth industrial revolution (4IR). The fourth industrial revolution marks the advent of the fusion of technologies to the extent that the lines between the physical, digital and biological spheres are becoming blurred (Ferrari 2017, p. 3). This statistic, however, also indicates that graphic design curricula need to be adapted to remain relevant and ensure that graduates remain employable in the 4IR or Richard Buchanan's fourth order of design (FOD) (Buchanan 2015, p. 11). This observation is confirmed by the statement of the American Institution of Graphic Arts in *AIGA Designer* 2025 (2017, p. 2), that "the mandate to colleges and universities is to prepare this burgeoning population of communication design students for a half-century of practice in the profession of the future".

From personal experience and as an external examiner at four Gauteng tertiary institutions (of which two are private institutions and two public universities), many South African graphic design curricula leave UX/UI design education to multimedia programmes or merely treat it as an extra within a larger project. Owing to the impact of constant technological advances on the consumption of designed media, this indifference is creating a gap with regard to training graphic design practitioners for a changing industry. If tertiary design curricula do not adjust the content of their programmes, their outdated message-centred design approach is likely to struggle to keep graphic design relevant (*AIGA Designer* 2025 2017, p. 3).

An outdated message-centred design curriculum was also, to some extent, the problem in UJ's Department of Graphic Design. While the curriculum already offered interaction design projects prior to 2018, these units were taught by external lecturers who changed annually, subject to availability. Continuity was, therefore jeopardised. These units of learning often focussed more on digital development, software and coding, and less on UX and UI design principles. For these reasons, it seemed prudent that a full-time lecturer should play a larger role regarding digital design, to expand and develop the unit annually, and continually align the curriculum with industry requirements and expectations for graduates.

In consultation with colleagues from UJ's Department of Multimedia, I developed a focused UI course for second-year communication design students. The first course on UI design took place from February to March 2019. The project was reviewed internally via anonymous student questionnaires. To ascertain the success and relevancy of the project, with an aim to

modify and improve it for 2020, alumni working in UX/UI design were also asked to give feedback on the brief, class notes and a final student project.

Aim of the paper

The main aim of this paper is to suggest improvements to graphic design curricula with regards to UI and UX design, on the basis of findings from the students' and alumni' feedback on the initial second-year user interface project. This research is a step towards ensuring that the curriculum remains relevant for graduate employability in South Africa's changing creative industry.

Methodology

The new learning unit was created based on the theory of atomic design, which is a modular approach to UI design and UX design that breaks interfaces down to create interface design systems in a more deliberate and hierarchical manner (Frost 2016, p. 42). The project brief and outcomes were reviewed through quantitative anonymous student feedback, as well as qualitative industry feedback. Proper ethical clearance was obtained from specific student participants to use excerpts from their projects, as well as from alumni and student participants with regards to questionnaires completed by both groups.

Key concepts

UX vs graphic design

UX differs from traditional graphic design, in that the role of the graphic designer is normally that of an interpreter of messages (Krippendorf 2006, p. 11) whereas UX design, according to Pretorius et al. (2015, p. 2), can be seen as "a broad umbrella field of disciplines and practices that focus on applying user-centred and market-related research, and iterative design methods for the design of digital products and services" but also as "a specific field of design that situates the notion of experience as a key conceptual concern of the design process".

The Interaction Design Foundation's definition in some ways constitutes a combination of these two interrelated interpretations: "User experience (UX) design can be defined as the process design teams use to create products that provide meaningful and relevant experiences to users. This involves the design of the entire process of acquiring and integrating the product, including aspects of branding, design, usability and function" (Interaction Design Foundation 2019).

UI vs graphic design

Within the broader field of UX design, the principles of user interface design align best with graphic design principles, although the understanding of bigger systems, that is, UX, still remains crucial to design a good interface. The user interface is the information exchange between users and technology, which guides how they use the functionality defined in the specifications and structured in the interaction design (Garrett 2011, p. 109). Interface design moved designers' interest from the external appearance of technology to the interaction of users with technology (Krippendorf 2006, p. 8). Jesse James Garrett, writer of *The Elements of User Experience* (2011), defines interface design in practical terms such as selecting elements, such as colour, font and buttons, and laying these elements out for the screen in a logical, user-friendly way to help the user complete a task (Garrett 2011, p. 114). Interface designers must

take into account how an end-user interacts with the design, how the user makes the transition between screens and assure that the designed components provide feedback on the user's interactions (Murphy 2018). According to Krippendorf (2006, p. 8), "Interfaces constitute an entirely new kind of artefact, a human-technological symbiosis that cannot be attended to without reference to both. For designers, a key concern is that interfaces are understandable".

The fourth industrial revolution's growing impact on communication and graphic design

The need to introduce new modules such as UI design, arises from technical innovations linked to the fourth industrial revolution, a term first used in 2015 by the executive chairman of the World Economic Forum, Professor Klaus Schwab, in an article in Foreign Affairs, and elaborated on in his 2016 book, *The Fourth Industrial Revolution*. In 2006 Klaus Krippendorf (2006, p. xiv), Professor of Communication at the Annenberg School for Communication, University of Pennsylvania, already remarked that skills such as desktop publishing, traditionally associated with graphic designers, have been taken over by technologies. This has "forced a redrawing of the boundaries between design skills and mere technological literacy" (Krippendorf 2006, p. XIV). Since then, technological progress has brought about considerably more changes. While Frey and Osborne (2013, p. 26) state in their working paper on the future of employment that "it seems unlikely that occupations requiring a high degree of creative intelligence will be automated in the next decades". Changes in technology and media consumption, such as a decrease in printed media and above-the-line advertising (Breitenbach 2018; Thompson 2018), have decreased the need for traditional graphic design, while digital advertising and UX design have increased (van der Haar 2018). It seems, though, that formal tertiary tuition has not measured up to recent developments. According to the American Institute of Graphic Art (AIGA), there has been a shift in establishing the changing goals of communication design, but United States design schools, "assigned new media instruction to specialised classes, or in some cases, to independent curricula that left communication design programs bereft of instruction in emerging technologies for as much as a decade" (AIGA Designer 2025 2017, p. 1).

The United States of America Bureau of Labour estimates 4% growth in traditional graphic design positions between 2016 and 2026, versus an anticipated 8% growth in multimedia design, 15% growth in web development and 24% in software development (United States Department of Labor Occupational Outlook Handbook 2019). While this picture is a little different in South Africa (van der Haar 2018) owing to a dissimilar market structure, it still indicates that a dramatic shift in media consumption is underway. According to Pretorius et al. (2015, p. 2), "it has become increasingly common, perhaps even required, for organisations to include user experience (UX) activities, such as user research and testing in their design and development process" (2015, p. 2). This shift towards user experience correlates with Richard Buchanan's (2015, p. 11) four orders of design which "demonstrate the evolution of the design professions from graphic and industrial design to interaction design and, then, to the design of systems". The 19.7% of alumni employed in UX/UI are therefore already working within 4IR and the fourth order of design.

According to Schwab (2016, p. 7), "(on) the societal front, a paradigm shift is underway in how we work and communicate, as well as in how we express, inform and entertain ourselves". Krippendorf (2006, p. XV) recommends that "[d]esign has to shift gears […] to conceptualising artefacts, material or social, that have a chance of meaning something to their users, that aid

larger communities, and that support a society that is in the process of reconstructing itself in unprecedented ways and at record speeds". According to Tomás García Ferrari (2017, p. 4), senior lecturer in Design at Waikato University, New Zealand, in "[u]nderstanding that the domain of design has expanded from form-giving to creating systems that support human interactions, a literacy on systems becomes relevant to design". Meredith Davis, Professor Emeritus of Graphic Design at NC State University and former president of AIGA, in her keynote address at the 2008 AIGA conference, asks "if our role as designers is […] increasingly about designing tools, systems, and the conditions through and in which others create their own experiences, what are we doing to educate design students about engaging the people for whom we design; about platforms that are adaptable and expandable as participants and social structures evolve over time; and about working in interdisciplinary teams that include human-centred experts?" (Davis 2008, p. 5)

Based on these potentially disruptive changes, AIGA in 2017 studied the creative industry and compiled a list of influential trends and recommendations for graphic design curricula with regard to new competencies required by both practitioners and graphic design graduates (*AIGA Designer 2025* 2017). According to *AIGA Designer 2025* (2017, p. 2), "A design education for the future (…) is not one in which technology is simply a tool for the design or display of information but a data-rich, data-aware landscape that is reading and responding to everything we do".

Pretorius et al. state in a study on the 2015 landscape of UX Design that "(i)n South Africa the landscape of UX is at a critical point because although it has begun to gain acceptance as a valuable and viable approach to designing digital products, services and systems, there is still no specific, formal tertiary education route to becoming a UX designer" (Pretorius et al. 2015, p. 3). Their survey on 105 UX practitioners, "shows a variety of institutions where UX is offered, but according to the authors' knowledge, no institution offers a formal UX-focused degree" (Pretorius et al. 2015, p. 3).

UX design careers are mostly covered by South African multimedia programmes, but owing to the complexity of UX design fields, there is still room for graphic designers to enter the field, specifically as UI designers, because of the strong focus on visual design informed by UX. This is seen in the statistics generated from a UJ graphic design alumni network employment survey in 2018, based on information gained from LinkedIn and Facebook. The data indicated that, at the time of the survey, 19.7% of alumni had diverged from 'traditional' graphic design to UX design.

The 2019 Project

The first user interface course for second-year students of UJ's Department of Graphic Design took place from 12 February until 22 March 2019. The project ran over two three-week periods with a group of 44 second-year students.

The purpose of the module was to enable students to apply their knowledge of 'traditional' graphic design to the solving of design problems, using various design methods, processes and techniques to create professional UI designs, and in the process developing an understanding of designing functional human-centred systems.

A brief was developed in an interdisciplinary team with the assistance of UJ's Department of Multimedia. The chosen clients, owing to their varied products, were two well-known purveyors of seeds, who, according to the brief, required a new shopping application (app). Students were asked to:

1. Conduct basic research on a current user-interface design by:

- identifying three ‘commerce’ based applications, listing how the applications function, especially the organisation of product information, as well as drawing the phases of the user-journey within the App (Figure 1);
- drawing user journeys for all phases of the interaction of their proposed app, taking into account the needs of the end-users (Figure 2).

2. Create a proposed design by hand and digitally with regard to colour, fonts and layout, including a series of wireframes, by:

- creating a style tile (Figure 3) of the proposed design,
- drawing a series of wireframes that show logical user journeys for all phases,
- showing all possible layouts and interactions within the wireframes
- basing all designs on a consistent grid.

3. Design cohesive interaction elements for a modular design by:

- sketching and designing cohesive interface and interaction components, including different behaviour states of *use,* that is, the interaction design pattern (e.g. pressed button, incorrect entry)

4. Combine designed elements into a well-designed user interface by:

- creating a consistent visual identity for the entire app
- creating a mock-up of a comprehensive app

After the briefing, students were divided into two groups that both had to complete the project within three and a half weeks. As shown in Figure 1, as part of initial research, the user journey for an existing app is documented as part of initial research, representing the steps a user takes while interacting with the product (Mears 2013):

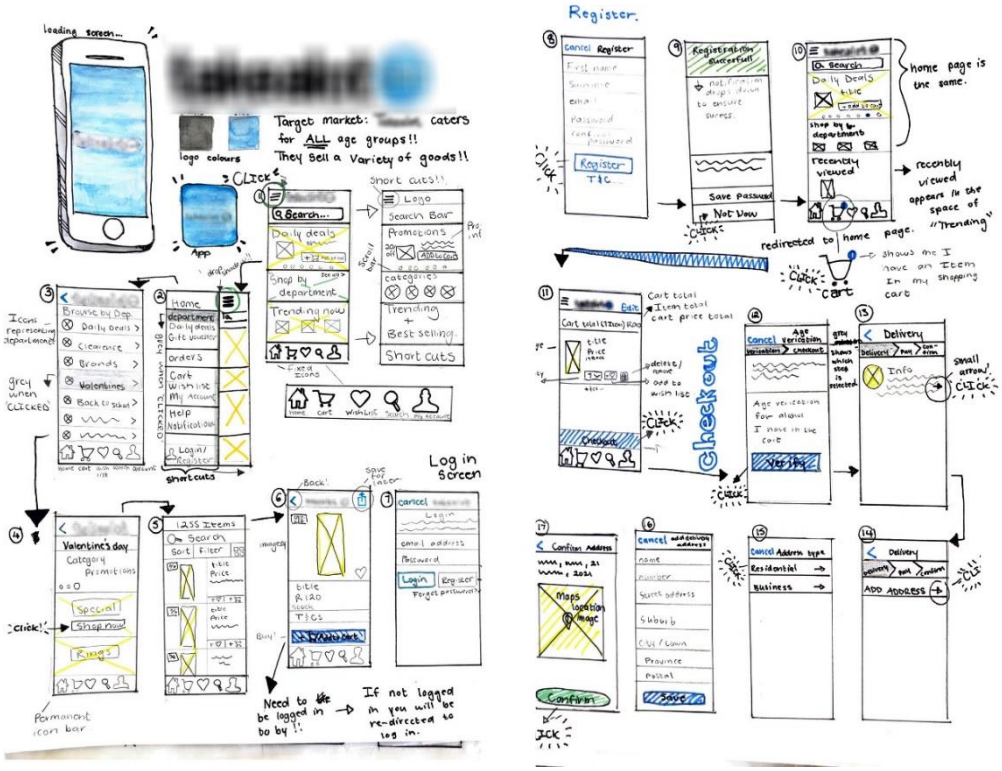


Figure 1: Existing user journey, 2019 (Crooks 2019) (research file)

During the first project phase, students had to complete three user journeys on shopping applications to help them grasp the logical coherence of an application. After research on target markets, relevant apps and user journeys, students designed their own initial user-journeys in rough wireframes (Figure 2).

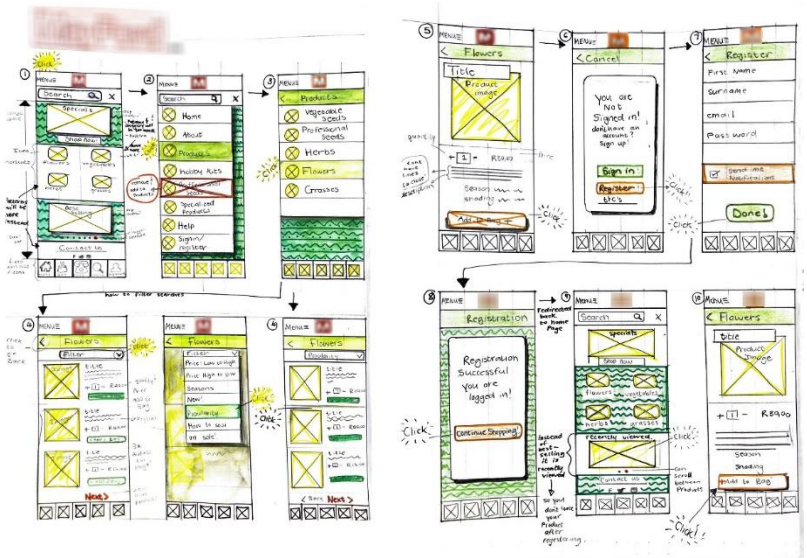


Figure 2: Student user journey (detail), 2019 (Crooks 2019) (research file)

During class, students were paired three to five times with peers and tasked to follow each other's user journeys. While this was only a small class exercise, it greatly improved the human-centred approach in a majority of the projects. Based on the more human-centred designs, students extended the range of their wireframes and developed brand-specific style tiles, proposing the look and feel of the application.

Figure 3: Student-generated style tile, 2019 (Crooks 2019) (research file)

Using the concept of atomic design, which is a modular approach to user interface design that breaks interfaces down to create interface design systems in a more deliberate and hierarchical manner (Frost 2016, p. 42), students were then required/tasked to develop a unique icon set and design all interactive media in their various states. All these separate elements were used to populate the initial wireframes and create a comprehensive application. Students had to hand-in a pdf digitally of the final app. Students also had to provide a thorough research document of their design process. This document had to include their visual inspiration, style tile, wireframe scamps, ideas for layouts, the site map, as well as their designed pages, including different behaviour states of use, for example, pressed a button and incorrect entry (Figure 4 as an example).

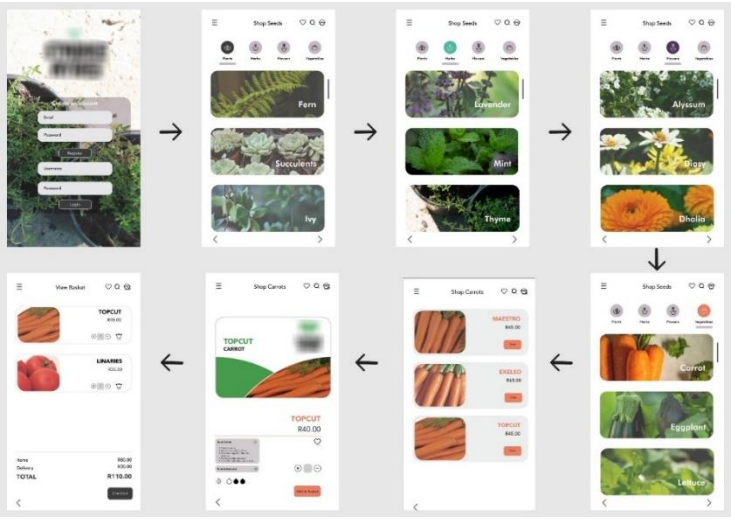


Figure 4: Starke Ayres site map (detail), 2019 (Bismilla 2019) (research file)

Feedback on the course

Feedback included the opinions of both the graphic design students who had completed the course and of graphic design alumni currently involved in the user experience field in South Africa.

Student feedback

A survey was conducted to obtain voluntary, anonymous feedback from 28 out of 44 second-year student respondents who completed the course. Questionnaires on Google Forms probed the suitability of the brief in relation to the students' level of study; the clarity of the course content; aspects of the content and activities that were most enjoyable; the problems experienced; valuable lessons learned from the unit; the influence of the project on students' feelings (did it make them more averse to or more positive towards a career in UI design); suggested improvements, and so forth.

Student feedback was positive, with 92% of respondents indicating that they had enjoyed the project. Some students struggled with compiling their research presentations (7%), icon design (21%), the choice of the right colour scheme (11%), and with the strict use of a grid (21%). Valuable lessons students learned included proper time management, project planning (28%); proper grid-use (36%); attention to detail (32%), and user-friendly and target market-friendly design principles (25%). Suggested improvements included a longer period for the project (21%); more depth concerning layout, styles and anatomic design (21%), as well as one request to be taught coding.

Industry feedback

To ascertain the project's success, to better align the project with industry requirements of graduates, and to improve the unit for 2020, a small number of relevant alumni were requested to provide feedback on the 2019 project by reviewing the course notes, the brief and a final student project, which received high marks according to the brief's outcomes.

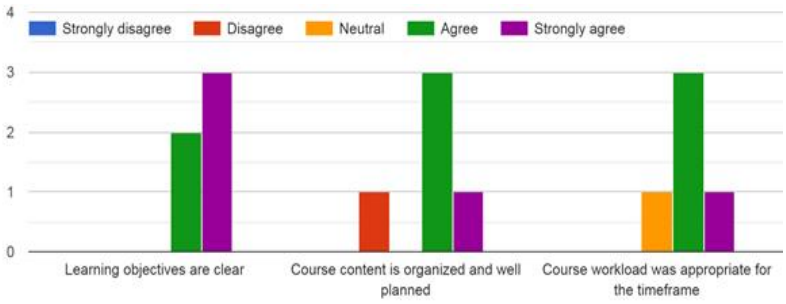
Questions were asked with regards to what alumni would have preferred to learn during their studies in view of their current careers; which skills they would recommend students be taught for a career in UI/UX; the potential contribution of the 2019 course to prepare students for industry; relevance of the course content; the complexity of the course; the structure of the course content; the amount of work required for the timeframe; the most valuable aspects of the brief and project; aspects of the content deemed less important or irrelevant and possible improvements and suggestions for an appropriate follow-up course.

The industry feedback was particularly valuable, as it highlighted gaps in both the project and the curriculum. However, the specific ways in which the alumni use their skills are not necessarily aligned with what they had been taught in undergraduate programs. For example, design thinking and human-centred design units, which require working with stakeholders to identify their needs, using empathy, respect and clear communication channels (Giacomin 2012), is taught in detail during the optional honours year, which only one of the alumni had completed. Two alumni had obtained an online qualification in UX design after graduating, to extend their knowledge after their university studies.

Alumni's main requests, that is, what they wished they had learned during their studies in view of their current careers, can be summarised as human-centred design (60%); prototyping software such as Adobe XD (60%); the foundations of UX and UI (40%); industry phases of product design and design systems (60%), i.e. understanding a systematic approach to UI design. The last three points were covered by the 2019 course. Alumni's emphasis on the value of better comprehending the phases of product design align with AIGA Designer 2025's focus on complexity, and the fact that industry-based design problems are progressively situated within larger human-centred systems, distinguished by interdependent relationships among elements or activities which require interdisciplinary expertise (American Institute of Graphic Artists 2017, p. 3).

Required knowledge for graduates, as recommended by the alumni, included empathy for users and of user testing (80%); colour theory (20%); digital typography (40%); prototyping software (60%); Information Architecture (60%); systems design (20%); wireframing (60%); user journeys (60%); responsive design (40%), proper grid use (20%), pixels and resolution (20%) and design consistency (20%), as well as an understanding of the technological limitations of developers (60%). Of the listed recommendations further user-testing, correct pixel and resolution use, as well as prototyping software (Adobe XD) will be integrated into the 2020 course. Colour theory, digital typography, information architecture, wireframing, user journeys, proper grid use and design consistency are already addressed in the current course. Further research will be conducted to understand technical limitations and responsive design, but this may prove too extensive for an introductory course. Alumni recommendations align with AIGA Designer 2025's (2017, p. 4) trend on linking physical and digital experiences, in emphasising users' transition across systems, devices, environments and activities in continuous communication and service experiences, and therefore the need of technology to provide a seamless, unified experience with regard to visual, system and information design.

Table 1. Course content evaluation, 2019, industry evaluation of the 2019 second-year UI course (Google Forms)



There was less consistency in what respondents deemed the most valuable aspects of the brief, namely the focus on information architecture (20%), understanding the fundamentals of UX/UI (40%), the project structure's introduction to process work (20%), the correct terminology used (20%), and requiring students to justify their design decisions (20%) (Table 1 & 2).

Table 2. Contribution to preparing students for practical skills in industry evaluation, 2019, industry evaluation of the 2019 second-year UI course (Google Forms)

The majority of alumni (60%) considered atomic and icon design as unnecessary. If these aspects were to be removed from the course, it could make room for a focus on other UI aspects, such as learning relevant prototyping software. One respondent felt that the style tile was also unnecessary, as all the applications she had worked on already had existing brands. Another felt the overlap between UX and UI needed to be highlighted more, as UI designers can still create wireframes and prototypes, influence the interaction, and do user research and testing, something that had been a particular struggle in developing the course.

The improvements alumni recommended were varied. These included explaining a real-world application process (20%); accentuating the role of the UX and UI designer in product design (40%); conducting user testing (20%), and defining stakeholders in detail (20%).

Some respondents suggested that the course should take place later in the year, with a preceding course in UX design. The follow-up course should focus on UI, and include iconography, graphical components, imagery and typography. While this is feasible, it would interfere and overlap with what is already covered by UJ multimedia, but some of these aspects are planned to be included in future courses.

Although the alumni were critical, the majority (60%) regarded the course as highly relevant, and 40% of respondents felt that the course covered the fundamentals well, and wished that they could have followed it.

Conclusion

The planned 2020 second-year UI project aims to combine the outcomes of the 2019 course with specific recommended changes, such as the introduction of prototyping software, namely Adobe XD, and a clearer explanation of key concepts such as UX and UI design. The process has been highly rewarding with regard to developing a model of practice, updating this module, as well as other modules that I currently teach, consequently further improving the UJ Graphic Design curriculum and the university's relationship with a growing industry.

In future, alumni from industry will be invited to come and expound on their role in the development of a real application, as this project has opened the door to a closer relationship between industry and UJ graphic design. This should not only introduce students to real-world inspired practical projects, better prepare them for their future careers and enable role-players from industry to become acquainted with potential employees but can also generate future research and new collaborations.

The new skills required of graduates are indeed "setting the base for a different kind of designer, not primarily concerned with the process of form-giving, but with the understanding of complex systems" (Ferrari 2017, p. 4). The constant improvements in technology present both a challenge for and an opportunity to tertiary graphic design curricula to be on the forefront, remain relevant and prepare students to easily cope with innovation in a rapidly changing creative industry.

References

Adtalent 2019, 'Adtalent salary survey', viewed 20 June 2019, <http://www.adtalent.co.za/wp-content/uploads/2019/01/Salary-Survey-2019.pdf>.

American Institute of Graphic Artists 2017, 'AIGA Designer 2025: why design education should pay attention to trends', viewed 5 April 2019, <https://educators.aiga.org/wp-content/uploads/2017/08/DESIGNER-2025-SUMMARY.pdf>.

Bismilla, Z 2019, 'Research file', University of Johannesburg, Faculty of Art, Design and Architecture, viewed 25 March 2019, <https://drive.google.com/file/d/11a3Hk0n7AeByjtrqpuUrB4k6R3oADPG4/view?usp=sharing>.

Breitenbach, D 2018, 'Magazines ABC Q2 2018: decline continues', *Bizcommunity* 14 August, viewed 29 June 2019, <https://www.bizcommunity.com/Article/ 196/39/180524.html>.

Buchanan, R 2000, 'Human dignity and human rights: towards a human-centred framework for design', Design Educators Forum of South Africa, Cape Town, 22 June, Keynote speech, viewed 20 June 2019, <http://www.defsa.org.za/sites/default/files/downloads/2000conference/09.%20Keynote%20Dr%20Richard%20Buchanan.pdf>.

Buchanan, R 2015, 'Worlds in the making: design, management, and the reform of organizationnal culture', *She Ji: The Journal of Design, Economics, and Innovation*, vol. 1, no. 1, pp. 5-21.

Crooks, H 2019, 'Research file', University of Johannesburg, Faculty of Art, Design and Architecture, viewed 12 March 2019, <https://drive.google.com/open?id=16T2L-vuMiaa44g0Ng7o_MaYWzJBwWsTF>.

Davis, M 2008, 'Toto, I've got a feeling we're not in Kansas anymore…', American Institute of Graphic Artists Conference, Boston, 4 April, Keynote speech, viewed 29 June 2019, <https://www.aiga.org/globalassets/migrated-pdfs/davis_keynote_paper_ and_images>.

Ferrari, TG 2017, 'Design and the fourth industrial revolution. Dangers and opportunities for a mutating discipline', *The Design Journal*, vol. 20, no. 1, pp. S2625-S2633.

Frey, CB & Osborne, MA 2013, **'**The future of employment: how susceptible are jobs to computerisation*?',* Oxford, Oxford Martin Programme on Technology and Employment, viewed 29 June 2019, <https://www.oxfordmartin.ox.ac.uk/ downloads/academic/future-of-employment.pdf>.

Frost, B 2016, *Atomic Design.* Pittsburgh, Pennsylvania, Brad Frost Web, viewed 7 February 2019, <http://www.softouch.on.ca/kb/data/Atomic%20Design.pdf>.

Garrett, J 2011, *The elements of user experience design: user-centered design for the web and beyond*, 2nd ed., New Riders, California.

Giacomin, J 2015, 'What is human-centred design?' *The Design Journal*, vol. 17, no. 4, pp. 606-623.

Krippendorf, K 2006, *The semantic turn: a new foundation for design*, CRC Press Taylor & Francis Group, Boca Raton.

Mears, C 2013, 'User journeys – the beginner's guide', *The UX Review* 8 April 2013, viewed 9 June 2019, <https://uxplanet.org/design-principle-organizing-information-343a7ef936a8>.

Murphy, C 2018, 'A comprehensive guide to UI design', *Smashing Magazine* 21 February, viewed 9 June 2019, <https://www.smashingmagazine.com/ 2018/02/comprehensive-guide-ui-design/>.

Nikolov, A 2017, 'Design principle: organizing information', UX Planet 14 May 2017, viewed 9 June 2019, <https://uxplanet.org/design-principle-organizing-information-343a7ef936a8>.

Pretorius, M & Hobbs, J & Fenn, T 2015, 'The user experience landscape of South Africa', *2015 Annual Research Conference on South African Institute of Computer Scientists and Information Technologists,* Stellenbosch, South Africa — September 28 – 30, 2015, viewed 3 July 2019, <https://www.researchgate.net/publication/ 301452757_The_User_Experience_Landscape_of_South_Africa>.

Schwab, K 2016, *The fourth industrial revolution*, World Economic Forum, Geneva.

The Interaction Foundation 2019, 'What is user experience (UX) design?', viewed 1 July 2019, <https://www.interaction-design.org/literature/topics/ux-design>.

Thompson, D 2018, 'Where did all the advertising jobs go?', The Atlantic 7 February, viewed 29 June 2019, <https://www.theatlantic.com/business/ archive/2018/02/advertising-jobs-programmatic-tech/552629>.

United States Department of Labor 2019, Occupational Outlook Handbook, viewed 20 June 2019, <https://www.bls.gov/ooh/>.

Van der Haar, O 2018, '#BizTrends2018: the changing media environment for ad agencies', Bizcommunity 10 January 2018, viewed 29 June 2019, <https://www.bizcommunity.com/Article/196/424/171968.html>.

