

Imagineering and Engineering Education: Learnings from the Case of Disney and Applications to Industry 5.0

King Harold A. Recto, PhD^{a,*}, Juan Jeffrey U. Consignado, DBA^b, and Romano Q. Neyra, DT^c

^a Ateneo de Manila University, Loyola Heights, Quezon City 1108, Philippines

^b Institute of Accounts, Business and Finance, Far Eastern University, Nicanor Reyes St., Sampaloc, Manila

^c FEU Institute of Technology, P. Paredes St., Sampaloc, Manila 1015, Philippines

*krecto@ateneo.edu

Highlights

- Imagineering is a competency needed to navigate Industry 5.0.
- The case of Disney offers practical insights on how companies may maintain a pool of competent and skilled Imagineers.
- Partnership with higher education institutions offering Engineering programs appear to be the best among the alternative courses of action presented.

Abstract

With a market valuation of \$238.9 billion, Walt Disney is among the most prosperous and influential entertainment corporations in the world. Being a company that puts high premium on creativity, it pioneered the concept of Imagineering and technology-based projects such as the Experimental Prototype Community of Tomorrow (EPCOT). As Industry 5.0 transforms the society, the demand for Imagineering is felt but Imagineers are just produced on-the-job and may not be very efficient. To understand Imagineering better, the authors embarked on a case study of where it began, in the Walt Disney Company. This technique was also used to identify Disney's strengths, weaknesses, opportunities, and threats. Three different courses of action were suggested: (1) creating career development programs for Imagineering professionals; (2) creating the company's own training system and development division; and (3) working with engineering schools to help students get jobs in the field of Imagineering. The third option was picked after weighing the benefits and drawbacks of each potential course of action. This is due to the fact that these schools already have academic programs that have been well researched and more Imagineering professionals who can teach. What more, they have comprehensive approach to producing Imagineering students. In pursuing the third option, its applicability to Industry 5.0 was also taken into consideration. Additionally, a thorough two-year action plan was created. This commences with a search for partner engineering institutions and also includes time-bound tasks to be completed by particular departments and executives of the corporation and/or their partner institution within a specific budget. It ends with a review of the academic curriculum and a discussion of a particular budget.

Keywords: Imagineering; Engineering Education; Industry 5.0; Disney; Competencies

1. Introduction and Context

Imagineering appears to be an important skill that graduates should develop during Industry 5.0. According to Jardin, people working with robots and smart devices are referred to as Industry 5.0. It is about robots assisting people in performing tasks more efficiently and effectively by utilizing sophisticated technologies such as the Internet of Things (IoT) and big data. It gives the Industry 4.0 pillars of automation and efficiency a genuine human touch.

In an article published by the Vaughn College, it was found out that there is an increase in demand for technologists and engineers. They are the professionals in the forefront of Industry 5.0. Some of the job titles they have are the following: Engineers, Cloud architects, Systems administrators, Cybersecurity experts and Application designers/developers

It was Alcoa coined the phrase Imagineering to represent the mixing of imagination and engineering in the 1940s. Union Carbide also used in it an internal journal in 1957 with an article by Richard F. Sailer titled BRAINSTORMING IS IMAGINATION ENGINEERING. A decade later, Disney applied for a copyright for the word, claiming first usage in 1962. This field of profession has the responsibility in designing and constructing the parks and other entertainment areas owned and managed by Disney. Imagineers are expected to have skills in storyboarding, creativity, and innovation.

Nonetheless, it is very clear that the people filling up these on-demand jobs should have a good sense of Imagineering. Electronics Engineers, for example, need to be able to imagine the flow of electrons to analyze a particular hardware using Engineering principles to solve a given issue. Suppose one is given the circuit in Figure 1 below:

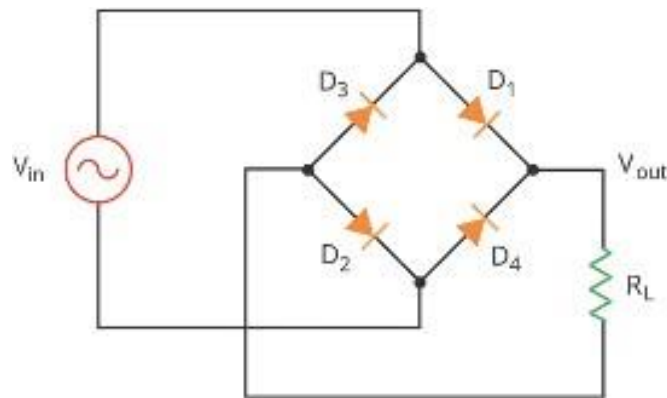


Figure 1. Sample Circuit that Needs to be Analyzed

The only way to determine the flow of current in the load, R_L , is to imagine the responses of the diodes D_1 , D_2 , D_3 , and D_4 to the sinusoidal voltage input. During the positive half-cycle of a sinusoidal input, for example, the Engineer would imagine that the V_{out} resembles the V_{in} because of the imagine flow of the electrons (denoted by the current I) and his Engineering knowledge of the response of diodes (i.e., it allows the flow of current in only one direction) as shown in Figure 2.

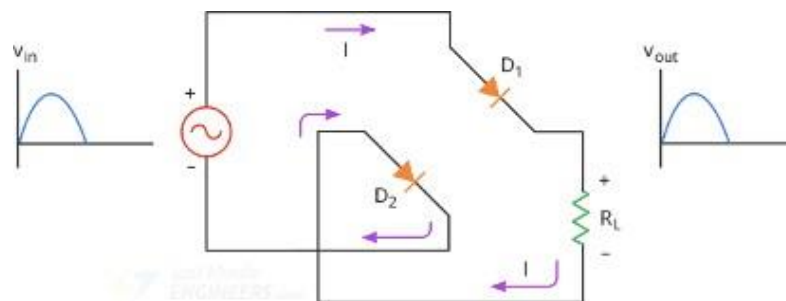


Figure 2. Imagined Response of the Circuit at V_{out} to the Positive Half-cycle of the Sinusoidal Input at V_{in}

He would again have to imagine what happens during the negative half cycle to come up with the continuation of the waveform in V_{out} as shown in Figure 3.

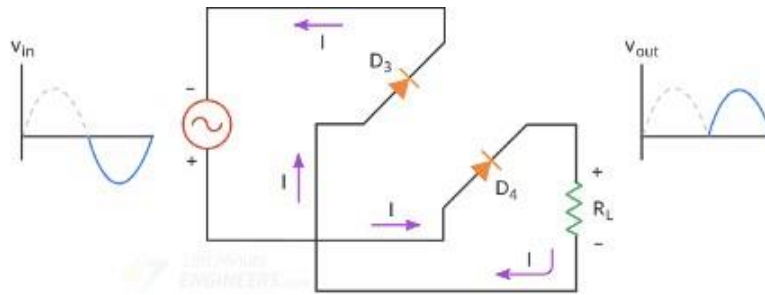


Figure 3. Imagined Response of the Circuit at V_{out} to the Negative Half-cycle of the Sinusoidal Input at V_{in}

In the end, he will be able to arrive at the following waveform of V_{out} given the waveform at V_{in} using his Imagineering skills as shown in Figure 4.

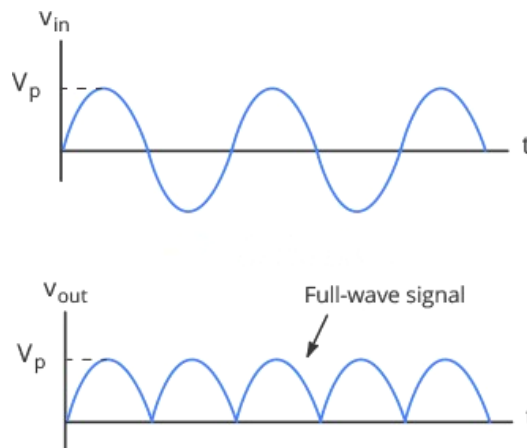


Figure 4. Imagined Waveform at V_{out} Given the Sinusoidal Input at V_{in}

The same goes for Cloud architects, system administrators, cybersecurity experts and application designers/developers. The cybersecurity expert, for instance, should be able to imagine what hackers would do so that they can engineer an appropriate system, using their technical knowledge, that would counter the attack. The quality of the system built against cyber-attacks is only as good as the imagined possible attacks.

In the article of Kerzner, it was described that in all stages of project development, Imagineering is key in planning and creating Disney theme parks, resorts, cruise ships, and other entertainment venues. Every activity necessitates some level of inventiveness. Imagineers have a wide range of skills and abilities, therefore the term "imagineering" encompasses over 140 various job titles, including artists, architects, engineers, lighting designers, show writers, graphic designers, and many others. The same is true for the professions that are in-demand today. Imagineering, then, would encompass other jobs outside of Disney: engineers, cloud administrators, architects, etc.

Though Imagineering has its roots in the 40s, it continues to be a valuable skill in Industry 5.0, especially in the case of Disney. According to Ramus, Disneyland was an apt metaphor for the industrial age view of work. He noted that although thousands of cast members and their supporting managers work at Disneyland every day, for the most part, they do not provide the tireless, repetitive, consistent, and often fascinating entrainment at Disney's theme parks. This task is really given over to animatronics, digital recordings, and a host of other special effects that populate Disneyland's entertainment factory. On the one hand, people greet guests at the gates, sell food, process souvenir sales, and operate the rides and their work contribute to the overall experience at Disney. However, the truth is that people visit Disney for its rides. Behind those rides are audio-animatronic characters that represent the essence of the Industry 5.0

In the case of Disney, as well as in the case of other industries, the three essential facts of Industry 5.0 as described by Jardin is simply at work. The first principle is that humans are to be supported, not replaced, by Industry 5.0. This is what happens in Disney: the cast members and supporting managers are helped by technology to deliver the Disney Magic experience that everyone came for. One would also find a parallel in the other industries.

A second characteristic of industry 5.0 aims to find the perfect balance between efficiency and productivity. Again, one would find its application in Disney as well as in other industries. As Ramus (2011) puts it, Disneyland created revolutionary styles of enjoyment that permit animals and imagined beings to carry out in approaches that could now no longer be viable without the technology. Otherwise, it would have to include infinite generations of actual animals playing performances that animal activists would definitely mind. Müllerblaustein, a timber construction firm, has teamed with KUKA on Industry 5.0-related initiatives, to make robots free them from physically demanding tasks and they can focus on creative functions such as craftsmanship. (Jardine 2020)

Finally, the third characteristic of Industry 5.0, according to Ramus, is that it is unavoidable. This is because it has brought efficiency to a level that it does not make sense for companies to revert to the old ways of doing things. Disney, for example, would not go back to paper and pen, in animating a cartoon character when their visual artists can conveniently do it with the aid of computers. In the same way, manufacturers of electronic devices would not return to manually soldering the surface mounted devices when a robotic arm can do it more accurately and more efficiently.

Hence, this paper will study the case of Walt Disney, being the evangelist of Imagineering and having a market valuation of \$238.9 billion, placing the company among the most prosperous and influential entertainment corporations in the world. (Beattie 2020) Because it is also a company that puts high premium on creativity, it pioneered the concept of Imagineering and worked on several technology-based projects such as the Experimental Prototype Community of Tomorrow (EPCOT). (Chenail 2004) Indeed, Walt Disney is a suitable subject for the case study since learnings derived from the company can be further applied to other companies in the Industry 5.0, thereby maximizing the learnings from this case.

2. Objectives

This study aims to address the need for competent and skilled Imagineers for Disney and apply the principles to the rest of the jobs in the forefront of Industry 5.0

In particular, it seeks to answer the following specific research questions:

1. What are the strengths, weaknesses, opportunities, and threats in Disney?
2. What is the best alternative course of action that can be taken to meet the demands of Disney in terms of Imagineering?
3. What is the role of Engineering Education in the alternative course of actions that may be taken by the management of Disney to maintain a pool of competent and skilled Imagineers?
4. What can other industries learn from Disney in terms of Imagineering that would help them navigate Industry 5.0?

3. Areas of Consideration

Kerzner (2019) described how Imagineering is implemented in Disney. According to him, the Imagineering project results for theme park attractions are visual narrative made via innovation. This is much different from standard engineering projects wherein the project is a just an implementation of hardware or software design and does deliberately add innovation to it. It cares not about any particular “story” that the project might allude to. In

contrast, every element of the delivery of Imagineering has a distinct meaning and plays a part in creating a story in a controlled setting, which is how the overall product is intended to function. It tells a narrative visually. The theme parks and the associated characters come to life in three dimensions, in contrast to conventional movies or novels, which are only two-dimensional.

When customers enter the theme park attraction, it is intended to transport them out of reality and give them the impression that they are participating in a tale, and perhaps even interacting with some of their favorite characters. Visitors to theme parks of all ages are encouraged to feel like they are active characters in the narrative rather than merely onlookers. Everything is made to provide individuals with a unique experience. People should ideally be led to believe that they are involved in the narrative. Imagineers watch the looks of visitors as they exit rides when new attractions are introduced.

In the Disney Book Group 1996, Walt Disney was quoted to say, “All I want you to think about is when people walk through or have access to anything you design, I want them, when they leave, to have smiles on their faces. Just remember that. It’s all I ask of you as a designer.”

Having a clearer idea of what Disney Company expect of their Imagineers, Table 1 now summarizes the strengths, weaknesses, opportunities, and threats of Disney. The table was generated through brainstorming of the authors and revised after comments from a team of quality management experts. Taking it one step further, one can also see that aside from the specifics like patents for 115 products, it can also a representative of businesses operating in the industry 5.0. For instance, a high-tech manufacturing plant can have a big market share and strong financial position as its strength. However, it may lack specialized training programs for Imagineers since the focus of their business is on production, not in developing their people in the organization.

Table 1. Analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) of Disney

Strengths	Weaknesses
Strong Brand Name and Reputation	Lack of Specialized Training Programs for Imagineers
Big Market Share and Strong Financial Position	Lack of Specialized Training Facilities for Imagineers
Presence of Innovation Culture	
Patents for 115 products	
Compliance to Building Code and Safety Laws	
Presence of Job Descriptions and Specifications	
Presence of Recruitment and Selection Strategies	
Hires employees based on Job Specifications	

Opportunities	Threats
Increasing Market Size	Fast Technological Advancement Continuous trend in innovation
Strong Presence of the Industry in the social media	Changing Tastes and Preferences of Customers Requires Large Amount of Capital Investment Increasing Demand for Skilled Imagineers Lack of Educational Institutions Offering Academic Programs for Imagineering

Table 1 shows that there is an increasing market size for Disney and its industry. This will provide job opportunities for imagineers. However, the fast technological advancement and continuous trend in innovation should be addressed properly through formal education and related trainings.

4. Alternative Courses of Action

Table 2 on the next page shows the alternative courses of action (ACA) that may be taken by Disney. Again, seeing the situation in Industry 5.0, they may be the generalized alternative courses of action of business operating in the Industry 5.0.

Table 2. Alternative Courses of Action

ACA #1: Disney should develop career development programs for their Imagineering professionals

<i>Advantages</i>	<i>Disadvantages</i>
Design Based on the Specific Needs of the Imagineering Professional	Depends on the Availability of Training Programs by the Provider
Focus in Developing Specialized Skills	Depends on the Availability of Training Experts in the Field of Imagineering
Can Develop Progressive Training Programs	Expensive Limited to interested Disney employees

ACA #2: Disney should establish its own Imagineering Training Arm/Institute.

<i>Advantages</i>	<i>Disadvantages</i>
Can design the Program Based on the Need of Disney	Depends on the Availability of Training Experts in the Field of Imagineering
More Imagineering Professionals Can Participate in the Program	Requires Large Amount of Capital Investment Requires the Establishment of Training Facilities
ACA #3: Disney should collaborate with Engineering Institutions to prepare their students for Imagineering Jobs	

<i>Advantages</i>	<i>Disadvantages</i>
Presence of Well-Studied Academic Programs	Difficulty of Convincing Engineering Institutions to Collaborate with Disney
Holistic Approach in Developing Imagineering Students.	
Availability of More Imagineering Experts to Teach	
Availability of More Imagineering Professionals	

According to Curia et al., education is the means by which companies can overcome their difficulties. While all the presented alternative courses of action are valid forms of education, all of them present advantages and disadvantages. All the alternatives also support organizational career management which is an added advantage to companies since it has been found out to have a significant correlation with job satisfaction (Wu 2008). Being equal in these aspects, choosing the best alternative, therefore, may lie on the customization of the training to fit the needs of the employees and long-term effectivity of the alternative.

The first one is low on customization since it would need to rely on trainings offered in the market which may not be able to address all their needs. Because of this, its effectivity can also be considered low.

The second alternative allows more customization but also requires much effort on the part of the company since it would need to pool people who can be trainers in their training arm. This approach may be ineffective since it would divide the focus of the company between its primary product or service and its training arm.

The third alternative therefore seems to be the most promising as partnership with Engineering Institutions make room for customization. Effectivity is also increased since the company would be able to focus its primary product or service while the Engineering Institution would continue to focus on the education of the trainees sent by the company.

5. Final Decision

Based on the evaluation of the identified advantages and disadvantages of the different ACAs, is concluded that best course of action is ACA# 3. Disney should collaborate with Engineering Institutions. This particular item will not only solve the problem of Disney but will also address the concern of the businesses operating in Industry

5.0. It will also provide opportunities for the complete professionalization of Imagineering and continuous advancement of this field. Even in the absence of formal education, obvious traces of Imagineering can already be seen virtual-social-physical (VSP) convergence across consumer devices, desktop machines, and Web platforms. However, it is only limited to self-expression that can range from fulfilling curriculum requirements at schools and university to fulfilling intense curiosity and daring hedonism on the edges of tall buildings. (Fox 2017) The coming in of Engineering Institutions can lift this limitation and encourage the students to consider other possibilities. Moreover, such partnership can also ensure the continuous innovation of the industry which eventually bolster its growth.

6. Detailed Action Plan

Table 3 shows the recommended action plan that companies may follow in order to ensure that they continue to produce and train their people in Imagineering based on the principles discussed by Kerzner.

Table 3. Detailed Action Plan

Activity/Task	Office/Officer Responsible	Timeframe	Budget
Search for Partner Engineering Institutions	Disney HRD	April to May 2022	353.66 USD
Signing of MOA with Partner Institutions	Disney HRD	June 2022	176.83 USD
Development of the Engineering Curriculum to Include Imagineering	Partner Institutions and HRD	July to December, 2022	% Partners
Processing of CHED's Approval of the Curriculum	Partner Institutions	January to April, 2023	% Partners
Marketing of the Program to Prospective Students	Partner Institutions	May to June 2023	% Partners
Identification of the participants from Disney	Disney HRD	July 2023	As budgeted
Implementation of the Curricular Program	Partner Institutions	August 2023 to May 2024	% Partners
Graduation of Employees in the Professional Diploma Program	Partner Institutions and Disney HRD	June 2024	% Partners
Evaluation of the Curricular Program	Partner Institutions and Disney HRD	August 2024	As budgeted

7. Summary of Learnings

The proponents conducted a SWOT analysis of Disney and determined the different areas of consideration. Thereafter, the alternative courses of action were formulated. These courses of action were evaluated to determine the best approach to address the problem of Disney which may also be applicable to Industry 5.0. After careful analysis of the given facts, the conclusion on Section VIII was arrived at.

8. Conclusion

In order to address the need for competent and skilled Imagineers for Disney and other jobs in the forefront of Industry 5.0, collaboration with Engineering institutions appears to be the best approach.

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References

- Beattie, Andrew (2020) "Walt Disney: How Entertainment Became An Empire." Retrieved from [https://www.investopedia.com/articles/financial-theory/11/walt-disney-entertainment-to-empire.asp#:~:text=Walt%20Disney%20\(DIS\)%20is%20one,after%20whom%20it%20was%20named.](https://www.investopedia.com/articles/financial-theory/11/walt-disney-entertainment-to-empire.asp#:~:text=Walt%20Disney%20(DIS)%20is%20one,after%20whom%20it%20was%20named.)
- Chenail, Ronald (2004) "When Disney meets the research park: Metaphors and models for engineering an online learning community of tomorrow," *The Internet and Higher Education*, Volume 7, Issue 2, Pages 107-121, ISSN 1096-7516, <https://doi.org/10.1016/j.iheduc.2004.03.001>.
- Fox, Stephen (2017) "Mass imagineering: Combining human imagination and automated engineering from early education to digital afterlife," *Technology in Society*, Volume 51, Pages 163-171, ISSN 0160-791X, <https://doi.org/10.1016/j.techsoc.2017.09.001>.
- Jardin, James. (2020) "Industry 5.0: Top 3 Things You Need to Know" in *GxP Lifeline*. Retrieved from: <https://www.mastercontrol.com/gxp-lifeline/3-things-you-need-to-know-about-industry-5.0/>
- Kerzner, H. (2019). *Innovation Project Management*. Wiley Professional Development (P&T). <https://bookshelf.vitalsource.com/books/9781119587330>
- LastMinuteEngineers.com (2021) "The Full-wave Bridge Rectifier" Retrieved from: <https://lastminuteengineers.com/the-full-wave-bridge-rectifier/>
- Ramus, Daniel (2011) "Disneyland and the Industrial Age: Audio-Animatronics and the Future of Work" in *Serious Insights*. Retrieved from: <https://www.seriousinsights.net/disneyland-and-the-industrial-age-audio-animatronics-and-the-future-of-work/>
- T. Curià Piñol, S. Artigas Porta, M.C. Rodríguez Arévalo, J. Minguella-Canela (2017) "Study of the training needs of industrial companies in the Barcelona Area and proposal of Training Courses and Methodologies to enhance further competitiveness," *Procedia Manufacturing*, Volume 13, Pages 1426-1431, ISSN 2351-9789, <https://doi.org/10.1016/j.promfg.2017.09.159>.
- Vaughn College (2020) "Demand for Engineers and Technologists Surge Amidst Coronavirus Pandemic." Retrieved from: <https://www.vaughn.edu/blog/demand-for-engineers-and-technologists-surge-amidst-coronavirus-pandemic/>
- W. Wu (2008), "The Relationship between Organizational Career Management and Job Satisfaction: An Empirical Study on Software R&D Professionals," 2008 International Conference on Risk Management & Engineering Management, pp. 593-598, doi: 10.1109/ICRMEM.2008.61.