Online Education for the Student Professional

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Abstract

This proposal outlines the application of the theory of constraints (TOC) to serving the working professionals in the industrial technology (IT) programs at the University of Texas of the Permian Basin (UTPB). Bottlenecks in the process are identified. Changes are then proposed in the delivery of the program to maximize throughput, as it applies to the number of students in the IT programs.

Introduction

This project will apply Goldratt's Theory of Constraints (TOC) to serve the working professionals in the technology courses at UTPB. In education we have to increase enrollment in order to keep up with the increasing cost of education. The constraint in developing online courses is that it takes a lot of work to develop an online course. Finding ways to increase the number of online courses will help serve the working professionals and increase student enrollment and program enrollment.

Overview and Background

In 2004, I was brought in to start up a new Industrial Technology program at UTPB. The curriculum is a combination of manufacturing, petroleum, and business coursework. The program was specifically designed to meet the needs of the manufacturing and petroleum industry in the Permian Basin of West Texas as one out of five jobs in the area is related to manufacturing and exploration related to the petroleum industry. The courses were initially offered at night because we expected working people to be interested in this program.

When we started the Mechanical Engineering program, enrollment in the Industrial Technology program dropped as we were competing for some of the same students. By offering courses online we attracted a new group of working students that were constrained by their jobs from being able to take any day or night courses. Many of these students work on a drilling rig and have to go wherever they are drilling, and do not get back to the office till the drilling job is over.

Project Plan

In Goldratt's Theory of Constraints[1] (TOC), a given group of processes will have a weakest link and the weakest link controls the entire system production rate. In order to maximize the system production, the weakest link must be improved and all other links in the processes regulated to the speed of the weakest link. According to Goldratt[2] the first step in the Thinking Process is to develop a list of at least 10 – 12 undesirable effects (UDE) that currently apply to the problem at hand. It is helpful to write the current state in a diagram format. This diagram shows a logical explanation of the situation (Figure 1 – Current Reality Tree).

In figure 1 the undesirable effects (UDE) of starting the mechanical engineering program was that it reduced the enrollment in the existing industrial technology program. Once the enrollment dropped we had faculty leave, and they were not replaced. Putting courses online helped reverse the trend. However, repeating the same courses too frequently meant that the online students could not take new courses. We had to develop a plan to offer new courses online every semester, so that existing students had new courses that they could enroll in. The constraint was that developing and offering new online courses took time. We developed a five year plan to offer new courses at the rate of one new online course a semester. Offering new online courses meant that we could now repeat courses less frequently and this helped increase enrollment. We tailored the new online courses to meet the needs of the working online students based on their input. Some of our students are telling us that as they are taking our courses they are implementing the lessons learned in their jobs.

Goldratt contends that compromising does not solve the core problem though short-term success may be realized. He suggests using the Evaporating Cloud (EC) (Figure 2 – Evaporative Cloud with Injections) to search for real solutions that will break the conflict that bring about a win-win solution for everyone. The injection in this instance is: Offer online courses in industrial technology to build industrial technology enrollment. This tool will logically show that once the injections are implemented, the desirable effects can be accomplished. When the EC is broken, the Future Reality Tree (FRT) is built using the injections from the EC (Figure 3 – Future Reality Tree). A Future Reality Tree (FRT) was then constructed in an effort to assure that all of the Undesirable Effects (UDE's) would be eliminated using the resolution identified in the Evaporative Cloud (EC). The FRT is essentially the same as the Current Reality Tree (CRT); however the injection(s) identified in the EC are placed into the tree to create a vision of the "future reality."

We were trying to grow both the engineering and technology programs. Both programs were competing for some of the same group of students. Offering evening courses was not enough to grow the technology programs, as the engineering programs also taught evening courses. Many of our working students are on call and have to work odd and long hours when they are on-duty. This makes attending regular classes difficult, if not impossible. The constraint was overcome by offering new online courses that met the needs of these students and their employers. The students were able to enhance their skills in order to be promotable.

The undesirable effect (UDE) of starting new programs is that they sometimes cannibalize students from existing programs. In order to counteract this problem we need to find new methods to differentiate between similar programs. Offering new online courses in the technology programs to meet the needs of working adults allowed us to make this differentiation. The mechanical engineering program is offered mostly during the day with a few night classes.

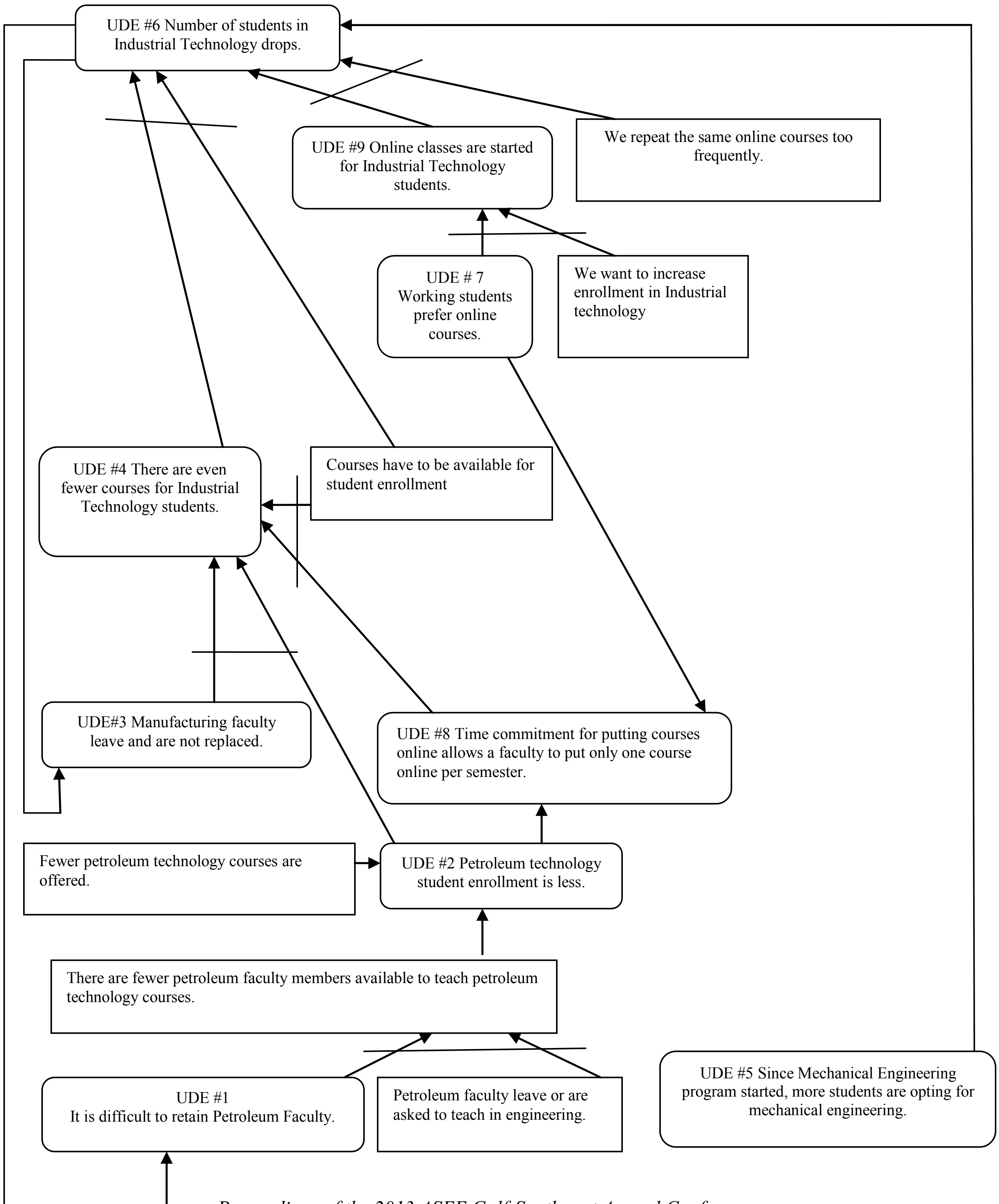


Figure 1 – Current Reality Tree (CRT)

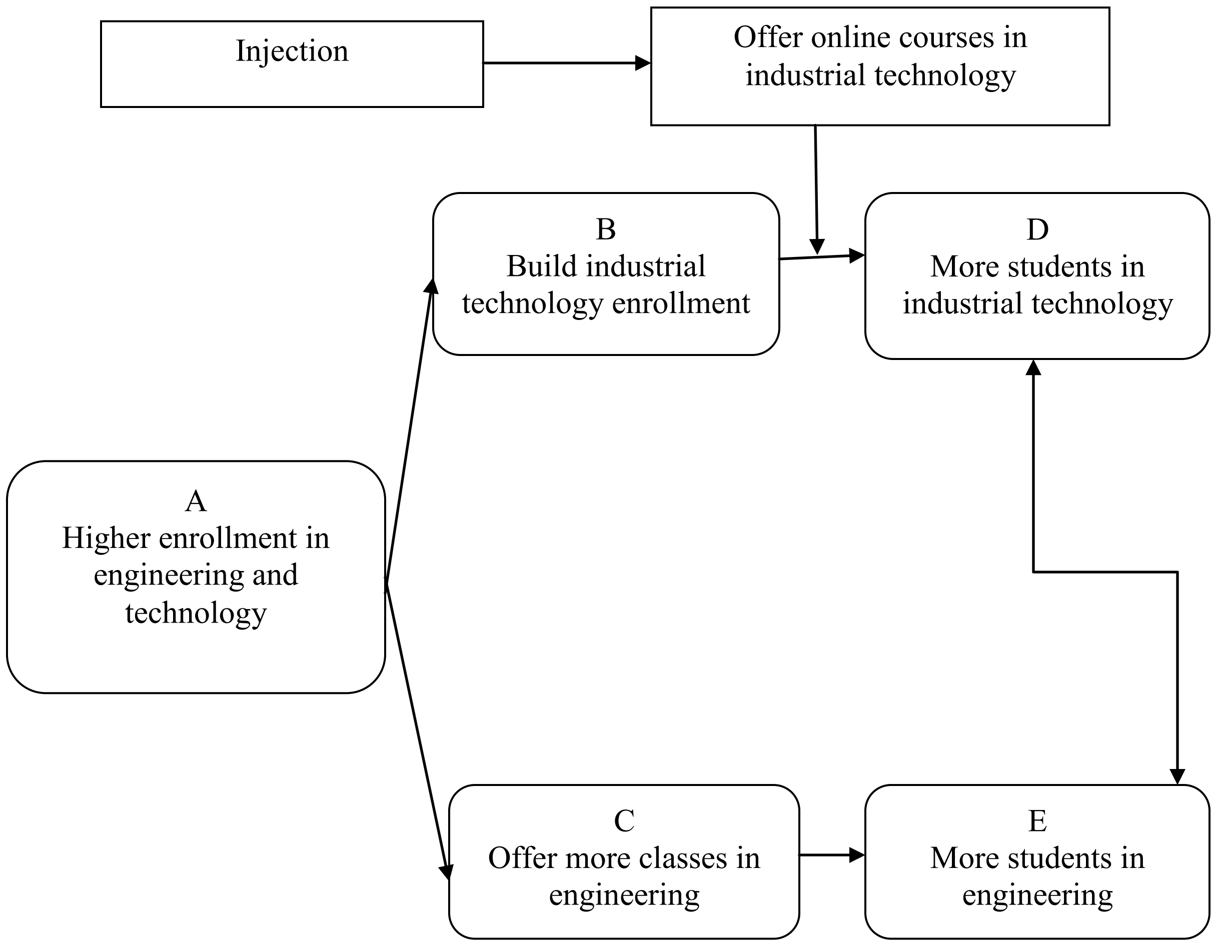
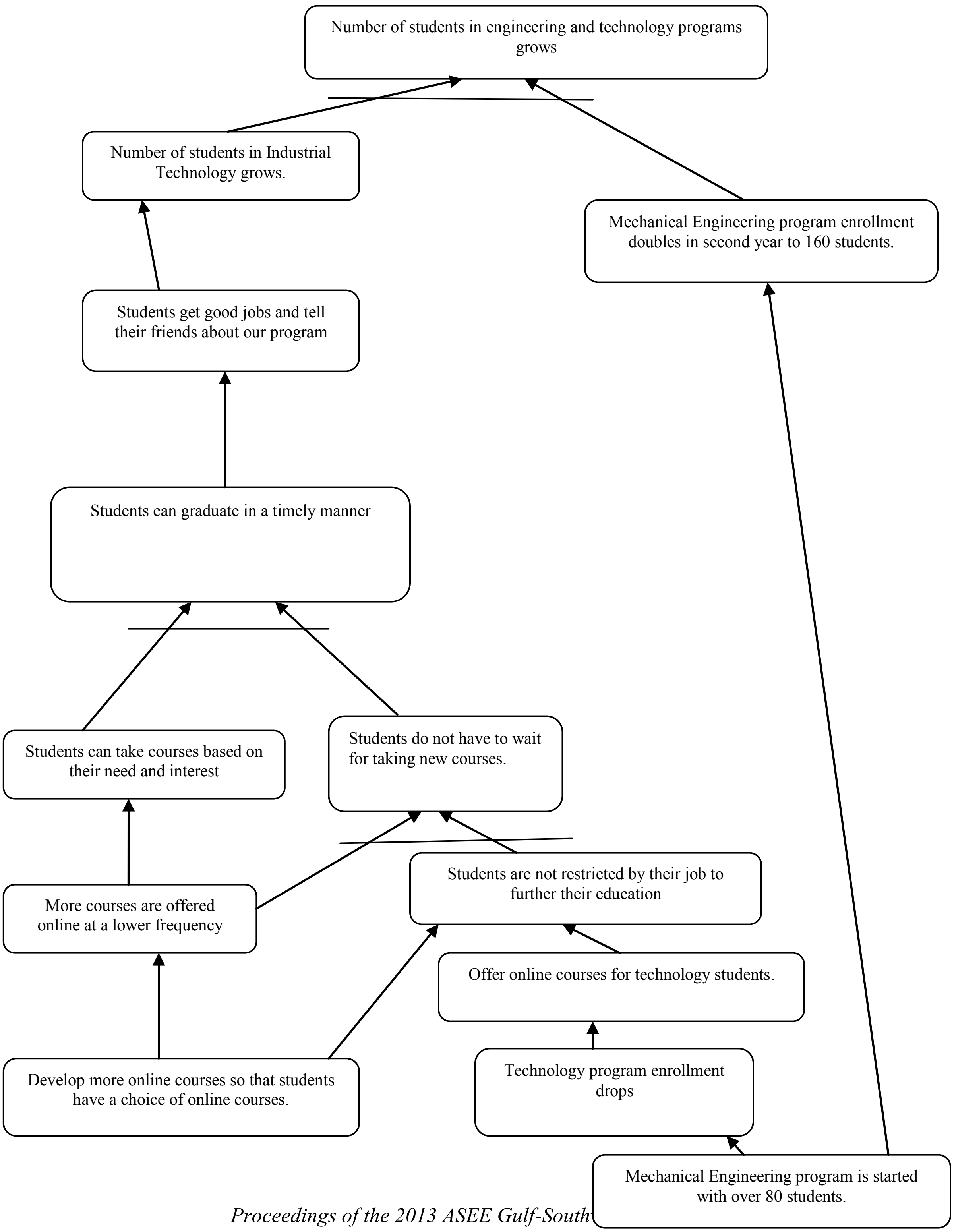


Figure 2 – Evaporative Cloud with Injections

The Industrial Technology program transitioned from an evening program to an online program to better meet the needs of working adults and not compete with the Mechanical Engineering program. Informal survey of students in the Industrial Technology program has told us that because these students have difficult work schedules, online courses have met a need for the professional development and educational enhancement of these extremely busy working adults.

The local oil and gas industry needs educated people to be able to constantly improve their operations in order to compete in a global economy. Offering new courses that met this need helped our program grow. Meeting with employers and working students helped us understand what was needed of our programs to help the local industry. As a result students have been able to get good jobs with leading oil and gas companies.



Number of students in engineering and technology programs grows
Number of students in Industrial Technology grows.
Mechanical Engineering program enrollment doubles in second year to 160 students.
Students get good jobs and tell their friends about our program
Students can graduate in a timely manner
Students can take courses based on their need and interest
Students do not have to wait for taking new courses.
More courses are offered online at a lower frequency
Students are not restricted by their job to further their education
Offer online courses for technology students.
Develop more online courses so that students have a choice of online courses.
Technology program enrollment drops
Mechanical Engineering program is started with over 80 students.

Figure 3 – Future Reality Tree

Project Implementation

A five year online course rotation cycle was developed for the Industrial Technology courses. It is shown in Table 1. One new course is put online in Blackboard each spring and fall semester till we have all the courses online in the fall of 2014. As per the rotation cycle most courses will be taught only once in two years after the cycle is complete. This will allow students to take the course they are interested in during their junior or senior year. Two courses have to be taught once a year because we also serve the management online completion program. The Petroleum Technology courses are also taught every year because the faculty has agreed to develop fewer online courses. As more online courses are available, they can be taught less frequently, and enrollment will be higher.

Course Description		**Yr 1**	**Yr 1**	**Yr 1**	**Yr 2**	**Yr 2**	**Yr 2**	**Yr 3**	**Yr 3**	**Yr 3**	**Yr 4**	**Yr 4**	**Yr 4**	**Yr 5**	**Yr 5**	**Yr 5**
Course no.	**Course title**	**Fa12**	**Sp13**	**Su13**	**Fa13**	**Sp14**	**Su14**	**Fa14**	**Sp15**	**Su15**	**Fa15**	**Sp16**	**Su16**	**Fa16**	**Sp17**	**Su17**
ITEC 3305	Industrial Safety and Health					X			X			X			X	
ITEC 3307/MNGT 3340	Project Management		**X**					X			X			X		
ITEC 3380/MNGT 3380	Managing Technology	X	X			X			X			X			X	
ITEC 4380/MNGT 4380	Total Quality Management		X			X			X			X			X	
ITEC 3390	Technology & Society	X													X	
ITEC 4302	Innovation				X									X		
ITEC 4310	Energy Technology				**X**			X						X		
ITEC 3340	Facilities Design							X			X					
ITEC 4303	Environmental Technology					**X**					X					
ITEC 3310	Manufacturing Technology	X			X		X			X			X			X
ITEC 4340	Construction Technology								X			X				
PTEC 3301/PENG 2301	Petroleum Fundamentals	X			X			X			X			X		
PTEC 3302	Petroleum Fluids and Gas Technology			X			X			X			X			X
PTEC 4302	Pipeline Technology			X			X			X			X			X
PTEC 3304	Drilling Technology					X			X			X			X	

Table 1 – Full program completion rotation cycle

Term	Fall 2011	Spring 2012	Fall 2012	Spring 2013
Total # of Students in Online Classes	91	109	114	127

Table 2 – Enrollment Results

Summary

Regular evening classes had enrollments of 12 to 20 students. Online courses have enrollments of 25 to 40 students. Informal survey of students has indicated that online courses have allowed more students to continue their education. Students with associate degrees need four-year degrees to move into management positions. Online education allows them to keep their job and pursue higher education, so they can move up in their careers. Many of our students have moved into better positions with their current employers after they graduated. Other students with little prospect for advancement in their current jobs have changed jobs in order to move up. . The time commitment associated with online education slows down the process of offering more courses online[3]. Since the program was implemented in fall 2011, my enrollment has grown to over a hundred students per semester. The results are shown in Table 2. This shows that the implementation of Goldratt's Theory was successful in improving enrollment in the online courses and serving the working professionals.

Conclusions

The advantages of online education are learning anytime and anywhere which is especially good for working adults including those that have to travel as part of their job. The use of online education in technical education is growing. E-learning is the new name applied to internet based online education. Online education also helps with scheduling and program costs. Many online students are older working adults balancing studies with demand of family and work

References

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2. Goldratt, E. M., (1994), It's Not Luck. Massachusetts: North River Press.
3. Zirke, C. (2004). "Distance Education Programming Barriers in Career and Technical Teacher Education in Ohio." Journal of Vocational Education Research, Volume 29, Issue 1, 2004.

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Dr. Raj Desai currently serves as Associate Professor in the Department of Engineering and Technology and Chair, Undergraduate Studies, College of Business and Engineering at the University of Texas of the Permian Basin. His research interests are in the fields of leadership, innovation, and new technologies.

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