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"SHOULD I PATENT THIS"?

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ABSTRACT
This paper addresses the recent legal and cultural evolutions within the United States Intellectual Property system and its impact on Industrial Design students. It reviews how the United States Congress has revised patent laws, diluting the rights of the inventor in favour of the inventor's sponsor. It also explains cultural shifts in patent creation and ownership, with teams of inter-disciplinary inventors employed by well-funded corporations at the core of the patent world. It then highlights how these changes do not favour student inventors and hinder their ability to protect their creative work.
This paper also explores how recent patent language includes claims of "user experience" and "usability" which can benefit industrial designers. It highlights intellectual property issues that students encounter, namely, dealing with creative rights ownership and Intellectual Property education. Finally, it proposes how design students and universities could evolve their traditional positions regarding intellectual property and their education methods to align training with the new intellectual property realities in the United States.

Keywords: Intellectual Property, design student, usability, user experience, technology transfer

1 INTRODUCTION

Recently our Industrial Design (ID) department witnessed an unfortunate argument between students over perceived intellectual property rights. Both sides engaged attorneys to argue their positions. Soon thereafter, the argument silently dissipated with no action taken by either side. The details regarding this conclusion are unknown, but it is suspected that neither party held "rights" that were legally pursuable and thus all arguments were mute. Unfortunately, it took two attorneys to clarify the situation to the young designers who were at the time passionately absorbed by the situation.
Industrial Design students create unique solutions to academic projects and often ask themselves (and their professors) "should I patent this"? Typically students hold an idyllic view of patents and their rights as a designer. They envision themselves as inventors akin to Thomas Edison, the Wright Brothers, and "Doc" Brown from the movie Back to the Future, who sacrifice countless hours and social relationships to develop products that will change the world and potentially create a substantial financial return. However, this notion of a "lone genius inventor" is "antiquated" and is partially to blame for conflicts similar to that mentioned above.
Over the last few years the intellectual property scheme in the United States has evolved and design students should understand the basics of patent law and trends so they may efficiently use limited resources wisely. These transformations include both legal and cultural changes. First, the United States Congress has altered patent laws, diluting the rights of the inventor in favour of the inventor's sponsor. Second, cultural shifts in patent creation and ownership place teams of cross-discipline inventors employed by large well-funded corporations at the core of the patent world. These changes do not favour the student inventor and significantly hinder their ability to protect their creative work.
However, there are emerging trends working in favour of industrial designers and potentially, student designers. These include the acceptance of "usability" as a driving force in patent "claim" language, and a push to license intellectual property developed in American Universities. Also, Industrial Design students should understand how these evolutions might affect their educational and private lives. Furthermore, the academic design studio, working on sponsored projects, is an ideal vehicle for learning about intellectual property issues.

This paper addresses the recent legal and cultural evolutions in patent law and proposes how design students and universities could evolve their traditional attitudes towards intellectual property and alter their education methods to align with the new intellectual property realities in the United States.

2 THE INDIVIDUAL INVENTOR

On June 1st 2011 the United States Committee on the Judiciary submitted to the US House of Representatives the America Invents Act to amend portions of Title 35, of the United States Patent Code. In this document, the committee reports that:

> "The U.S. Patent system, when first adopted in 1790, contemplated that individual inventors would file their own patent applications... It has become increasingly common for patent applications to be assigned to corporate entities, most commonly the employer of the inventor... Current law still reflects the antiquated notion that it is the inventor who files the application, not the company-assignee" [1].

The report further states that Section 115 and 118 of the Code should be modified, allowing the obligated "assignee's (corporate entities) to file a patent application" *without* the inventors immediate signature [1]. Historically, this signature has been a precious part of every invention indicating that the inventor has signed an oath "stating that the inventor believes he or she is the true inventor of the invention claimed" [1]. This new power enabling the transfer of inventorship from the inventor to the sponsor with or without the actual inventor's signature is a radical degradation of traditional inventors rights and signals the unimportance of the individual inventor in current patent law.

This brings into question that relationship between student designers and sponsoring institutions. A recent review of the author's institutional intellectual property policy indicates that students own the rights to their creative works. This policy dated October of 2000 states: "Students who independently develop intellectual property arising out of their participation in programs of study at the university will retain the ownership rights to such property" [2]. In this new environment, this statement seems outdated and begs the question, could a sponsoring academic entity transfer student rights to itself, just as a corporation could, without the consent of the inventor?

Typically Industrial Design programs incorporate outside corporations as sponsors for semester long studio projects. These corporations also typically request the intellectual rights to the student's work. Student designers are now in a unique situation. As the individual developers of intellectual property, they have to compete with two different possible sponsors, the University as the sponsor of their education, and the corporation sponsoring the semester's project. Ownership for the intellectual rights resulting from these academic projects could potentially become a three-way struggle between the student, the university and the corporate sponsor.

3 FROM INDIVIDUAL INVENTOR TO TEAM INVENTORS

Over that last few decades there has been a significant shift in the "culture" of invention. Corporate inventor teams have replaced the role of the individual inventor. This movement away from individual inventors is corroborated by observations from Dennis Crouch [3] who reports that of the patents filed in the US in "1952, 82% listed one inventor, 15% two inventors and 3% more than three inventors". "By 2011, the statistics had inverted. Less than 32% of patents issued list a single inventor", 25% list 2 inventors and "43% identify three of more inventors".

In a more recent report, Crouch [4] states that the trend showing an increase of patents filed with "teams of inventors" is increasing while patents filed with only one inventor continues to fall". Corporate inventor teams are the natural result of both the cost and complexity of contemporary inventions and the team based development methods that corporation's embrace today.

Most Industrial Design programs train students with simple, non-complex projects with some participation in single discipline team-based work, however, at the end of the semester, it is still the individual designer that is graded, not a team of inventors. Although students occasionally engage in cross-disciplinary projects in Industrial Design programs, it is not yet a standard practice. Consequently, industrial design students are primarily reliant on their individual genius to create patentable features while the trend for new invention is based on cross-disciplinary teams. While it is possible that a student design might invent something that is patentable, it is not probable.

4 INDIVIDUAL OWNERSHIP TO CORORATE OWNERSHIP

These corporate inventor teams are performing better today than at any time in history and corporations are using this trend to aggressively increase the size and quality of their patent portfolios. An analysis of patent ownership illustrates that individual inventors, who own intellectual property rights, are, like the individual inventors themselves, being replaced by corporations.

Evidence of corporate patent performance can be found in the IFI Claims Top 50 US Patents Granted list [5], published each year. This shows that in 2013, two popular consumer electronic companies, Apple Computer and Samsung Electronics, were granted a total of 1775 and 4676 patents respectively. Or, in a different perspective they were issued respectively 6 and 16 patents per workday. The process to develop and process patents in corporations is a complex and well-tuned effort. The inventors in those corporations need only get their creation into the hands of a team of attorney's who will nurture it through the patent application and granting process.

Evidence demonstrating that corporations dominate intellectual property ownership is found in the All Technologies Report, PARTS A1 [6] from the United States Patent and Trademark Office (USPTO). It shows that 82.5% of the total patents granted in 1999 where awarded to large entities, including both corporate and government entities. Thirteen years later, in 2012, 93% of all patents granted where awarded to corporations and governments. The relative number of patents granted to governments has stayed relatively flat over these 13 years, thus the growth has been in the corporate sector.

The drive to invent is a critical part of the race to rapidly build the size of the corporate patent portfolio. In today's world of litigation, the size and quality of your patent portfolio is worth millions or as recently demonstrated with the Apple and Samsung court case, billions of dollars. The process to obtain and protect a patent is not trivial, and individual inventors and especially design students rarely have the knowledge, time or resources to effectively protect patent worthy creations.

The patent game today is primarily a corporate game, the idea of an individual inventor or student creating a patent that is meaningful and defendable is an "antiquated" notion and students should be aware of the contemporary realities of the intellectual property world, before engaging in patent fantasy's or litigious argumentation.

5 USER EXPERIENCE AND USABILITY

User Experience (UX) is a relatively new term developed and promoted in the Human Computer Interaction (HCI) community. It is has not yet coalesced into a single definition but Law [7] "recommend(s) the term user experience to be scoped to products, systems, services, and objects that a person interacts with through a user interface." Bargas-Aliva [8] also highlights that key dimensions of UX studies include emotions and affect, enjoyment, and aesthetics.

Usability (UI) is a more common term used in HCI studies and is considered a subset of the User Experience focusing on the objective performance of a user interacting with a task, tool and the environment [9]. UX and UI were typically software focused, but are now considered a basic need in most serious new product development.

To stay abreast of the ever-evolving world of product design and development, Industrial Design departments are beginning to include usability and user experience studies in their curriculum. The foundational processes and ideals behind the new UX and UI methods are also useful in increasing the value and performance of non-software inclusive products covered in ID curriculum. With the advent of UX and UI ideals in product development, both in corporations and university curriculum, it will be insightful to uncover if it has influenced patent creation, and if so, then, how?

6 UX/UI IN PATENTS

To explore this notion, 10 patents from a single field of endeavour spanning 33 years were analyzed to discover how UI influenced the patents claims. Patents involving Illuminated Keyboards were randomly selected with a simple chronological spacing allowing for samples to represent different time periods spanning the years reviewed. Analysis of the samples showed that for eight of the ten patents, usability had "little" to "no" influence on the patent claim narrative. However, in two patents, usability played a predominant role in defining the claim narrative.

This analysis also uncovered that keyboard engineers are proficient at inventing new ways to solve the same problem (illuminating a keyboard), but are blind to how these inventions could be used in new ways. Only after usability ideals uncovered new issues were fresh claims incorporating illuminated

keyboards invented. In saturated domains, such as illuminated computer keyboards, it appears that incorporating UI and UX methodologies in the product development process could enable new patentable claims.

6.1 The Patent Analysis

Each of the ten patents were studied and grouped together by how UX/UI issues influenced the claim narrative. In the first group, Boulanger [10] and Brown [11], the word "user" is never specified, but they speak about an "operator" as an extension of their engineered system. For example, "…keys to extend through the openings to be manually depressed by a keyboard operator". Boulanger is only concerned with the systematic thoroughness of the mechanism, not the humanness of the operator.

The second group, Chiang [12], Douzono [13] and Suwa [14] lacks any mention of an operator or user. For example, the Chiang patent states: "Since computers may be used in various environments, such as dark environments, an illuminated keyboard is provided". One may assume that the user in this scenario is considered, but he/she plays no part in the specification of the invention. This team focuses solely on the precise and challenging engineering problem of illuminating a keyboard.

The third group, Howell [15], Zhang [16] and Welch [17], includes the word "user" and "operator" a few times in the document specification, but with limited impact. For example, the Howell patent states: "Portable computer systems are often used in low light situations. In these situations, it is easy to read information shown on the display. However, it is quite difficult to see the keys of the keyboard." In this narrative the user is alluded to but is not a driving factor in developing the claims.

The fourth group, Shipman [18] and Bronstein [19], engage usability issues fully in the patents claim narrative. Shipman dramatically highlights a number of different ways users need to operate keyboards in poor lighting situations. For example: "poor lighting…causes the keyboard operator to memorize the key locations or to strain their eyes." Although he is very conscious of the users needs, neither he nor any of the other inventors or patents mentioned so far have redefined the problem beyond "how to see a keyboard in the dark". It is noticeable that after 30 years of invention in a single domain engineers have produced only technological updates to the same problem.

Bronstein's patent, however, is a radical departure from the previous patents. This patent focuses on usability, which redefines how illuminated keyboards could be used. Bronstein explains that in conjunction with software programs, like tax forms, linking select illuminated keys with the requirements on the monitor enhance usability. He explains the following scenario:

> "A user may be presented with a form on a display screen of an electronic device associated with a keyboard, such as an electronic form. The variable illumination of one or more different keys on the keyboard may increase the user's efficiency in completing the form... The form may require the user enter… numbers in order to complete the form and may require the user to move or "tab" between entries on the form... The electronic device, which may be coupled to the keyboard, may provide a device input to the keyboard instructing that the numerical keys… the "TAB" key, and the "+," "-," and "." keys… be illuminated".

Where the other patents in this set have been developed to optimize a single well-established issue, this user-centred approach engages aspects of a meaningful user experience incorporating enhanced usability, to invent fresh solutions to fresh issues. This user-focused mentality illustrates in part why Apple, the owner of this patent, is currently a leader in the consumer electronics industry.

7 INTELLECTUAL PROPERTY AND DESIGN STUDENTS

To educate and protect students in intellectual property matters, the author's academic department has developed a number of proposals. One model mimics the evolutions identified in the legal and cultural changes outlined in this paper. In this case, to overcome the individual inventor scenario projects are sought which allow work in cross-disciplinary development teams on usability or user experience. An example of this collaborative effort can be reviewed in the paper "The Hewlett-Packard Sensory Home Project" [20].

Also, recognizing that intellectual property issues are realistically managed best by the experienced staffs of large institutions and not individuals, students participating in these courses are encouraged to assign their intellectual property rights over to the university who in turn, negotiate all IP issues on their behalf. In the current educational structure, when corporations require intellectual property agreements for sponsored projects, the students, as the owners of their creations, are left to negotiate

the terms of the agreement directly with the sponsor. This is a rather one-sided event that typically leaves the students feeling abused.

In the past, it has been demonstrated that students occasionally create work that corporations value and desire to develop further. On these occasions, students enter negotiations on their own behalf (what student has money for an attorney?). Being excited about the request but lacking knowledge and experience they typically overvalue their work, underestimate their rights and botch the negotiations, which benefits neither party. Both parties would be better served if students would allow an experienced attorney to negotiate these situations on their behalf. To address this issue at a university, one might consider reviewing how their university licenses intellectual property.

Large universities typically have Technology Transfer offices that handle processing of intellectual property and negotiating licensing contracts for the inventions created in the university's research labs. For individual players, such as students, to participate in the intellectual property domain in today's environment, they will need to collaborate with an established player, who has benevolent intentions. The Technology Transfer offices found at many large universities could fill this need.

Unlike most corporations, universities typically have generous profit sharing plans with their inventors. At the author's institution, intellectual property based income is shared between the inventor who receives 45% of the proceeds (minus the initial costs of processing the IP), the college of the inventor receiving 27.5% of the proceeds and the Technology Transfer office receiving the remaining 27.5% [2]. Enlisting students in this scheme would seem ideal, however, it requires first that the university be open to engaging with students on this level and secondly that the students are willing to participate in a "share the work, share the profit" venture.

To educate students in intellectual property issues, these same experts could be enlisted to either run a small IP workshop explaining the basics of intellectual property, or provide the professor with materials and guidelines for class presentation. The training would include the basics of patent and copyright law. It could potentially include real contracts that the students would sign as part of the studio course. Students would not only learn about contracts and what is patentable, but also how to search for prior art, understand claim language and perhaps most importantly, begin to understand the value and best use of their creative endeavours.

8 CONCLUSION

Students need to obtain a realistic view of the contemporary intellectual property environment and discover how they can effectively interact with it. In the product development world, they will be required to deal with it at one point or another.

First, they need to comprehend that their typically nostalgic view of Doc Emmett type inventors, who create patents, gaining fame and fortune, are extremely rare or even extinct in contemporary society. Second, they need to understand that today's patentable inventions predominantly come from teams of inventors that are usually composed of multi-disciplinary experts. Third, that playing in the intellectual property arena is primarily a game reserved for well-funded institutional players with a well-tuned legal staff. Fourth, that although recent changes in the intellectual property domain are a disadvantage to students, their usability and user experience research skills, as well as, their ability to network with inter-disciplinary peers, will enable contemporary students to create fresh, patentable, product designs. Finally students need to learn that IP is not a mystery to avoid, but an opportunity they are uniquely qualified to utilize. As students become familiar with the issues surrounding intellectual property, their behaviour should also evolve. An offence taken when one student feels another student has unjustly incorporated her "novel" idea into his work should disappear as well as the often-asked question, "should I patent this".

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