Introduction

PhD completion, retention and graduation are complex topics and the factors exacerbating non-completion also run a gamut of challenges for both universities and students (von de Schoot, Yerkes, Mouw, & Sonneveld 2013; Kittell-Limerick, 2005; Pauley, Cunningham, & Toth, 2000). Among these is the variance across institutions of available data. Around the world, professors rely primarily on the training tactics of their doctoral experience while university administration is hampered in development of programs or faculty because they have little useful data between cohorts and programs. This leaves anecdotal evidence on which to understand the where or why students stall out within the educational process. Universities are plagued with legacy systems, not set up to track levels of student success let alone to implement the wealth of technologies being develop daily to nudge users towards successful milestones and help them keep the pace (University Professional & Continuing Education Association, 2012, Thaler, R. H., & Sunstein, C. R. (2008 will).

DoctoralNet is a relatively young technology business. 85% of our initial cohort graduated in three years, in both business and in education and while attending three different universities. The following chart discusses the symptoms or challenges as experienced by universities and students, their root causes, and our current best thinking about how to apply technology+ to enable PhD, and other types of doctoral students, to graduate consistently in 3-3.5 years. Why technology plus? Doctoral education research is subtle and complex, making it impossible to be solely directed through technology. Therefore, our company solution develops technology whenever possible and supplements it with highly experienced (mostly emeritus will) professors able to offer near 24/7 feedback.

The DoctoralNet Solution:

U= University | S= Student

U	S	University and/or student concerns	Root challenges within this concern:	DoctoralNet Technology + solution
X		University Rank, Research Grants and Endowments.	1. The university market today is highly competitive both within a nation and across the world. 2. Universities in developing parts of the world are working hard to compete so that their best students do not go out of the country for their education, thus increasing the likelihood they stay and offer their leadership to their country of origin. 3. 90% of Thompson Reuters International ranking for universities is tied directly or indirectly to doctoral level research. 4. Research citations tied to a particular university affiliation correlate with acknowledged expertise within a given field and increase likelihood of financial support of research in those areas.	• 85% of DoctoralNet pilot students graduated in 3 years – thus raising the citation/faculty level for those universities. • Support services for writing and publication also available for instructors at universities with DN subscriptions/support for professor publications.

X	X	Retention.	1. There is an increase in part time students around the world, merging academic responsibilities within complex lives. 2. Older, mid career professionals look to doctoral work to aid them advance, yet coursework can seem divorced from their business realities. 3. Finances remain a challenge and many doctoral grants run out prior to the student finishing the degree. One internal document from the UK reported that 73% of those who did not return said it was a financial issue and 100% reported financial as part of the challenge. 4. The increased burden of student loans may cause students to disengage.	• DN analytics track student engagement and report out first the student with concern and then to the supervisor/ university with an alert. • Automations© - our interactive research design tools set the student up for success and take away frustrations with 24/7 tools and feedback. • DN interactive map guides the process/allowing students to move back into the flow of the work easily after their work flow was interrupted. • Targeted group work/mentoring Professiorial help to select meaningful topics and problems. • DN works with those who finance and support students, enhancing CSR efforts by helping other push students to graduate faster. Were

X	X	Completion.	1. To track is where a student may be stalled out in the process of developing their research. Three points in the process are most likely to create barriers to success:
			  a. They may never design a defensible research study that would be significant to their field.
			  b. They may never complete the review of literature or preliminary proposal required by their university guidelines.
			  c. They may not collect enough data or be able to analyze it in such a way as to complete defensible results and findings and/or stagnate in the writing.
			2. Contributing to all of the above areas where completion becomes a difficulty is a correlating drop in pace or velocity towards completion, causing the student to stall and eventually drop out.
			3. Research demonstrates that isolation contributes to students dropping out when they seem unable to overcome one of these milestones as they feel they have no safe place to turn, and they run out of alternative resources.
				1. DN analytics track where a student is in the process and the confusion or trouble they face in several ways – each adding up to a profile of their advancement which is shared with the student, supervisor and university. Analytic data is compiled and milestones are noted in a dashboard created from:
				• Interaction with asynchronous content and on the site.
				• Interactions as part of groups or in webinars.
				• Notes from personal interactions with site staff/professors.
				• Attendance and engagement data.
				2. Economies of scale allow DN to produce a constant stream of "boosts" or services aimed at increased knowledge and engagement. These include: accelerator programs, regular webinars on research topics, writing groups, discussion groups on topics, etc.

X	X	Financial investment, student annual progress and (for some	1. A doctoral programme may be a relatively large expense as the numbers of students are small and the % of professorial time is relatively high. 2. Student Year Cost – an analysis metric	Automated individual help has resulted in the 85% successful graduation in three years. This substantially reduces student year cost as it increases the efficiencies

		universities) profitability.	developed by Bowen and Rudenstine (1992) and used by Harvard and others, demonstrates that the greater the length of time after the 3 year mark equates with greater maintenance costs per student per year for the length of years until the cohort has entirely finished or dropped out.	for both the university and the grant provider.
X	X	Variation in skill and caring of faculty for those they supervise.	1. The lessons in PhD supervision come with experience. Newer professors have only their own experience to draw upon and it is through the peer review of committees, defense and vita voce' that deeper understanding of the art of research is crafted. 2. The variation in understanding of the mid career adult can exacerbate challenges with supervisors, especially when they do not understand the research design process and the first several ideas or sets of writing do not come close to meeting standards.	• DN hires only experienced professors who have helped more than 10 students graduate as part of their university experience. • DN professors work in teams so that when one is not as successful with a student as we would like others are brought in. • Training available for professional development to improve mentoring skills.
	X	Lack of skill in academic writing	1. Mature students may have been out of academia for a long time, working in a business environment which requires a less formal writing style. 2. The formal dissertation or thesis requires a higher standard of internal consistency across a longer document than most students have attempted before. 3. The variation in backgrounds between faculty within an institution may create variation in guidelines which can be confusing from the student point of view.	• Interactive webinars about academic writing. • Writing groups. • Writing buddies. • Assistance from research graduates . • Editing help.

Pace has been demonstrated to be a key metric in PhD completion, largely because, with the advent of greater levels of complexity, the longer the student tarries in the research and writing process the greater the chance outside forces will intervene and destroy their focus. DoctoralNet Ltd is dedicated to, and continues to develop, technology+ solutions, delivered in one package to enable universities to reach the highest possible rate of PhD completion in 3-3.5 years. Technology alone will never be the complete educational solution so DoctoralNet develops interactive materials + strategic and timely boosts from experienced professor mentors. The result of our first pilot was 85% graduation rate in 3 years.

The "technology +" approach smoothes the rough spots in the process for both the student and the university itself by using interactive technology to focus the student on the deliverables of research and strategic mentorship when only the explanation of an experienced professor will do. DocNet technology focuses, and reports to the university on: engagement/retention, the process of designing, the editing and process of academic writing and personal nudges which help students keep the pace.

The second less tangible metric to consider is engagement. A recent interview with a Carnegie Mellon student was instructive as she discussed the many ways and means that this and other prestigious institutions involve and wrap their full time students into not only the topics but the lifestyle of academia, creating near full engagement for their students and resulting in 95% completion. This is not possible for many institutions today, hampered as they may be by finances, technology, etc; just as this level of involvement is not possible for students who work at a distance. It is important to note that "wrap around" services have proven to reduce educational risk in many instances (HiherEd Insight (n.d).

As stated earlier, when an initial stage start up, 85% of our first pilot group (n=39) graduated in three years. **With Irish National grant support we are now recruiting university partners/pilots.**

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