Teaching Technologization

How Dutch Public Administration study programs have adapted to technologization on the job market.

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July 1st, 2020

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Ethical Approval BMS Ethics Committee: 200409

ABSTRACT

This paper examines the relationship between increasing technologization and the effects this phenomenon has on Public Administration study programs in the Netherlands. The pressure from students; new literature and research; job market; faculty vision and how they form a curriculum is the foundation of this research. Interviews with Program Directors and former Program Directors are next to online curriculum data the main sources of analysis. The literature creates an image of technologization being of increasing importance, but the evidence of this research suggests otherwise. Curricula seem to be moving away from technologization, instead of towards it. One explanation for this shift is that the role of the job market in providing feedback for study programs is much smaller than anticipated.

Wordcount (excluding references and abstract): 11.813

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INTRODUCTION

We live in a century in which it is impossible to think of not having technology. We use it for transportation, entertainment, contact relations, food preparation, in our studies, in our work, and simply for killing time. With all new kinds of technologies emerging, new types of effects will be felt. Most will be good effects, like more forms of entertainment like 4DX in cinemas, smartwatches, self-driving cars. However, some of the effects will be negative to certain groups in society, think about factory workers getting replaced by machines, transportation being done by self-driving vehicles, surgery being performed by robots. MacCarthy (2014) stated that we live in an era of technological unemployment—that technology is increasingly making skilled workers obsolete. This type of unemployment was the motivation for this thesis and the research question that is formulated at the end of this section.

Before every job market entry there is a history of education leading up to it. The effects that technologies will have on low skill jobs and routine jobs, has been analyzed thoroughly in the literature. Therefore, the focus of this thesis will be on the effects of technology on the education that higher education (HE) graduates received. HE graduates will occupy high skilled jobs facing automation from advances in artificial intelligence including accounting, mortgage origination, management consulting, financial planning, paralegals, and various medical specialities including radiology, general practice or even surgery (Acemoglu & Restrepo, 2017). A recent McKinsey study on the four fundamentals of workplace automation concludes that: "a significant percentage of the activities performed by even those in the highest paid occupations (for example, financial planners, physicians, and senior executives) can be automated by adapting current technology" (Chui et al, 2015, p.6). So, where the numbers for the low-skill, routine jobs are there, the numbers, data and research for high-skill jobs and automation are not yet known. However, we cannot just sit and wait for the effects to be felt. The future will automate high skill jobs and we should anticipate this future change. To anticipate this change in the job market, we need to turn to education. Since education is the build up to the job market this is the area that needs to change in order to keep employability of higher education graduates high.

Most scholars in the literature have been focusing on the effects on low skill, and routine jobs, this makes that there is a knowledge gap in the literature about to what extent technology will be able to take over high skill jobs. With Artificial Intelligence (AI) already able to beat the world's best chess and the world's best GO player there is no comprehending of how capable AI will be to perform tasks previously only assigned to humans. With current technologies, 23% of all employees already feel like they need new knowledge and skills to properly function in their job, according to research by Statistics Netherlands (Grijpstra & van Uitert, 2017). Once again, the answer to the problem can be found in (higher) education. The creation of these technologies tells us that we need to ask the question how education needs to anticipate this change. Frey and Osborne (2013) stated that the coming of new technologies raises questions in two domains: first, the ability of human labour to win the race against technology by means of education; second, the potential extent of technological unemployment, as an increasing pace of technological progress will cause higher job turnover, resulting in a higher natural rate of unemployment. This thesis will be focusing on the first domain: can human labour win the race against technology by means of education? With Dutch universities as our unit of observation for higher

education, and more specifically due to time constraints Public Administration programs within Dutch universities. Public Administration study programs are chosen since they are the most interdisciplinary of the social sciences. And where the effects of technology on the beta sciences is already very well included and accounted for the effects on the social sciences often lag behind. There is no change unless there is no way around it anymore. Education often falls behind. Almost every other social science study is connected with technology in some sort of way and therefore the effects of technologization will be felt by HE graduates. The question is whether higher education will take it upon themselves to teach the new generation of graduates about emerging technologies and their impacts.

The purpose of this research is to contribute to the research about the kind of effects technologization will have on education as a whole. While we already see changes in applied sciences such as engineering who anticipated technological advances by incorporating the studying of AI in its programs, it is also important to research the consequences it will have on the social sciences in the domain of education. They will in the short term feel secondary and indirect consequences of technologization. In the long run, they will also feel the direct consequences. The scientific relevance of this research is the knowledge gap in how adaptation can be formulated and designed so that it will remain a social science curriculum, but, anticipated on the new needs of the job market. It will contribute to knowledge about Dutch public administration programs and what the motivation is to change a curriculum. Whether they have a connection to changes on the job market or whether they see this apart from their responsibilities as an educational facility. Whether their feedback and changes are only coming from within the university. Furthermore, secondary literature research into the effects AI and other technological development will have on social science jobs will provide new insights into the course the job market can take in the future.

So, how is higher education, in this case universities in the Netherlands, anticipating technological change on the job market? The overall research question formulated is:

In what way have universities in the Netherlands adapted to technologization of the job market?
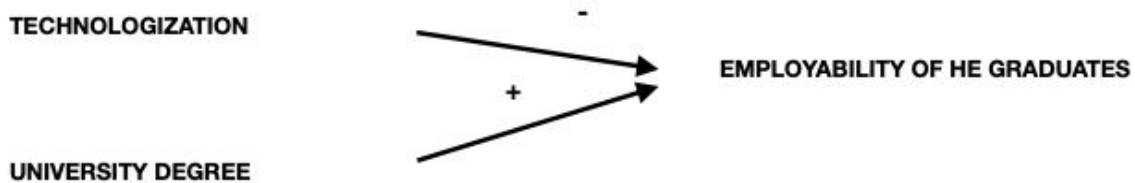

This question will be researched using qualitative data analysis, and secondary literature research. Data collection will be on curricula of the public administration programs in different Dutch universities. We will analyze whether they changed existing courses, added new courses or changed the name of study programs. Adding to this will be the interviews in which Program Directors can illustrate whether there are other courses not mentioned in the online data that also integrate technologization. Three concepts are central in this research, technologization, higher education, and organizational change. All of them will be discussed in the theoretical framework. Three propositions will be formulated based on the educational change we assume to find. Data collection will be on online course information, online curriculum information and in-depth interviews about Public Administration study programs. Data analysis will scale the different study programs from most adapted to technologization, to least adapted.
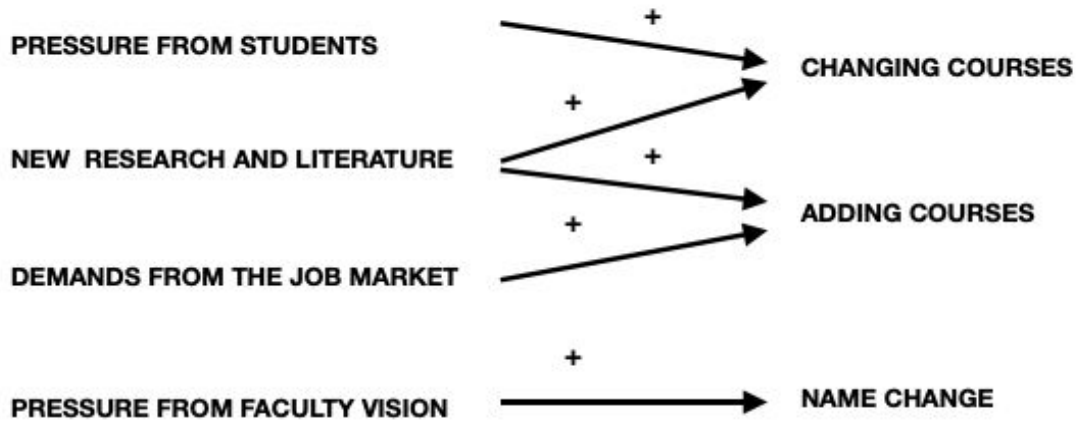
THEORETICAL FRAMEWORK

As stated in the introduction the theoretical foundation of this thesis has three central concepts. First is the technologization of work, specifically in relation to Industry 4.0, IoT and AI. Second is higher education, in relation to employability, the prospects for higher education graduates that enter the job market. Third, organizational change of universities, with a focus on social science departments and public administration studies. The first two concepts are the assumptions on which the qualitative data will be gathered on the third concept. This section will discuss each concept, the scholars and literature that substantiates the concepts and the hypotheses. So, where technologization and higher education find their substantiation in the literature and will be the assumption that form our first three hypotheses, it is organizational change that shows us the causal relationships that we will gather data on.

Figure 1 and 2 portray the causal relationships between the variables analyzed in this thesis. Both the relationships of the assumptions that are the foundation for the hypotheses and the relationships portrayed in the hypotheses.

FIG. 1 CAUSAL RELATIONSHIP LITERATURE ASSUMPTIONS

TECHNOLOGIZATION

-

EMPLOYABILITY OF HE GRADUATES

+

UNIVERSITY DEGREE

FIG. 2 CAUSAL RELATIONSHIP HYPOTHESES

PRESSURE FROM STUDENTS $\quad$ + $\quad$ CHANGING COURSES

NEW RESEARCH AND LITERATURE $\quad$ + $\quad$ +

DEMANDS FROM THE JOB MARKET $\quad$ + $\quad$ ADDING COURSES

PRESSURE FROM FACULTY VISION $\quad$ + $\quad$ NAME CHANGE

Technological change

Technologization will be used as an umbrella term in this research. Technologization as a verb is to make something technological; to equip with technology. Technologization in this research will reflect every other technological process found on the job market (e.g. innovation, computerization, automation, digitalization, digitization). By using technologization as an umbrella term for all of the other concepts literature with mention of any of these concepts can be used in the research.

Technologization is closely related to Industry 4.0. This means the introduction of the Internet of Things (IoT) and Artificial Intelligence (AI) on the job market. The Internet of Things can be described as a dynamic global network infrastructure where physical and virtual 'things' have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network' (Vermesan et al., 2009). Artificial Intelligence (AI) is one of the creations from industry 4.0 and the IoT. AI will do to skilled and higher education jobs what automation has done to low skilled, routine jobs (Prisecaru, 2016).

John Maynard Keynes (1930) came up with the term technological unemployment in 'Economic Possibilities for Our Grandchildren'. Keynes identifies technological unemployment as a new emerging 'disease' that many people, in that time, have not heard of yet. His definition of technological unemployment is unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour (Keynes, 1930, p. 325). In the era of AI and IoT this means that these new emerging technologies will be able to be used economically and will replace humans on the job market or radically change their jobs.

In his article, Ford (2013) shows that the high end of the polarized job market is also under attack as technology advances. Higher-wage white-collar jobs will be increasingly susceptible to software automation and machine learning. One of the biggest drivers of progress in this area is likely to be the "big data" phenomenon. The impact of big data and the internet of things can be felt in different

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professions. For example, lawyers and paralegals have been displaced by e-discovery software that can rapidly determine which electronic documents are relevant to court cases. More routine forms of journalism—such as basic sports and business writing—have also been successfully automated. So, with big data and artificial intelligence even high skilled jobs for HE graduates are at risk of being automated. Technology is becoming smarter and more creative, and it will be likely to replace people with a background in higher education as well. The foundation of this argument is that most jobs are fundamentally routine. Not in the way that they are the same every day, but they consist of a cluster of actions that are performed to get the wanted results. Therefore, when breaking a job into its different actions we might be able to teach technology how to perform these actions, which fundamentally changes or dismisses jobs for people (Ford, 2013).

What is most common for recent technologization is that these new technologies (AI & IoT) concern tasks that are considered to require specific human capacities related to visual perception, speech, sentiment recognition, and decision-making. In other words, AI is replacing mental tasks rather than physical ones, which were the target of previous waves of mechanization of automation from a policy perspective (Ernst et al., 2019). Many analysts are warning that advances in both robotics and AI over the next few decades could lead to significant job losses or job polarization and hence widen income and wealth disparities. In 'Progress without People' Noble (1995) shows that information technology has been developed and used over the years to deskill, discipline, and displace human labour in a global speed-up of unprecedented proportions (Noble, 1995: XI). Mainly because over the course of 5 decades of information revolution people and their working conditions were actually worse off than before. Campa (2014) stresses that every technological change is qualitatively different from the previous ones. In this era, artificial intelligence and its products intertwine with globalization. This means that with global input to new technologies and global implementation of these new technologies there is a faster and wider effect felt than with previous technological changes.

We assume that the coming of new technologies will have negative effects on employability of HE graduates. With the new technologies causing jobs to change, jobs to become obsolete and therefore causing uncertainty for the job market prospects.

So, the fact that overall high skilled jobs are feeling an effect, this effect might be quite specific to a limited group of higher educated professions. Since this thesis analyzes the social sciences, and public administration areas, there needs to be evidence in the literature that the effects of technologization will also be felt in this domain. Computers in the context of AI are the first truly "universal machines", which can find applications in all industries, across all types of work, and are designed to continue learning and improving as more data becomes available (Bruun & Duka, 2018). Technology in the context of AI and the IoT is not only applicable to lawyers and journalists. By the method of dividing jobs into its fundamental clusters of action and by the continuity of AI in learning how to act in certain situations, it will be able to take over almost every job, or at least be able to replace a big part of the labor force.

Next to AI being applicable in all domains, there are some scholars that tell us that AI will be applicable in specific public administration contexts. Predicted, AI will be applicable in the domain of responsiveness, judgement and accountability. It is said that scientists are developing AI systems that

will not only learn to learn independently but could also possess values, motives, and goals. Furthermore, these systems may be capable of making subjective, political judgments (Barth & Arnold, 1999). Artificial intelligence can be seen as an apolitical technology for improving the rationality of decision-making and the efficiency of operations in organizations. However, in public policy there is no such thing as an apolitical or valueless decision, but AI gives us the potential to know and predict underlying values and biases. So, this means that humans will no longer be needed to understand the values and choices that people need reflected in decision-making, AI has the potential to unravel these and understand them so that the decision-making process can be optimized.

More recent addition to the literature is by Kouziokas (2017), who states that artificial intelligence can be used in public administration to forecast high crime risk transportation areas in urban environments. In this research artificial intelligence was used as a forecasting method to develop a prediction model for transportation stations with high crime risks. The study was very promising, and this shows that AI cannot only replace people in public administration, but public administration graduates will have to be able to work with the adaptation of AI in their field of work. This evidence leads us to accept our second hypothesis.

We assume that there are many ways in which technology will not only change the job market for HE graduates in general, but it will have direct effects for public administration graduates. With technology already being integrated in the ways illustrated above the application of technology in other public administration domains is very likely.

Higher education

Higher education is increasingly expected to directly 'enhance employability' (OECD, 2016). Higher education has been put central in this research because the effects of technologization on the job market has been widely analyzed and researched for low-skill, routine jobs. Therefore, analyzing job market opportunities for university graduates will provide new insights for the existing literature. Since the main variable that is analyzed is job opportunities for HE graduates it should be certain that having a university degree actually increases job opportunities.

While it is common knowledge that people with a university are not often a big part of the unemployed population, to prove this we turn to the statistics. To portray the situation in the Dutch job market of university graduates, we turn to Statistics Netherlands. Their numbers show that directly after leaving university the numbers for students with and without a university diploma differ a lot. Immediately after leaving school, people that did not finish their university program with a degree have an unemployment percentage of 27,9%. Graduates that finished their university program with a degree have, after immediately leaving, an unemployment rate of only 18,1%. The difference becomes even bigger one year after finishing their program. The ones without a degree have an unemployment rate of 21,3%, and the ones that do have a degree only have an unemployment rate of 8,5% after one year (CBS, 2019).

These numbers illustrate the assumption that a higher education degree will have positive effects on employment possibilities. However, with the incorporation of new technologies in jobs

education needs to change if it wants to maintain its positive relation with employability. So, changes on the job market need to influence changes in the organization of the HE educational institutions to remain their elite position.

There is an argument to be made as to why higher education is chosen as the unit of observation and the interviews are with program directors. Higher education institutions have a great amount of autonomy when it comes to institutional policy. Policies are drafted and implemented by the higher educational institutions themselves in consultation with the ministry of education and the accreditation institution in the Netherlands and Flanders (NVAO). This autonomy is determined in the *Higher Education and Research Act 1992* (Wet op het Hoger onderwijs en Wetenschappelijk onderzoek 1992) and is governed by a board who is responsible for ensuring the effective management and for planning future developments. So, when we want to analyze the educational change that is set forth by technologization, higher educational institutions themselves are what we need to analyze.

Organizational change

This section will shine some light on the ways in which social science departments, and public administration studies in the Netherlands have adapted to technologization on the job market. This section is the foundation for the qualitative data collection, with the use of interviews. The three hypotheses will be the basis for the interview questions and will be the topic of analysis. These are also the qualifications for the different public administration studies, whether they are grouped as adapted best or least.

In the context of educational unemployment, educationalization is an expectation that the future of work can be improved by more investment in education. Educationalising is desirable because it empowers people and solves problems (Deleuze, 1992). Therefore, the approach in solving the issue of technologization on the job market is to educationalize the matter. According to Collins (1979) education can act as a form of 'hidden Keynesianism'. Meaning that it can absorb some of the insecurities on the job market caused by advancing automation and precarization of employment. One way to do this is through educational expansion. This restricts the flow of labor into the employment sector and keeps the rates of unemployment and underemployment low. According to (Peters et al. (2019), "There is

little that societies and individuals can do other than to invest in formal education and upgrade

their human capital to compete for a shrinking pool of viable employment opportunities (p. 257)."

Marchant, Stevens and Hennessy (2014) created a framework of policies that should be able to smoothen the transmission towards a more technologized job market. One of the ways in which is done is by adopting new policies for education. Their recommendations show that we should create a framework in which educational facilities work together with governments and employers to make sure that employees can have a lifelong learning experience. They also believe that educational curricula should be updated, so that the content of education aligns with the rapidly changing world. Their article

states that now is the time to experiment with education, to try to find what strategies and approaches work best in the era of evolving technologies and jobs.

In a study by Roberts (2015) after talking to academics and asking them what they believe influences their curriculum decisions most they found 8 influences. These being discipline of study, institutional context, research, sociopolitical context, academic identity, students, teaching and learning, and educational purposes. Participants in the study perceived the most direct influences to be: (1) educational purposes; (2) discipline; (3) research; (4) teaching, learning and students. So the main thing that influenced curriculum change in this study was found in the mission of the university itself, thus educational purposes and discipline, new literature and research on the job market and within the field of study, and the feedback they received from students. According to Barnett et al. (2001), "A curriculum, in other words, is a dynamic set of forces: the actual form that curricula take in particular settings represents the balance of the interplay of the separate interests (p. 438)." The four interests that interplay in this case are students, job market (potential employers), university (faculty) and together with changes in the literature and research of a field of study these are the main drivers of change within an education institution. Based upon this literature we formulated the following three propositions which will be the foundation for this research.

H1: Pressure from students and new literature will lead to changes in existing courses in public administration courses.

H2: New research and literature accompanied by demands of the job market will lead to adding new courses to the public administration study program.

H3: The vision from the university itself will lead to name changes of existing public administration study programs and courses to better reflect the vision.

EMPIRICAL DESIGN

In the context of educational change this thesis examines the impact of an external development (technologization) on university curricula. Educational change in this context means name change of a course or study program, adding new courses, or changing courses. In the literature, we identified three ways in which pressures can lead to educational change. This is through pressure from the faculty itself, from outside the university (job market, literature), or from students. In order to gather information about all three types of pressures there is a combination of looking at online data, the description of the study programs, courses, and course descriptions. This combined with interviews with current and former program directors of Public Administration studies at Dutch universities provides the most representative dataset of the educational situation. The motivation to choose program directors is because they are personally involved in the decisions made about the curricula. They will therefore be

familiar with changes made over the last year and the motivations for these changes. So, should technologization be a phenomenon that pushed for educational change, program directors can substantiate that.

The gathered data can be found in Data Appendix I: Data Curricula, and Data Appendix II: Interviews. The interviews were conducted online and were used as additional information for the data found online. In-depth questions about the curriculum situation and possible changes for the future were asked. Together with questions about how feedback for the study is gathered to get an overview of the pressures the study program faces, and whether any of these stakeholders are advocates for more technologization in study programs. The more complete overview of the study program and its technologization components is drawn in the next section about data documentation. The interviews are coded with Atlas, and the curricula data is presented in a table.

The study programs will eventually make a scale in the data analysis section. There the mentions of technologization terms in the name of the study, the name of the courses, and in the course descriptions will be once again discussed and the scale will be from most adapted, to middle, to least adapted to technologization. The data from the interviews is also added. So, that other courses that also discuss technologization, but do not reflect this in the course name or description, will be taken into account. The study programs will be rated from most, middle, to least technologized. Below you will find the scale used to analyze the amount of technologization each study program contains, going from 5 (most important) to 1 (least important). The data analysis will discuss the motivation for the places each study program has on the scale.

TABLE 1. Overview of how study aspects are scored

Aspect of study	Scale	Motivation
Technologization in the name of the study	5	The name of a study reflects what will be taught overall, when a PA study is labeled technical, it is guaranteed that technologization will be the main component of the study program.
Technologization in the name of a course	4	What goes for the name of a study is the same as the name for a course, when something has tech-terminology in it, it will be a big component of the course.
Technologization in the study description on the university's website	3	When tech-terminology is mentioned in the study description there needs to be mention of it in one or some courses. But it often does not say much about the extent to which technology is discussed, therefore, scored less than tech inclusion in the name.
Technologization in the description of a course	2	When tech-terminology is used in the course description it will be mentioned in the course, but it can still be just one case used in the course. Or one mention of types of digitalization or technologization. Therefore, less scored than tech inclusion in the name.

Technologization in a course, but no tech-terminology used online	1	If there is technologization in a course, as said by one of the participants it is often a case or a mention of it. The same can go for terminology in the description so they are scored the same.

FINDINGS

In this section the universities and their level of technologization are discussed in a case type manner. Each university and its most relevant data will be portrayed. By doing this in a case to case way it will create a clear foundation for the data analysis that will indicate which study programs are more adapted, middle, and least adapted to technological change. Data deemed most relevant is whether there was a mention of a technologization term in the study description, in the name of the study or a course, or in a course description. Whether the university has very good or very little ties to the job market. Whether technologization is a priority in the study program or neglected because of other priorities. The interviews with the (former) program director will illustrate whether there are other ways in which technologization may be incorporated in the study program.The data on the curricula can be found in Data Appendix I: Data Curricula. The data on the interviews can be found in Data Appendix II: Interviews. The websites of the study program descriptions on the different universities can be found in the footnotes.

TABLE 2. Overview of the data collection

Methods	Data collection period	Sample	Details
Online data collection	April - June 2020	6 participating studies	6 PA studies, online curricula (course descriptions, courses and study description) discussed in the context of technologization
Interviews	April - June 2020	6 participants	6 Participants, interviewed, transcribed and coded. (Topics: technologization, educational change, job market, feedback on study programs.)
Document analysis	June 2020	Final report of 6 studies and participants	In the data analysis the participating studies are scaled. From most adapted to technologization, to least. Using the

		data gathered in the interviews and online.

Public Administration Erasmus Rotterdam

The Public Administration study program of Erasmus Rotterdam does not have a technologization term in the name of the study. When looking at the content of the study on the Erasmus website[1] there was no mention of technologization terminology. In the study description there was also no mention of contemporary technologies, or technological change as part of the program. The website mentions criminality, pollution, and flexibilization of the job market as examples of topics that are discussed in the study program. When looking at the curriculum there is one course that has a technologization term in the name: Technology, Policy, and Society. After looking at the course descriptions there was another course that mentions contemporary technology. In the course description of Political Science, it says that the course will discuss the impact of social media on politics. In the course description of Technology, Policy, and Society it says that it focuses on the role of modern ICT within today's society and democracy. The course description also states that the course discusses how computerized predictions impact the way actors make decisions, and ethical issues connected to the interplay between technology and democracy. So, the technologization terms used in the course descriptions of the study program are social media, technology, ICT, and computerized.

The program director of Public Administration mentions that other components of the study pay attention to technologization or have the possibility to integrate technologization. She mentions Network Governance again as a course that extensively discusses technologization in the form of case studies. Introduction to Public Administration is another course that does this according to the program director. Next to the mandatory courses, students that write their theses or need to do a project have creative freedom when it comes to topics and can thus pick topics that discuss forms of technologization or have technologization influences (Program director, Interview 5, 28 April 2020).

The Public Administration curriculum the way Erasmus teaches it today was implemented a few years ago. The Erasmus university made the choice to go from 4 modules to 8 modules with 5 weeks and one course to complete, often together with a project. They had a reorganization that placed them in the one department with sociology. As a result of this the Public Administration students share courses with Sociology students. The Public Administration study program has 4 core subjects that they want students to use as lenses to look at social problems within their curriculum. These core subjects are economics, law, political science and sociology. These will not be changed, however, according to the program director there is some discussion as to whether psychology should be added as a new core subject. She says that a possible course for the future envisioned for Public Administration is adding psychology to the program and working more closely together with the job market.

The Erasmus university works together with the job market to get feedback on their study program but also in their curriculum itself. In their course Management, Consultancy and Policy Advice

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[1] https://www.eur.nl/bachelor/bestuurskunde/inhoud visited on June 8th, 2020.

students work together with the municipality of Rotterdam to do a project. The university of Rotterdam is very well engaged with the job market when it comes to curricular change, but the results have not been more technologization in the study program curriculum (Program director, Interview 5, 28 April 2020).

Technologization is not only integrated in the study program as curricular change. New forms of technology are also being used to help professors teach. Professors can enroll in micro-labs, which are small educational videos that help improve lectures. One of those is how to record a good educational video. This is not the only way in which teachers can be challenged to examine the way they teach and whether it is still timely and topical. When teachers want to become a senior lecturer, they need to pass the senior qualification education. The program director told us that the lecturer giving the Technology, Policy, and Society course recently passed the senior qualification. In order to do so she made the necessary changes to the course, making it more timely. This was not only for her to become a senior lecturer, but she felt that the students were no longer as connected and involved with the class as they used to be. So, she felt that changes were due. This way they make sure that the program is still up-to-date and courses on technology actually discuss contemporary technologies (Program director, Interview 5, 28 April 2020).

Technical Public Administration Delft

In Delft they offer Technical Public Administration which already has the word technical in its name. Looking at the study program description on the University of Delft website[2] there are mentions of other technologization terms rather than the ones incorporated in the name of courses or the description of courses. When looking at the curriculum, the courses offered in this study program we can see that there are 8 courses that have a technologization term in the name when looking at the general overview of the website. However, 6 of those are called technologization specialization, which is a general term and students need to choose one of three specializations in which they then receive courses. These are energy and industry, information and communication, transport and logistics. So, when changing technologization specialization with one of these three names (which are the specialization the students actually choose). The two courses that clearly mention their technologization terminology in the name are: Introduction of Programming in Python, and Discrete Simulation.

When we look at the course descriptions, we see that there are 8 course descriptions that have technologization terminology in them. The first one is the course description of Problem Analysis (probleemanalyse), and it states that the course makes you analyze problems that are technically challenging. The description of System Modeling 2 (systeem modelering 2) states that you will model the complexity of socio-technical systems and compare them to physical models. In the description of programming Python (inleiding programmeren in Python) there is a description of the different types of technology programs you need to be able to control. It mentions Python, Jupyter, data types, basic algorithmic research and analyzing algorithms, API's, libraries, and debugging. The course description of System dynamics (systeemdynamica) mentions that cases will be about e.g. energy, and innovation.

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[2] https://www.tudelft.nl/onderwijs/opleidingen/bachelors/tb/bsc-technische-bestuurskunde/ visited on June 8th, 2020.

Next to that it states that you will analyse simulation models. The course description of Governance and Law 2 (bestuur en recht 2) puts legal questions regarding complex technical systems and policy programs as central, topic e.g. CO_2 storage and optical fiber networks. The course description of Discrete Simulation (discrete simulatie) states that you will learn to build simulation models and use them in an advisory trajectory about complex socio-technical issues. This is done with the help of simulation platform SIMIO. The course description of Ethics and Safety (ethiek en veiligheid) states that it will teach students to philosophically think about which ethical issues arise during research and maintenance of technology policies. Lastly, the course description of Research and Data-analysis (onderzoek en data-analyse) mentions that it will explain cases from e.g. ICT, energy, and transport.

To summarize, the technologization terms mentioned in the course descriptions are: technically, socio-technical, Python, Jupyter, data types, basic algorithmic research, algorithmic-analysis, API's, libraries, debugging, energy, innovation, simulation-models, technical systems, optical fiber networks, simulation platform SIMIO, technology policies, ICT.

As stated in the theoretical framework there are three main places from which pressures to change the educational program come. The Technical Public Administration study program in Delft has felt some pressure from the faculty members to change the curriculum. The pressure felt is from the faculty's vision to add an artificial intelligence course. It takes some years before a program director knows for sure whether a technological advance is a trend or hype or whether it will have long lasting social effects (Program director, Interview 6, 18 May 2020). After waiting the appropriate time period to look at the way AI will develop on the job market and in the literature, it is safe to say it is not just a trend. Therefore, AI will most likely get its own course in the near future.

The Technical PA study program has ties to the job market to evaluate the study program. There is an annual meeting with companies from the job market, that employ, or might possibly employ graduates from the program. Feedback from these annual conversations are all positive. The companies stated that they eagerly await Dutch engineering graduates. This means that there is no further push from the job market to add more technologization in the study program. The program director himself would like to see the study program move into a more mathematical side for it to go more to its engineering roots. So, make the social science compartment a little smaller and increase the mathematically modeling component. He would like for the study program to get back to its engineering roots. He feels like the social science side of the program is too elaborate the way it currently is (Program director, Interview 6, 18 May 2020).

Public Administration Leiden

The Public Administration study program in Leiden does not have a technological term in the name. There are also no technologization terms in the study program description found on the University of Leiden website[3]. Next to the study program description we looked at the course descriptions of all the public administration courses, from the Policy, Governance, and Organization specialization and from the Economics, Governance, and Management specialization. In neither specialization nor in the

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[3] https://www.universiteitleiden.nl/onderwijs/opleidingen/bachelor/bestuurskunde visited on June 8th, 2020.

common courses there is a mention of technologization in a course name. There is only one course in the study program, taught in both specializations, that mentions a technologization term in its course description. It is a general course that all Public Administration students, regardless of specialization have to pass. The course is Public Governance and Public Administration (openbaar bestuur en bestuurswetenschap). The course description states that one of the things discussed in the course is whether public governance institutions should act on certain wishes of the public, such as safeguarding privacy. Privacy is the technologization term in this case, because it is intertwined with contemporary technologies.

To get additional information about the study program we spoke with a former program director of Public Administration, who now teaches the courses European Union Politics and Policy, and Introduction to Political Science. According to the former program director both courses, but especially the European Union Politics and Policy, discuss contemporary technologies and their consequences with the use of case studies. One of the cases discussed in his lectures is privacy, and emerging urgency from people to safeguard their online data. Privacy and data protection are not a new phenomenon, but it takes on new forms (Former Program Director, Interview 4, 30 April 2020). Privacy has become a more pressing matter with big online platforms emerging that everyone uses, but many do not know how these platforms process and protect their data. Platforms that have been in the news especially in relation to privacy matters are Google, Amazon, Facebook and Apple. So while technologization is not a big component of the courses, it is mentioned in light of new privacy policies and legal implications. There has been a new hire in the Public Administration department. This new member of the faculty is responsible for creating a course about technologization and its effects on and in Public Administration. So, while technologization is still small, it will be expanded in the near future (Former Program Director, Interview 4, 30 April 2020).

Technologization in the curriculum is not the only way the university has incorporated contemporary technologies. There is an increasing use of technology in the way a university shapes lectures. At the University of Leiden lecturers need to record all lectures. There can be made an exception, when a lecturer has a solid argument for not recording a lecture, because of e.g. discussing sensitive information. Professors can choose when they want to put the recorded lectures online, this can be immediately after the lecture or one week before the exams. Also with the new challenges emerging from Covid-19 there are new ways of providing education online. For example, for one of his courses the former program director needed to change his simulation game into a take-home exam (Former Program Director, Interview 4, 30 April 2020).

Universities are expected to have close ties to the job market concerning feedback about the study program, but the University of Leiden has limited connections to the job market. The university has information about where their students end up, and feedback about what their alumni found useful in their study the moment they graduated. However, there is no data about what helped alumni on the job market. There is also no data on what competencies or knowledge possible employers would like PA graduates to have. There are not enough resources at the University of Leiden to keep up with all of the emerging changes form the job market since these shifts happen so fast and regularly (Former Program Director, Interview 4, 30 April 2020). So there is a knowledge gap in what the job market needs from the university and what kind of students the university educates.

Public Administration Tilburg

The Public Administration study program in Tilburg does not have technological terms in the name. In the description of the study program on the university website[4] there is mention of a second year course that discusses the impact of social media on public decision making. Other than mentioning the course and what it discusses there is no mention of contemporary technologies or technologization terminology. This second year course is the only course in the Public Administration study program that has a technologization term in the course name: Media, ICT, and Policy. There is one other course with technologization influences, it mentions technologization terminology in its course description: Lawful Protection from the Government (rechtsbescherming tegen de overheid). These are the only two courses in the study program that have technologization influences mentioned. In the Lawful Protection from the Government course description, it states that recent developments that influence the relationship between civilians and the government will be discussed. This will be done with the use of algorithms, artificial intelligence, blockchain as examples of such recent developments. The course description of Media, ICT, Policy mentions that students will learn to identify and explain stages of information and communication technologies (ICT). Students also learn to describe theories of why the government adopted these innovative ICT's. Students learn to assess and propose solutions concerning policy issues of ICT use in governments, e.g. fake news, data privacy, artificial intelligence. To sum up, the technologization terms mentioned are: algorithms, artificial intelligence, blockchain, ICT, innovative, data privacy.

When speaking to the current program manager from Public Administration it became clear that there will not be more courses integrating technologization, because there are other priorities. The program director mentions that he believes the psychology component of their study program is too small and wants to expand this. While technologization of the curriculum is on hold, the program director does want to look at what the effects of Covid-19 will be on technology and the way Public Administration is taught. In his opinion, going to university to sit in a lecture room and listen to someone speak for 2 hours is outdated (Program Director, Interview 1, 5 May 2020). So, Covid-19 might to his opinion have lasting effects on the way the University of Tilburg will teach Public Administration. Another component of the study program that has led technologization to fall to the background is their legal component. The unique selling point of the PA program in Tilburg is that it falls under the law faculty (Program Director, Interview 1, 5 May 2020). So the PA courses have gotten more legal influences than technological influences over time. These are the three major priorities that have led to the technologization part of the curriculum to become smaller. Their Media, ICT, and Policy course is the remainder of their research trajectory from 20 years ago that was about studying the effects of ICT on public governance. This shows that integrating new technologies and their social consequences into a curriculum is not a recent phenomena. It also proves that the other priorities have pushed technologization to the background when it comes to choosing what to implement in the curriculum.

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https://www.tilburguniversity.edu/nl/onderwijs/bacheloropleidingen/bestuurskunde?gclid=EAIaIQobChMIhda12ZTy6QIVCud3Ch20Rg29EAAYAiAAEgJgSPD_BwE visited on June 8th, 2020.

The university's ties to the job market have room for improvement. To get more engaged with the job market there is a project to be implemented in the near future where the study program will converse with alumni and possible PA graduate employers. These conversations are going to be annual, with 5-7 alumni and 5-7 possible employers. The goal is to get an image of what it is that the job market needs from university programs these days. So, spark a conversation with employers, alumni and study programs. In recent conversation with the possible graduate employers, feedback for the study program was that they needed to do more skill-oriented education. Their alumni should have more professional skills when joining the job market (Program director, Interview 1, 5 May 2020). There is to date, no feedback from the job market that students need more knowledge on technologization.

Public Administration Utrecht

This Public Administration study program has no technological term in the name. In the study description on the University of Utrecht website[5] there is mention of digitalization, which will be discussed as a societal change that impacts the world. However, when we get to the courses offered by the study program there is no mention of technological change, technologization or even digitalization in either the names of the courses offered by the study program or the course descriptions of the study program.

When speaking to the Former Program Director it becomes clear that there is actually some technologization in the curriculum even though it is not mentioned in the course names or descriptions. University of Utrecht has a GovernanceLab, this lab tries to shape a partnership between students and the job market. This has led to research about Smart Cities as one way to integrate technologization in the curriculum. It also has a second year organization science that discusses technologization as a case in the course. The Former Program Director states that there are more courses that integrate technologization but do not put it central, it is often but an example or case studied. The Public Administration program at the University of Utrecht is a selective study program, with only 90 students getting accepted each academic year. Each of those 90 students are able to enroll in the honors program of the university. In the honors program there is also a technologization component. The research component teaches about media and how you can use contemporary media to strengthen the impact of your research. So using contemporary technology and its scope to reach a bigger impact. What is also striking for Utrecht is that they used to have an elective course about Social Media and Governance, but they no longer teach this course because no one was enrolling in the course (Former Program Director, Interview 8, 4 June 2020). So, where technologization is a part of the study program it is but a small part. This small part seems to be enough; students do not need it to be a bigger component of their study program because electives with technologization components do not attract students.

The Former Program Director does have a prediction that one form of contemporary technology will be expanded in the Public Administration study program in the future. He predicts that civil participation and democracy will be expanded in the future. E-governance is a big component in this. One of the questions will be how e-governance can make governance more responsive to what society wants. Especially when it comes to public civil service (Former Program Director, Interview 8, 4 June

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[5] https://www.uu.nl/bachelors/bestuurs-en-organisatiewetenschap visited on June 8th, 2020.

2020). So, where technologization is currently quite small in the study program, the future can possibly hold a bigger place for it in the curriculum.

The University of Utrecht has ties to the job market about their study program. Last time their former Program Director spoke with the municipality of Utrecht, one of the main employers of graduates. The municipality had one piece of feedback, they wanted the students that they hired to be more diverse. They wanted the graduates of the study program to be more diverse (Former Program Director, Interview 8, 4 June 2020). While the former Program Director does acknowledge that keeping the conversation going between universities and the job market is important, it is often not as productive as one hopes. The job market does rely a lot on the university to know how to educate their students and often do not give substantive feedback.

Public Administration VU Amsterdam

This Public Administration study has no technological term in the name. But the study program description on the university's website[6] mentions digitalization as a societal development that has consequences that we need to be able to deal with. When looking at the courses offered in the study program there are none with digitalization or another technologization term in the name. They do have three courses with technologization terms in the course descriptions. Course descriptions containing such technologization terms are, Governance and Politics of Social Problems; Social Capital and Networks; Governance of Society. In the course description of the course Governance and Politics of Social Problems (bestuur, politiek en samenleving) mentions: "Students learn how to analyse current societal, economic and cultural developments and how these influence politics and policy-making, such as the role of (new social) media, capital, the rise of the commons, identity questions and technological innovations". The course description of Social Capital and Networks (sociaal kapitaal en netwerken) states that social capital changes over time and changes its relationship to individualization, digitalization and whether it can be influenced by policy change. The Governance of Society (besturen van de samenleving) course description states that they want to show the fading distinction between public-private institutions in governance. They want to do so by using recent developments, such as big data; shaping e-health; e-learning. To sum up, the technologization terms used are: new social media, technological innovations, digitalization, big data, e-health, and e-learning.

The Program Director of Public Administration states that technologization is not one of the subjects central in their study program, but the increasing difficulty of governing society is. These two topics are intertwined in the study program, with technologization mainly used in case study of governance courses. The study program discusses the increasing complexity of the world and governance. Organizations are moving in networks instead of clear hierarchical structures, and this is partly thanks to technology (Program Director, Interview 7, 2 June 2020). Network society, and late modernity are two key subjects in the Public Administration program of Amsterdam. The study program illustrates technology as the stepping stone for organizations to make their own decisions, apart from former frameworks. This has consequences on governance, which is one of the central subjects.

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[6] https://vuweb.vu.nl/nl/onderwijs/bachelor/bestuurs-en-organisatiewetenschap/inhoud visited on June 8th, 2020.

Technical processes are translated into social processes in the study program so that they have cases that show direct consequences for Public Administration.

The Program Director's vision for the future of this study program is to expand the component of the study program on the notion of a network society as written about by Manuel Castell. The increasing social distance, that Covid-19 has tremendously increased in a very short time span, increases the autonomy of the individual. This increasing autonomy makes governance more complex, and will lead us closer to the ideal network society (Program Director, Interview 7, 2 June 2020). Given that Covid-19 is increasing the autonomy, and thus the network society, this component of the study program will most likely be expanded in the future. With it comes the technologies that make it possible to establish this autonomy and make the network cooperations between actors possible. So, with expanding the network component, there will be more technology cases discussed as well.

Next to technology in the curriculum the Program Director also expects the role of teaching technologies to expand. Again, with Covid-19 having a big effect on education, there is a big chance it will have long term effects on the way we teach. The university is currently working hard on providing up to standard online education. It has decided that the first semester of next academic year will also be taught online (Program Director, Interview 7, 2 June 2020). However, the way it is right now will not be permanent, since there are still issues that need to be resolved in order to provide optimal education. The issues arising with online education are class attendance, lack of class discussion and interaction, and how to make a proper exam (Program Director, Interview 7, 2 June 2020).

DATA ANALYSIS

In this section the different Public Administration studies will be ranked in a case by case manner. In Table 2 show the different rankings and their motivation. The studies will make a scale of the studies from most adapted to technologization, to middle, to least adapted. The studies were scaled with the use of table 1, as can be seen in the empirical analysis.

1. Technical Public Administration Delft

The study program has the word technical in the name of the study, it has (apart from the technology specializations) 2 courses with technological terminology in the name. There are 8 course descriptions that mention technologization terminology. When speaking to the Program Director of the study it has become clear that every course has a technology component in it, even the mathematical modeling courses are about calculating advantages and disadvantages of new technologies (Program director, Interview 6, 18 May 2020). So, with a total of 28 courses excluding the minor period and including the bachelor thesis there is an addition to the amount of technologization in the program. This program is the most adapted to technologization since it has technologization integrated in every aspect of the study.

2. Public Administration Erasmus Rotterdam

There is no mention of technologization terminology in the study name and study description. There is one course that has technologization terminology in the name: Technology, Policy, and Society. Technology, Policy, and Society and Political Science have technologization terminology in their course description. When speaking to the Program Director she stated that there are other courses that have technologization integrated in the teaching, Network Governance and Introduction to Public Administration both discuss technologization in their course (Program director, Interview 5, 28 April 2020). This study, together with Tilburg and VU are in the middle of the scale. Erasmus put first because it has as many courses that have terminology in the course descriptions as Tilburg, but it has an addition of courses that discuss technology as stated by the Program Director.

3. Public Administration Tilburg

There is no technologization terminology in the name of the study program or the study description. The study description does mention the course in the second year that has technologization in the name: Media, ICT, and policy. Together with Media, ICT, and Policy, the course Lawful Protection from the Government has technologization terminology in the course description. When speaking to the Program Director it became clear that there are no other courses that integrate technologization in the course (Program director, Interview 1, 5 May 2020). With just as many courses having terminology in the name, and mentioning terminology in the description as Erasmus it has no additional courses integrating technologization. But with VU only having terminology in the course description it is scaled lower.

4. Public Administration VU Amsterdam

There is no technologization in the name of the study program or in any of the course names. There is mention of digitalization in the study description. There is also mention of technologization in the course description of three study programs: Governance and Politics of Social Problems; Social Capital and Networks; Governance of Society. In the interview there was no mention of other courses containing technologization other than the three mentioned previously (Program Director, Interview 7, 2 June 2020).

5. Public Administration Leiden

Leiden does not have any technologization terms in the name of the study, name of the courses, or in the study program. There is only one course in the general part of the study program, that both specializations need to follow that has a technologization term in its course description. When speaking to the former Program Director he stated that the Political Science course and the European Union Politics and Policy both discuss technologization in the course as well, but only briefly as a case example (Former Program Director, Interview 4, 30 April 2020). This study program, together with Utrecht are least adapted to technologization. Leiden has no mention of technologization at all, the former Program

Director only told about some cases discussed in the courses he gives. But, these are only very small components of the course.

6. Public Administration Utrecht

The study program does not have a technologization term in the name of the study. It does mention technologization terms in the study description. There is no mention of technologization terminology in the names of the courses or the descriptions of the courses. When speaking to the Former Program Director it became clear that there is technologization in the study program, even though it is not mentioned in the online curriculum (Former Program Director, Interview 8, 4 June 2020). Technologization is a part of the honors program and also part of the research component of the study program. The honors program of the PA program contains Challenges of Europe, International Research Project, and Creating Societal Impact that all have technologization impacts. Next to that students can follow Future of Development Cooperation: Scenarios for 2025 program which also contains technologization. But, this means that only students that enroll in the honors program will have these technologization components in their study program. So, where it may seem that technologization is a big part of the program, when you are not an honors student, it is non-existent.

The theoretical framework formulated three propositions for this research. This section will revise the three propositions and their independent variables. The independent variables in the causal relationship portrayed in Figure 2 are pressure from students, new research and literature, demands from the job market, pressure from faculty vision. When speaking with the (former) Program Directors it became apparent that not all of the independent variables actually assert influence over the dependent variables.

The first proposition formulated in the theoretical section discusses changing courses. H1: *Pressure from students and new literature will lead to changes in existing courses in public administration courses.* All of the program directors have admitted that they have ways of getting feedback from students after courses and annually integrate this feedback by changing course content. Pressure from students themselves is the biggest influence on the curriculum. However, this feedback is given when they are part of the study, not when they graduated and have knowledge of what has been especially helpful in the study program. New literature and research also leads to changes in existing courses. When certain concepts have different effects or are less significant the course will anticipate this new knowledge and better the existing program. This evidence means that we can accept our first proposition. Because, the feedback that students provide does lead to annual changes to the courses in the study program, and new literature and research also leads to changes in existing courses.

Our second proposition is about the creation of new courses in a study program. H2: *New research and literature accompanied by demands of the job market will lead to adding new courses to the public administration study program.* Since faculty members and lecturers often also perform their own research or read contemporary literature they are aware of the new concepts and study materials arising in their study area. When significant amounts of research and literature are created about a concept it will be integrated in a study program. This can be seen by the example of Delft, soon

integrating an AI course because of the increasing research and development, and literature about the concept. All universities have ties to the job market and receive feedback from alumni when they have a visitation related to accreditation of the study program. However, the job market is often clueless when it comes to what they want to see differently in a study program. Some feedback related to skills of alumni is apparent, but this is not significant for the curriculum change, because skills are often taught on the job. Lecturers and faculty both have knowledge of recent developments in their area of study and make sure that courses integrate relevant contemporary literature. This evidence makes us partly accept or second proposition. While increasing literature and research and development lead to study programs integrating new study programs, the influence of the job market is not existent in the participating study programs.

The role, and amount of pressure that faculty vision exert varies per university. So is it bigger in Delft and Utrecht than Tilburg, Leiden, Erasmus Rotterdam, and VU Amsterdam. Because higher educational institutions have a lot of autonomy in how they shape a curriculum for a study program the roles and importance of the actors is not equally important in all universities. The evidence does not support our third proposition. H3: *The vision from the university itself will lead to name changes of existing public administration study programs and courses to better reflect the vision.* The participating study programs in this research have not changed their name or course names as a result of faculty vision. New research and development, along with literature lead to new cases discussed in courses. These new courses may lead to an evaluation of the course name, and possible change. However, the evidence does not suggest that the change comes from faculty vision pressure.

DISCUSSION

All of the technologization terms used in the participating Public Administration studies are:

Algorithms, algorithmic-analysis, API's, artificial intelligence, basic algorithmic research, big data, blockchain, computerized, data privacy, data types, debugging, digitalization, e-health, e-learning, energy, ICT, innovation, Jupyter, libraries, optical fiber networks, Python, SIMIO, simulation-models, simulation platform, social media, socio-technical, technically, technology policies, technical systems, technology, technological innovations.

Striking about the terminology used is that, besides Technical Public Administration, none of the studies mention contemporary technology implemented specifically in the Public Administration domain. There is no mention of e-governance, databases, smart cities, or online campaigning. There is mention of the effects that new technologies have on society: privacy policies, governance in the social media era.

There seems to be a shift in university teaching that moves away from technology towards societal processes. The University of Tilburg used to have a research program teaching about the relationship between Technology and Public Administration. There is only one course remaining, Media, ICT, and Policy. The University of Utrecht used to have an elective course about Social Media and Governance but there were barely any, to no students enrolling in the course. So, it is a result from student priorities in the Public Administration programs that have led to the decline in technology

courses. Technologization is replaced by other priorities. When speaking to the (former) Program Directors of the participating studies it became clear that almost all priorities in the studies clash with technologization. There is no longer an established connection between societal issues and technology. This is illustrated by Tilburg and Erasmus Rotterdam. Tilburg has their legal aspect as a unique selling point, that does not include technologization. Erasmus Rotterdam wants to increase collaboration with the job market and integrate more psychology in the curriculum, which does not include technologization. Delft, the most technical program of them all, has a Program Director that wants to move the curriculum away from teaching about technologization and increase the engineering component of the program.

The Public Administration study programs in Leiden, Utrecht, and VU Amsterdam do want to expand teaching about technologization. The program in Utrecht wants to expand the component of technologization by including e-governance in the curriculum. VU Amsterdam wants to increase the Network Society component, and how technology makes this shift possible. Leiden has hired a new member of the faculty that will introduce a new technology course in the curriculum.

In the beginning of this research we assumed that there would be pressure from students, faculty itself and the job market to increase technologization in Public Administration courses. After speaking to the Program Directors, it becomes clear that there is no push from the job market to increase teaching about contemporary technologies and their implementations. Students have shown to have little interest in expanding the technologization component of their studies. This is illustrated by the lack of enrollment in the Social Media and Governance elective in Utrecht and only one course remaining of a technology research component of the study program in Tilburg. So, most changes in the curriculum in relation to technologization are initiated from the faculty level.

Besides curricular change the teaching technology component of studies is becoming bigger. The whole world has been in lock-down the last few months, this means that universities have been closed and education has been provided from a distance. Lecturers are online, via Zoom or Microsoft Teams or pre-recorded so students can watch them whenever. Exams are online, projects or simulations that needed to be done in person are changed into online tests. Every Program Director has acknowledged that this situation will be the beginning of a change in the way we teach. So, technology will be a bigger part of university study programs, but how this will be shaped is still uncertain, because we are in the midst of the change.

CONCLUSION

To conclude, the most adapted Public Administration study is the Technical Public Administration study program in Delft. This study was highest on the scale because it integrated technologization in every aspect of the study program. The other courses were not that different when it came to the integration of technologization. The study programs in Amsterdam, Leiden, and Utrecht have no courses with a technologization term in the name, which is striking. But, at least every study program has one course that integrates technologization. In Utrecht these are mostly electives from the honors program which makes for the component of technologization in the overall study program to be smaller when you do

not enroll in the honors track. This is the case in most study programs, there is always free room within a Bachelor's program to personify your own study program. So, there is always an opportunity to do a project on technologization, to follow electives about it, or enroll in a minor program on the subject. The Program Directors stated that electives and research programs on technologization are becoming much less popular. It seems to be that students do not prioritize technologization as a component of their study program. This evidence was unexpected when starting this research. We assumed that students must want technologization as part of their study program, because of its influence on modern society. But, this did not seem to be the case. Half of the participating studies predict a future change in the course that would include more technologization and half of the participating studies predict change that does not include more technologization. With technologization being more integrated in every aspect of life, work, home, entertainment, and so on, we predicted the anticipation of this change to be reflected in study programs. Public Administration studies are about looking at societal problems and shifts in the world through a multi-disciplinary approach, technologiation is one of the shifts we expected would be more elaborately discussed in the program.

As stated in the data analysis, the evidence from the participant study programs did not support all of our propositions. The evidence suggests a much smaller role for the job market in evaluating study programs than was anticipated. With technologization being a phenomenon first starting on the job market, the lack of influence the job market has on study programs might be a reason for the amount of technologization in a study program. Employability was the personal motivation for researching technologization in study programs. Personal assumptions were that learning about technologization would lead to better job opportunities and higher education would anticipate the technologization shift. The job market has a small role in providing feedback, the main feedback is coming from students. They fill in surveys for the courses they took, right after they finished them. Most feedback is about workload, how interesting a course is, or how a lecturer teaches. Program Directors of PA have acknowledged that Bachelor students are not aware of which aspects of a study program they will value when entering the job market. Therefore, their feedback is not always useful to create a well adjusted study program. The sources of feedback can be the reason for why a certain concept is widely discussed in a study program, or why it is not.

This study is a stepping stone for further research. There is an argument to be made about the representation of the research. Public Administration at the Radboud University in Nijmegen, Management of Social Challenges at Erasmus Rotterdam, and Management, Society, and Technology at University of Twente are excluded in this research. Due to time constraints this research has not reached its full potential. The Association of Public Administration in the Netherlands (Vereniging Bestuurskunde) could be used as a participant in this study, and students' views on technologization in their curriculum are lacking. We recommend future researchers to also look at the side of students, since their enrollment in a study program is a big influence in how it is shaped. We also recommend the use of surveys over interviews. Because, an obstacle encountered in the interviews was that the Program Directors did not know some of the answers from the top of their heads. Using surveys gives them time to research some of the answers and take more time to answer the questions. This will lead to a more complete dataset. We recognize the limitations of this research due to time constraints and the use of interviews. Also, looking at the relationship between job market feedback to study programs will give interesting insights in how study programs ensure employability and make sure that their students are

well equipped to enter the job market. The literature discussed in this research made us assume that the relationship between the job market and higher education was closer than the evidence suggests. The evidence suggests hardly no relationship at all. More research about why there is a shift in education towards less technologization, while in real life technologization seems to be increasing still, can be an important contribution to higher education. Technology will only develop more and will integrate every part of daily life. Technology integrating higher education by having online lectures, exams, discussions and reading materials means that we should be aware that teaching about technology is crucial.

It was unexpected that teaching about technology and technologization was so small, but the shift towards even less technologization was completely unforeseen. This study shows that PA study programs do not see technologization as one of the lenses needed to look at societal shifts and problems. So, the results of this study are unforeseen, technologization is a small part of Public Administration teaching, and will possibly only become smaller. To come back to the research question, '*In what way have universities in the Netherlands adapted to technologization of the job market?',* Dutch universities are not actively adapting their study programs to technologization. Technologization is not their main focus, neither the focus of students. There are other shifts, concepts and courses that have gained priority over technologization. decreasing its component in the program.

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