

AMERICAN UNIVERSITY OF BEIRUT

CAN NUDING AND MACHINE LEARNING IMPROVE THE
EFFECTIVENESS OF UNIVERSITY CAREER SERVICES?

by
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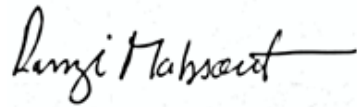
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AN ABSTRACT OF THE THESIS OF

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Building student career identity is central to the mission of higher education. Career decisions are taken at young ages and involve both immediate and long-term costs and benefits. Previous work on nudging interventions in higher education had targeted students' matriculation, retention and academic involvement. This paper explores the potential of college career services in employing nudging and machine learning to influence and support students with their career identity build-up process, which in turn would impact their success and commitment.

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CHAPTER I

INTRODUCTION

Two out of every three college graduates leave school feeling unprepared for the job market, yet 40% never take advantage of the free career counseling offered by their college, according to a report by Strada Education and Gallup (O'Hara, 2018). Bill Hansen, President and CEO of Strada Education Network and former U.S. Deputy Secretary of Education, states that students feel underprepared to enter the workforce while employers bemoan the skills of recent graduates, which signals demand for new career advising and work-relevant learning models that support more successful transitions from education to employment (Gallup; Strada Education Network, 2018).

Recently, the field of education has become a site for behavioral interventions and nudging where learners are increasingly nudged towards predefined modes of participation and behavior. Thaler and Sunstein (2008) explicitly note in their book *Nudge* that the shaping of educational options for students counts as a choice architecture. Nudges could be advantageous to aspiring students to better achieve their goals of academic success. Some authors have addressed the impact and importance of nudging on matriculation, retention rates and academic performance none of them discussed the potential impact of nudging on building students' career identity which is part of the college experience (Damgaard & Nielsen, 2018; Dimitrova et al, 2017; Cripps, 1996).

This thesis aims to highlight the role of career services to add to the literature on behavioral interventions and nudging using insights of machine learning. Firstly, it highlights the gaps that lead to mismatch between graduating students' skills and

workplace requirements. Second, it identifies intervention opportunities valuable to both academics and policy makers when designing future education/career interventions based on the institution's structure, needs and priorities. Third, it addresses the main constraints, challenges, and ethical concerns about nudging in general and nudging with machine learning in particular.

Nudge, in the context of behavioral interventions, one can ask if "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options (Thaler & Sunstein 2008). Recently, education nudging related to the use of digital technology often involves Machine Learning (ML) systems that are designed to shape students' choices and decisions based on constant tracking and predicting of their behaviors, emotions and actions (Nemorin, 2017). Machine Learning (ML), an artificial intelligence approach, tends to be understood as a method through which algorithms learn from data without the requirement of formal structuring by a human programmer. ML has grown rapidly over the last two decades. Meanwhile, learning analytics (LA) offers new opportunities to improve student retention and success (Stiles & Wilcox 2016). Learning analytics focusses on the use of institutional data about students to promptly identify poor performance so that actions can be taken to facilitate success. Used most frequently to describe the application of ML in education, LA has been defined as the measurement, collection, analysis and reporting of data about learners and their contexts for purposes of understanding and optimizing learning and the environments in which it occurs (Siemens, 2010).

One of the aims of higher education is obtaining advanced skills and expertise, and thereby offering better job opportunities for their students after graduation. Nyström, Dahlgren, and Dahlgren (2008) realized that students who are less certain why

they are in degree programs are more likely to adopt ‘just getting by’ approaches where the aim is to pass. But as students start to understand where the degree might take them, the relevance of the learning becomes clearer, and engagement with the curriculum is strengthened (Bridgstock et al., 2018). Therefore, students need to be able to recognize what it is they have learnt over the course of their degree and how they can apply it.

Connecting college education to job market has been one of the goals of higher education since the 1636 founding of Harvard University, the oldest institution of higher education in the United States (McGarry, 2018). Nowadays, universities are seeking to position themselves in a competitive higher education environment by demonstrating to prospective students that their graduates are successful in the labor market. Thus, universities are seeking ways to support students in preparing for the job market, and are approaching this challenge in different ways, whether through academic departments (Mason, Williams, and Cranmer 2009) or within designated careers service units (Watson 2011) or a combination of approaches (Farenga & Quinlan, 2015). Universities are interested in improving the employability of their graduates, as it is a critical factor for individuals in labor markets. Employability can be enhanced by career development learning (CDL) which Bridgstock (2009) defines as “the acquisition of capabilities that are useful to the lifelong development of one’s career, grounded in an ongoing learning-based process that builds knowledge of the world of work and one’s self” (Bridgstock et al., 2018). A key outcome of CDL is career identity. The student’s career identity acts as a ‘cognitive compass’ (Fugate, Kinicki, & Ashforth, 2004), supporting their learning and career choices, and helping them to make sense of learning experiences. One way to integrate CDL in the curriculum is through collaborative efforts between academic staff, careers services, and learning designers,

with the enabling strategic support of senior leadership (Bridgstock et al.,2018; Williams,2007). Developing career identity and enhancing employability requires that students acquire the skills necessary for career transition and the habits of life-long learning that are keys to professional success. And senior leaders in higher education are beginning to recognize the direct link career services has to recruitment, retention, and revenue for an institution (Ceperley, 2013; Education Advisory Board, 2012).

The thesis is organized as follows. Section 2 presents an overview of both nudge interventions in higher education and career services' role in preparing students for the workplace. In section 3, gaps between students, career services, and the workplace are identified. Section 4 offers suggestions on prospective nudge interventions by career services that would support students through their career identity build-up and job placement processes. In section 5, challenges, limitations, and opportunities are discussed on the proposed interventions as well as on nudging with ML. Ethical concerns on nudging and nudging with ML are discussed in section 6. I conclude with some final thoughts in section 7.

CHAPTER 2

LITERATURE REVIEW

2.1 Machine learning interventions in high education

Big data, learning analytics, and smart devices, all make powerful tools for gathering and using information about students (Wilde & Zaluska, 2016). That information could be used for designing and applying interventions that target students identified 'at risk' or to improve students' success. According to The Glossary of Education Reform (2013), the term 'at-risk' is frequently used to describe individual students or groups of students “who are considered to have a higher probability of failing academically or dropping out of school.” (p. 4). The technological advances in AI allow the collecting, processing, and application of data especially when ML algorithms are deployed. ML algorithms can identify potential predictors to be used to inform personalized interventions for students 'at-risk' (Aguiar et al. 2015, Wilde & Zaluska, 2016), or improve their success (Kil et al., 2016). Kil et al., 2016 further discuss how ML, with a set of algorithms, can complement and facilitate institutional transformation that involves people and processes by empowering a data-informed culture of care rather than a culture of accountability, and where stakeholders stay engaged by transforming their roles from operational to empowered through intentional intervention design and execution.

2.1.1 Matriculation support

After getting their acceptance into college, students must navigate a number of tasks such as completing their financial aid forms, submitting their final high school

transcripts, obtaining immunizations, and paying tuition, among others. Without support on those tasks, many students succumb to “summer melt,” the phenomenon where college intending high school graduates fail to matriculate, (Page & Gehlbach, 2017). To support students in matriculation to college, Page & Gehlbach conducted a field experiment in Georgia State University (GSU) employing artificial intelligence (AI). A personalized intervention was designed by AdmitHub, the artificial intelligent system, and customized for GSU for the experiment. Neural Network method was employed from the machine learning toolbox. The experiment results show that admitted and committed students at GSU have 3.3 percentage points more probability to enroll on time than the control group which indicates that personalized interventions in this context help lower summer melt and provide helpful support and guidance to students throughout their transition from high school to college. Similarly, Page, Castleman, and Meyer (2017) reported positive effects on financial aid applications and college enrolment in Texas of personalised reminders of financial aid applications, the steps involved and feedback on how far in the process the individual student had reached. There is also work on interventions that encourage families to fill out college financial aid forms (Bettinger, Long, Oreopoulos, & Sanbonmatsu, 2011; Castleman & Page, 2015; Castleman & Page, 2016) and interventions that reduce summer melt (Bird, Goodman, & Lamberton, 2017; Castleman, Owen, & Page, 2015).

2.1.2 Retention control

At Grinnell College effort was devoted to integrate Predictive Learning Analytics through the deployment of in-house and commercial software systems to better reach to students, especially those at risk of low retention. Through engagement

of both machine learning models and college human intelligence networks (faculty, advisors, administration and students) there is great potential in identifying patterns from students' data which generate the building blocks for developing alerts, predictive models, and associated interventions (Stiles & Wilcox, 2016). Different methods have been used for drop-out prediction: Support Vector Machines (Iykontzou 2009), Neural Networks (Iykontzou 2009, Guo 2010), Decision Trees and Bayesian Classifiers (Dekker et al 2009). Risk predictors enabled to reach students with targeted interventions, many of which have lasting effects on college persistence (see Castleman et al., 2014; Castleman & Page, 2016). To improve degree completion rate, Wilde suggests that education planners must have a very good understanding of the learner actions and context, something that could be achieved by deploying data collecting techniques and processing this data to design interventions that reinforce learners' positive behavior.

2.1.3 Supporting involvement & success

A study by Brown et al. (2019) focused on providing social reference points to encourage students to start working earlier on assignments. The study contributes to the growing literature on nudging student behavior in undergraduate higher education by focusing on a specific academic task across two semesters of a very large undergraduate introductory course. Personalized nudges encouraged students to start working earlier on assignments with promising results for personalization that suggest the potential for un-intrusive messaging for encouraging students to make changes to their coursework behavior. Moreover, choice architecture interventions have been used, for example, to facilitate the course selection process during academic advising appointments by

helping students understand the potential impact of co-enrollment in difficult courses on their predicted odds of academic success (Denley, 2014, Arnold, Castleman, Chewing, & Page, 2015). One approach to addressing the lack of personalized feedback in large lecture courses involves helping students understand their behaviors in the context of other students' performance in the course (Fritz, 2017). Other interventions related to student involvement and success are represented in studies that aimed to predict examination performances using ML methods ranging from Neural Networks (Cripps 1996, Oladokun et al., 2008), Decision Trees, (Guruler et al., 2010) Regression Analysis (Abdous et al., 2012). By comparing various data sources, Tempelaar et al. found that computer-assisted assessments such as quiz performances are the most effective in predicting examination performances (Tempelaar et al., 2015). A correlation between emotional affects and examination performances has been observed by Pardos et al. (2013). Recently, Jovanovic et al. used cluster analysis to identify patterns of platform use related to self-regulation and examination performance (Jovanovic et al., 2017).

2.2 Career services role in high education

2.2.1 Evolution of career services

Before there were career centers on college campuses, faculty assumed the responsibility of mentoring their students and preparing them for future employment (Herr, Rayman, & Garis, 1993). In the 1920s and 1930s, industrialization and a post-World War I baby boom created an influx of students, which increased the need for educational and vocational guidance for graduating teachers, slowly moving faculty away from their mentoring roles (Vinson et al., 2011). The landscape of higher education and career guidance changed once again post-World War II in the 1940s and

1950s. Driven by a reactive approach and philosophy, and fueled by the increased demand for workforce in manufacturing and mining, career staff played the roles of job fillers and measured their success by placement numbers (Dey & Cruzvergara,2014). In the 1970s and 1980s, as higher education shifted into a development model, which placed the responsibility of learning and educational outcomes on the student, career centers role emphasis was on counseling, career planning, and job search preparation (Casella, 1990). In the 1990s and 2000s, the dot-com boom increased the competition for candidates on college campuses, which helped engage career centers in employer relations and facilitate the relationship between students and employers through various networking career events and recruiting activities (Dey & Real, 2010). With the economic downturn in 2008, many universities began the process of reinventing their career services from the traditional transactional model to a customized connection model that promises specialized career development support to students and meaningful connections to internship and employment opportunities (Dey & Cruzvergara,2014). Dey and Cruzvergara further stated that senior leaders in education institutions have recognized the link between career services office and recruitment, retention and institutional revenue, and have begun to make a concerted effort to improve their career services operations.

2.2.2 Preparing students to the workplace

Although a degree is important to employers (Association for Talent Development, 2012; Eisner, 2010; Jackson, 2009), a degree is not always a guarantee that a person is fully equipped with the skills to meet the needs of the job market (Casner-Lotto & Barrington, 2006). Heckman and Kautz (2012) make it clear that soft

skills drive academic and life success. They discuss the benefits of social and emotional skills and argues against determining an individual's success solely on cognitive skills or IQ. Soft skills are becoming more and more important, yet the definition and perception of soft skills can vary in different settings. Soft skills do not always have a consistent definition between different cultures, places, and hierarchies (Dharmarajan, Pachigalla, & Lanka, 2012). However, Eisner (2010) found that practitioners appear to be in wide agreement on the importance of today's college graduates possessing interpersonal ability, communication, drive and adaptability among other soft skills. A 1999 literature review by Tanyel, Mitchell, and McAlum of skill set research show that employers find interpersonal ability, ethics, and responsibility/accountability to be top attributes for a new graduate to possess. Based on these findings it is expected from career services to play a major role in supporting students' skills acquisition process, something that students are not able to acquire solely from academic achievement.

CHAPTER 3

IDENTIFYING THE GAPS BETWEEN STUDENTS, CAREER SERVICES AND THE WORKPLACE

3.1 Gaps between student skills and workplace requirements

Graduating students are considered prepared to enter the workplace when their personality and their talents match the required knowledge and skills of a particular job. But not all employers are entirely happy with the graduates' levels of preparedness for the work environment (Boden & Nedeva, 2010). In fact, employers have stated that college graduates' skills are not at the level needed to perform tasks required in the business world (Schoeff, 2007; Banerji, 2007; Levine, 2005; Stevens, 2005). National studies and surveys have consistently found that businesses have difficulty finding employees with the right skills. In 2006, a joint study "Are They Really Ready to Work", found that employers have growing frustrations over the lack of skills they see in new workforce entrants (The Conference Board, et. al., 2006a); and that the new workforce entrants need applied soft skills and ethical awareness (Hinchliffe & Jolly, 2011). Another joint study, conducted in 2008 by SHRM and [WSJ.com/Careers](http://www.wsj.com/Careers), found the majority of HR professionals surveyed agreeing that those who receive degrees from "highly reputable colleges and universities" are believed to be better prepared than those whose degrees are from "other colleges and universities". Later in 2016 a report by PayScale "Workforce Skills Preparedness" found that a majority of managers (60%) reported a lack of critical thinking and problem solving, while 44% said

graduates weren't able to take ownership of their work, and 36% reported a deficit in teamwork skills.

3.2 Gaps between students and careers services

Career services play a major role in meeting students' vocational development needs and one of the primary missions of the university career center is to help students make decisions and choices about their own careers. Most centers provide four core services: career counseling/advising, instructional sessions and workshops, job and internship opportunities, and networking sessions with alumni and other professionals (Schaub, 2014).

The influential role of career centers in directing students' towards academic and career development was questioned by Kahn et al. (1999) who found that some students had no idea of the existence of careers service center on campus, and that the majority of them who were aware of its existence, were unaware of all the services it provides, and that they seek support when they are close to graduate (Morey et al., 2003, p. 14).

Students are not finding career services that helpful. A 2016 annual Gallup-Purdue University study on how recent graduates interacted with career centers showed that only 17 percent of those who graduated from 2010 to 2016 said they found their college career centers to be "very helpful," with another 26 percent reporting that the career office was "helpful." Less than 40 percent said they found career centers to be "somewhat helpful," and 17 percent said the interactions were not helpful at all (Gallup, 2016). Students' perception of the helpfulness of the careers services is another aspect that impacts the extent to which students seek and make benefit of these services. A study by Puchkoff and Lewin (1987) found that perceptions of usefulness influenced

whether students responded to letters offering vocational assistance from the college counseling center. Students with either perceptions of relevance of the services or perceptions of helpfulness responded to the letters they received from career center, and expressed an interest to obtain vocational assistance. Students that did not perceive helpfulness in career counseling did not respond to letters. Junn, Fuller, Derrell, and Graves (1996) investigated differences in students' perceptions of services on college campuses in regards to class, sex, and ethnic differences. They found that female and white students rated services more favorably than their counterparts. Clearly, students' awareness of the existence of the career services on campus, and their perceptions of both usefulness and helpfulness impacted their use of and engagement with such services; and this also varied among gender and ethnicity.

3.3 Gaps between careers service and stakeholders

The role and impact of career services may vary across schools and majors based on the institution and program. Hawthorn et al. (2002) found that in vocational courses such as medicine and architecture - which are linked to specific occupational role - school of faculty tend to regard career guidance as being irrelevant and job placement as being its own responsibility. Only students who decide to change vocational direction are usually regarded by the department as 'deviants' or 'drop-outs' and are referred to the careers service. Whereas in semi-vocational courses such as chemistry and psychology - career guidance and job placement are a shared responsibility between career services and the department, states Hawthorn et al. Nonetheless, in non-vocational courses such as English and history - they found that the department tends to view career guidance and job placement as being the sole responsibility of the careers service This overlap in

roles indicates the existence of a gap and a lack of collaboration between career services and faculty for majors requiring vocational and semi-vocational courses. The collaboration of both entities over sharing insights on students' achievements, strengths, weaknesses and potentials, would help students, especially those struggling, get direction, examine options, and take corrective actions in an early stage saving resources on both institutions and students.

Alumni can offer recent perspectives on current job market and provide valuable insights for professional networking programs, panels, and workshops. Yet, most of the interactions between alumni and their alma mater have been limited to letters and e-mails about event announcements (Moss, 2018). With online technology, nonetheless, colleges have started to take more initiative to involve alumni in enhancing the career services experience. Pennsylvania State University, for example, has been building on the standard practice of job databases to create a database of volunteer alumni career coaches that students communicate with via email or phone (Hanover Research, 2014). In 2010, the University of Richmond combined its offices of career services and alumni services to create its office of alumni and career services (Staff, 2018).

CHAPTER 4

PROSPECTIVE NUDGES BY CAREER SERVICES

College students can face a combination of logistical, financial, and psychological stressors that can, given their young age, drive them off-track and lead them to make decisions that may not be in their best long-term interests (Levine 2005; Super et al. 1996; Crites & Savickas 1995). The literature on interventions in education, summarized in section 2, was focused on helping students to matriculate, avoid dropping-out, and improve their performance. Some nudge interventions are based on ML insights and others are not. Future nudges by career services would not be far from previous work in the education field. They could create opportunities to enhance student commitment and success outcomes as the career services primary goal is guiding students while they build their career identity. During the career identity build up phase, students are expected to raise questions such as: What drew me to this course? What are my core work values and how can the range of career options open to me fit with those values? What skills will I require in my intended career and how will I acquire those? How will I cope with setbacks? What will I do if my career needs change or the labor market changes? And since choice architecture influences how we navigate complex decisions (Thaler & Sunstein, 2008), career services intervention, whether ML informed or not, could help students answer questions that involve a multi-criterion decision-making problem.

4.1 Nudge opportunities

To raise student awareness on the existence of career services, some colleges like Rutgers, University of Central Florida, and Monroe Community College, have their career services visit classes to provide students with anything from a broad overview of career planning to a targeted workshop on topics such as resume writing or interview skills (Clayton, 2011). Clayton believes that there are two obvious drawbacks: the need to foster buy-in from faculty to give up classroom time, and only being able to talk to students in a group format. To make every student aware of the existence of the career services, colleges might experiment with default options, which could also motivate every student to benefit from these services.

Another area for experimenting interventions is changing students' perceptions about careers services, taking into consideration the varied perceptions across gender and ethnicity. Nudges that involve students and alumni, who had positive experience with career services, would impact these perceptions by either reinforcing the positive perception or altering the negative to a positive one.

After choosing a school and program, students must choose what courses to take, when and why to take them. The advising that does take place is often focused on mechanics of course registration, rather than bigger questions about goals. For Clayton (2011) year, it seems plausible that traditional methods of student advising could be improved with technological innovation in different areas, one of which is career/educational exploration. Careers services would nudge students to support their decision-making about courses that are in alignment with their career goals. Such an approach might nudge students toward choices that are more likely to result in academic success without constraining their array of potential choices. Thus, students are more

likely to engage actively and meaningfully with learning opportunities offered during the course.

Given the influence they could have on their students, nudging faculty members is another possibility. Career services could nudge faculty to prod them explain to students, and on a regular basis, how course material is related to jobs in the market and emphasize on the skills their students are supposed to acquire during the learning process. It is not expected, though, that all types of skills can be acquired within a class context, yet this strategy could help students in other areas like writing their resumes, researching those jobs, and deciding on extracurricular activities that build the required skills.

Based on evidence of the mismatch between what employers want from graduating students in the workplace and what the latter can offer, there is a potential role of extracurricular activities in developing student employability. That is why career services, by collaborating with other student service units, would need to consider nudging students to engage in more of these activities. As grades alone are poor predictors of success (Chickering, 1994)., “successful careers call for well-developed cognitive skills, interpersonal competence, and motivation” (p.51). Purcell et al. (2012) noted how key employer skills tend to be less well developed by academic study yet are widely sought by employers, whereas participation in extracurricular activities led to less unemployment and more graduate-level jobs (see also Stuart et al., 2011; Martin, 2010; Cole et al., 2007).

Another area of exploration by choice architects is nudging the employers, as they are main determinants of students' job placement. It is arguable that the failure of employers of any type to employ graduates from diverse backgrounds is the result of

discrimination. Existing field experimental research unequivocally shows the existence of ethnic discrimination in the labor market (Bertrand and Duflo 2017; Bertrand and Mullainathan 2004; Kaas and Manger 2012; Oreopoulos 2011). Besides, research on discriminating against LGBT shows that, in some cases, gays and lesbians must pass as heterosexuals in order to gain access to the job market (Badgett et al. 1992). Findings of a study by Di Stasio et al. (2019) show that there is substantial discrimination against religion, but also that there are large differences across countries of destination (Lancee, 2019).

4.2 Proposed nudge interventions

Choice architecture, which is the ways to select and present choices that can lead to better behavior, is the core of any designed nudge intervention (Münscher et al., 2015; Thaler & Sunstein, 2008). One implication of choice architecture, as observed by Thaler & Sunstein, is that big problems do not always require big solutions. Designing a choice architecture for a variety of nudges by career services depends on the purpose and target of the intervention. Münscher et al. (2015) aggregate the empirically tested choice architecture interventions into three nudge categories: decision information nudges, decision structure nudges, and decision assistance nudges - which can be used as a guide while designing new nudges.

Making the involvement of students with career services, for example, a default is a nudge that causes a small change to the decision environment and works without the student actively making a decision about contacting the career service. A message that could be personalized for each student, would put appointment options in front of the student who is expected but not obliged, to show up at the career services office, or

interact and meet virtually with them on the internet. Defaults have been shown to have meaningful impacts on a number of individual decisions ranging from organ donation (Abadie and Gay, 2000; Johnson and Goldstein, 2003) to saving decisions (Madrian and Shea, 2001).

To influence students' perceptions about career services, decision information nudges could be exploited to facilitate the perceptual process of problem presentation or framing, and help the nudged access available information. Information framing, notes Fridman et al. (2016), nudges a person to reconsider his initial opinion. These nudges are 'educational' in nature and induce 'active' decision making. After being nudged, students who do not perceive helpfulness in career counseling, could re-consider responding to letters or texts from career services, and seek their guidance. Choice architects could go further and add a psychological element to the nudge especially when targeting people's perceptions and beliefs (Damgaard & Nielsen, 2018). Another approach to impact and alter students' perception about career services would be seizing the benefits of social comparison nudges, a form of decision assistance nudge. Presenting statistics about students and alumni who got placements and had positive experience with career services could be a possible simple nudge targeting perceptions.

When it comes to directing students' choices on courses, workshops and extracurricular activities, decision structural nudges can facilitate the choice among alternatives. It could be easier for students to sign up for a course or activity, but harder for them to stay devoted. At that stage, decision assistance nudges would remind students of behavioral options, foster commitments, and provide feedback on positive behavior; for example, receiving a rewarding message after attending a recommended workshop.

Nudging employers against discriminatory behaviors depends on the country's and the educational institution's culture, among other factors. Psychological and boost interventions, that are similar to informational nudges, can target employers' mindsets and beliefs (Damgaard & Nielsen, 2018). These nudges aim to de-bias behavior by adding specific and brief information to the decision environment. Furthermore, to influence behavior, not only in the specific decision environment in which the information is provided, but also in other contexts and long into the future. This is very crucial since once on the job, employees can get discriminated against in promotions or job retention.

Insights from nudge interventions by Bird et al. (2017) and Forsyth et al. (2007) suggest that some interventions may be too small to produce effects, and that it would be possible to combine several types of interventions for more effectiveness, given the large positive outcomes of applying nudges in many fields.

CHAPTER 5

DISCUSSION

5.1 On career services interventions

Many studies conclude that some of the main factors influencing career decision-making include non-personal factors that refer to one's family, community, and the circumstances and the context one is living in (Yip & Côté, 2013; Zeeleberg et al., 2008; Goldstein & Hogarth, 1997). Non-personal factors represent a real challenge to planners in careers services whose interventions have to support decisions that will make current and future job seekers better off. As Gottfredson (2002) observed, the difficulty lies in the fact that a student will need to compromise, taking into account the opinions of significant others who intervene explicitly or implicitly in the career decision-making process (Gati, 1993). Those family members or acquaintances, often have good intentions but do not necessarily possess the relevant knowledge or expertise. The effectiveness of nudge interventions to direct students towards better career choices is questionable in the context where adolescents would dismiss certain career options if they do not have parental approval.

However, conditions experienced by today's young adults such as expectations, education, economics, and parental relationships have affected their life cycle development. These factors have contributed to the realization that a change has occurred in the transition to adulthood (Reitzle, 2006; Shanahan, 2000), leading to the designation of a new developmental stage referred to as early adulthood or emerging adulthood (Arnett, 2000; Furstenberg et al., 2004). In this early adulthood stage young

men and women linger in a state of semi-autonomy, building their educational credentials for the labor market, and establishing emotional and economic independence from their parents (Arnett, 2000; Furstenberg et al., 2004). These findings indicate that these adults can decide about their careers even without their parents' approval; and thus, become more susceptible to career services nudges.

Another concern is the ever-changing recruitment trends along with huge technological advances which may not be in complete synchronization with students' major choices and skills acquired during their academic journey. Hence, the degree earned may impact the likelihood that a new college graduate is on track with contemporary recruitment trends. Studies report that, unlike in earlier years when companies tended to recruit from a large variety of majors, employers are increasingly drawing from business and technical (engineering and computer science) graduates (Gardner, 2008; National Association of Colleges and Employers, n. d.). So, what if a student joins the best education institution in the country for a degree in marketing for example, would it pay off by the time he enters the workforce? That is a big question directed at education planners, career services and, of course, employers.

As a matter of fact, required skills in the labor market are changing quickly, but computing systems are also changing at the same speed, notes Ramapo (2010). The big data revolution and advances in machine learning algorithms indicates that the occupations that can be replaced by technology are also increasing, so it would be crucial to understand and anticipate these changes and try to re-shape education and policies in a timelier manner to help to narrow the widening skills gap (World Economic Forum, 2016). This puts the effectiveness of career services nudge interventions at test. Nevertheless, many universities began the process of reinventing

their career department, moving them from the traditional transactional model of career services toward a customized connection model that promises specialized career development support to students and meaningful connections to internship and employment opportunities, as well as mentoring and experiential learning (Dey & Cruzvergara, 2014). This in turn allows for multiple networks on and off campus to overlap, and for career services' nudge interventions to be useful in guiding students throughout their college experiences including career choices and career identity development phases.

Several empirical studies have revealed that nudges may have very heterogeneous effects even when those experiments are based on randomized controlled trials (RCT) (Allcott, 2011). Kil, Baldasare and Milliron (2020) revealed that population heterogeneity in the real world is responsible for that disparity of results. Today, students entering higher education, as Lairio & Penttinen (2006) notes, are a much more diverse population than previously.

Thanks to the Internet that provides specific functionalities, like user tracking, and to data analytics and ML toolbox, which provide opportunities for education institutions to distinguish patterns in student behaviors, and as a result, allows personalization of nudges presented to users, making them potentially more effective. Career services should closely consider the alignment of the treatment, students' behavior, and their goals when developing models for personalizing their nudges. For example, career services can collect information on students' goals and motivation to courses, career options, academic performance, activities' engagement, etc.; and doing that from an early stage for better personalization and targeting.

5.2. On nudging with ML

Machine Learning power lies in its ability to review large volumes of data and discover specific trends and patterns that would not be apparent to humans. They provide a variety of models and techniques ranging from very simple ones such as Logistic Regressions to more complex models such as Neural networks. ML techniques like Support Vector Machine and Neural Networks are designed to analyze large amounts of data and capable of handling high dimensionality very well (Yang & Trewn, 2004). Moreover, ML algorithms gain experience with more data and thus keep improving in accuracy and efficiency which in turn enhances decision making.

When employed in any field, the major drawbacks in ML applications are commonly related to insufficient or noisy data (Wuest, 2016). In addition, Widodo & Yang (2007) argue that in some models, if trained data is too small, the model will suffer from under-fitting, thus end up with biased predictions. Such predictions will give wrong insights, and in that case nudges will be irrelevant. Sometimes when data sets are trained on complex models, the model could over-fit, which weakens the ability of the model to generalize and be useful on new data (Widodo & Yang, 2007). Since the testing result is dependent on the specific selected training data, multiple trainings with different data sets or models is recommended. Furthermore, ML needs enough time to let the algorithms learn and develop enough to fulfill their purpose with a considerable amount of accuracy and relevancy. It also needs massive resources to function, when complex models like neural networks are employed This can mean additional requirements of computer power. Kil, Baldasare and Milliron (2020) realize the importance of ML in recommending intervention strategies but they also caution that

ML needs to gather and provide evidence that the recommended intervention strategies will bear fruit in a cost-effective way.

Baer, Hagman, and Kil (2020) believe that AI and human intelligence can complement each other. ML techniques and learning analytics are increasingly intended to frame students' choices to nudge decisions towards optimal outcome (Knox et al., 2019), which indicate a potential for ML-informed nudges to impact student's career choices. Results interpretations become tricky given ML complexity, all of parameters, algorithms, and factors of human agency that need to be taken into account. And since knowledge needs to be contextualized and embodied in ways that machines cannot do, teachers and educational researchers need to be intimately involved in the technologies as they evolve (Lodge et al., 2018) and interpret how best to use data through the lens of learning design (Alhadad et al., 2018).

CHAPTER 6

ETHICAL CONCERNS

A number of scholars have convincingly argued that ethical concerns related to nudges may arise on occasion, while there is no good reason to think that any nudge inherently and by necessity is ethically problematic (e.g. Nys & Engelen, 2016; Blumenthal-Barby & Burroughs, 2012; Ashcroft, 2011; Thaler & Sunstein, 2008). Concerning the evaluation of nudging ethics, Lembcke & Brendel (2019) states that these ethical considerations can hardly be addressed discretely or binary as there is usually no right or wrong. So far, behavioral economics and policy related research have been raising three important areas for ethical considerations - freedom of choice and autonomy, transparency and goal-oriented justification of nudging. One remarkable and often criticized aspect of nudges is that they often influence individual behavior without being noticed by the affected subject (Dhingra et al., 2012, Hansen & Jespersen, 2013). This raises the concern that nudges covertly violate individual autonomy and are therefore unethical (Bovens, 2009, House of Lords Report, 2011). The most straightforward solution to this problem, suggest Brun et al. (2018), is to instruct policy-makers to disclose information regarding the potential influence, thus being transparent about the nudge and its purpose. However, this suggestion raises the concern that nudges will no longer be effective (Bovens, 2009). However, studies found no evidence that informing subjects that they were presented with a default option influences their effectiveness (Kroese, 2016; Stefel et al., 2016; Loewenstein et al., 2015; in a laboratory experiment, find no evidence that informing subjects that they

were presented with a self-default option influences their effectiveness. Another recent finding by Arad and Rubinstein (2017) illustrate that some people behave in a completely different way simply out of protest against being manipulated.

Clavien (2018) determined four strands of argumentations typically used by practitioners to claim their nudges as ethically acceptable: (1) The nudge helps to achieve some desirable outcome or (2) to fulfil important values or moral principles. (3) The nudgers' goals stem from good intentions and (4) one can provide evidence that nudgees do or would share the goals pursued by the choice architect. However, Clavien noted that nudges will leave a trace of moral violation as long as there are reasons to think that some nudgees would find it unbearable to be nudged.

There is a growing number of ethical issues regarding the collection and analyses of educational data, issues that include greater understanding and transparency regarding the “purposes for which data is being collected and how sensitive data will be handled” (Oblinger, 2012, p. 12). Legal frameworks such as the U.S. Family Educational Rights and Privacy Act focus largely on how information is used outside an institution rather than on its use within the institution, and Oblinger (2012) argues that it is crucial that institutions inform students “what information about them will be used for what purposes, by whom, and for what benefit” (p. 12). For data-informed career nudges, students' information would be shared at least with employers. Wel and Royackers (2004) discuss the ethics of tracking and analyzing student data without their explicit knowledge. Of interest, Land and Bayne (2005) discuss the broad acceptance of student surveillance and cite studies in which they record that the concept of logging educational activities seems to be quite acceptable to students. Still, the notion of online

privacy as a social norm is increasingly questioned (Arrington, 2010; Coll, Glassey, & Balleys, 2011).

Pre-existing biases embedded in the data on which algorithms are chosen to be trained has been a real concern (O'Neil, 2017; Pasquale, 2015; Angwin et al., 2016). When the data fed to the machines reflects the history of unequal society, the program in return will learn this society's biases. Therefore, algorithms can reflect and reinforce existing biases in society (Barocas & Selbet, 2016). Mittelstadt et al. (2016) argues that determining the potential and actual ethical impact of an algorithm is difficult for many reasons. They realize that identifying the influence of human subjectivity in algorithm design and configuration often requires investigation of long-term, multi-user development processes. Even with sufficient resources, problems and underlying values will often not be apparent until a problematic use case arises. Nonetheless, the remarkable new prevalence of algorithms and the widespread claims for their significance provide sufficient reasons to investigate their consequences.

CHAPTER 7

CONCLUSION

Career services attract students chiefly in the final phase of their studies, when it is often too late for the systematic development of professional competence. The phenomenon of many college graduates is not absorbed in the world of work and those on jobs lack vital skills, requires a change in the pattern of arrangements for education and career services so as to improve the response to various challenges and prepare students. Careers services in universities tend to employ a very limited number of specialist staff, and those staff tend to be trained in advising or counselling (Bridgstock, 2018). For these nudge interventions to be meaningful and feasible, career development learning must involve professional learning on the part of careers staff as well as academics, and this requires collaborating the efforts of the institution's community as a whole. Investing in career centers would allow more influence in their campus communities and more connection to all their stakeholders. They will be better equipped to engage students with early and individually tailored nudge interventions that enhance the career identity build-up process.

As the integration of technology in educational institutions becomes a requirement, AI and human intelligence can complement each other as knowledge needs to be contextualized and embodied in ways that machines cannot do. Administrators and faculty must engage students by meeting them where they are—adopting systems and policies to provide personalization, accessibility and interactivity across different channels. Ethical concerns will always arise when human privacy,

freedom and autonomy are involved and while accommodating students' information-gathering and decision-making behaviors. Making interactions timely, accessible and customizable would benefit students and generates behavioral data for institutions. Thus, education planners and choice architects have an opportunity in exploiting big data and machine learning toolbox to influence students' learning outcomes, career choices and even employers' behaviors.

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