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THE ANESTHESIA CONTINUING EDUCATION MARKET AND THE VALUE CREATION
FROM A SUSTAINABLE UNIFIED PLATFORM

BY

Jefferson Souza

A doctoral project submitted to the faculty of the Medical University of South Carolina
in partial fulfillment of the requirements for the degree
Doctor of Health Administration
in the College of Health Professions

THE ANESTHESIA CONTINUING EDUCATION MARKET AND THE VALUE CREATION
FROM A SUSTAINABLE UNIFIED PLATFORM

BY

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Abstract of Dissertation Presented to the
Medical University of South Carolina
In Partial Fulfillment of the Requirements for the
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Jefferson Souza

Chairperson: Jami Jones, PhD
Committee: Jillian Harvey, PhD
Angela Mund, DNP

Practicing anesthesia professionals in the United States are all governed by various profession-specific regulatory bodies that mandate continuing education (CE) requirements. To date, no unified resource exists for anesthesia professionals (i.e., Anesthesiologists, Certified Registered Nurse Anesthetists, and Anesthesiologist Assistants) to explore the CE offerings available within the marketplace. This study endeavored to convey the potential value of a unified anesthesia CE resource. It investigated how to cultivate a sustainable platform to potentially improve how anesthesia professionals search available CE offerings and to potentially enhance how anesthesia CE providers reach anesthesia professionals. This qualitative study was conducted utilizing an integrative review of the literature. The key concepts identified and investigated were network effect, segmentation, first to market, best of breed, search costs, transaction costs, minimally viable product, evolutionary phases of platforms, platform theory, platform business model,

platform economy, and types of platforms. Inductive content analysis was chosen as the organizational method for the resultant qualitative data. The goal of the analysis was to create a conceptual, practical, and strategically applicable platform paradigm for the anesthesia CE marketplace driven by the insights and amalgamations from the literature. The analyzed concepts, dimensions, and indicators of platform successes and their applications potentially facilitate anesthesia professionals' CE explorations and CE providers' marketing efforts, as well as contextualize the overarching impacts and implications onto the anesthesia CE industry and beyond. The conclusion portrays these impacts and implications.

Keywords: Anesthesiologists, Certified Registered Nurse Anesthetists, Anesthesiologist Assistants, CE, network effect, segmentation, first to market, evolutionary phases of platforms, platform theory, platform business model, platform economy, types of platforms

Table of Contents

Acknowledgements.....	iii
Abstract.....	v
Table of Contents.....	vii
List of Tables	x
List of Figures.....	xi
Chapter 1: Introduction.....	1
Background.....	1
Population.....	13
Study Need and Problem Statement.....	17
Research Questions.....	18
Chapter 2: Literature Review.....	20
Defining Platforms	20
Strategic Platform Framework	22
User Sets Within the Potential Platform.....	29
Platforms Within the Anesthesia Industry.....	32
Chapter 3: Methodology.....	36
Research Method.....	36
Sample Selection.....	36
Data Collection Instrumentation	38
Data Collection Procedure.....	40
Data Analysis.....	42
Protection of Human Rights.....	45

Chapter 4: Results.....	46
Defining Coding Trees.....	46
Coding Tree for Network Effects.....	46
Network Effects.....	49
Coding Tree for Segmentation	66
Segmentation.....	68
Coding Tree for First to Market.....	91
Fist to Market.....	93
Omitted Key Concepts.....	121
Coding Tree for Evolutionary Phases of Platforms.....	122
Evolutionary Phases of Platforms.....	124
Coding Tree for Platform Structure and Functions.....	145
Platform Structure and Functions.....	147
 Chapter 5: Discussion.....	 194
Discussion of Network Effects.....	194
Discussion of Segmentation.....	198
Discussion of First to Market.....	203
Discussion of the Evolutionary Phases of Platforms.....	207
Discussion of Platform Structure and Functions.....	212
Limitations and Future Research.....	215
Conclusions.....	219
 References.....	 221
 Appendices.....	 246
Appendix A. Pertinent Anesthesia Billing Modifiers.....	246
Appendix B. ABA’s MOCA 2.0 Quality Improvement Activities.....	248

Appendix C. NBCRNA’s CPC Program Class B Activities and their Values.....	249
Appendix D. ASA’s and AANA’s Calendar of Events.....	250
Appendix E. Summary of Reviewed Articles: Network Effects.....	252
Appendix F. Summary of Utilized Articles for Coding Tree: Network Effects.....	255
Appendix G. Summary of Reviewed Articles: Segmentation.....	257
Appendix H. Summary of Utilized Articles for Coding Tree: Segmentation.....	264
Appendix I. Summary of Reviewed Articles: First to Market.....	266
Appendix J. Summary of Utilized Articles for Coding Tree: First to Market.....	272
Appendix K. Summary of Reviewed Articles: Best of Breed.....	274
Appendix L. Summary of Reviewed Articles: Search Costs and Transaction Costs.....	276
Appendix M. Summary of Reviewed Articles: Minimally Viable Product.....	277
Appendix N. Summary of Reviewed Articles: Evolutionary Phases of Platforms.....	278
Appendix O. Summary of Utilized Articles for Coding Tree: Evolutionary Phases of Platforms.....	284
Appendix P. Summary of Reviewed Articles: Platform Theory.....	286
Appendix Q. Summary of Reviewed Articles: Platform Business Model.....	293
Appendix R. Summary of Reviewed Articles: Platform Economy.....	303
Appendix S. Summary of Reviewed Studies: Types of Platforms.....	322
Appendix T. Summary of Utilized Articles for Coding Tree: Platform Structure and Function.....	335

List of Tables

Table 1. <i>Initial Key Concepts, Search Terms, Databases, and Quantity of Results per Database Considered for the Review of the Literature</i>	39
Table 2. <i>Types of Lock-In Effects</i>	60
Table 3. <i>Implications and Explanations of Consumer-to-Consumer Behaviors</i>	84
Table 4. <i>Processes for Segmentation</i>	87
Table 5. <i>Processes and Actions that Drive Effective Market Segmentations</i>	90
Table 6. <i>Benefits of Platform Thinking (i.e., Internal Analysis)</i>	131
Table 7. <i>Steps Top Management Should Take to Effectively Organize a Platform Planning Project</i>	134
Table 8. <i>Strategies for Leveraging Current Market and/or Platform Technology Proficiencies</i>	143
Table 9. <i>How the Essential Technological Elements Shape the Architecture of Successful Platforms</i>	152
Table 10. <i>Technological Features, Functionalities, and Tactics that Enhance Customer Relations, Strategic Business Partnerships, and the Position of a Platform Within the Marketplace</i>	153
Table 11. <i>Supplier Engagement Processes</i>	172
Table 12. <i>Tactics Frequently Utilized by Platform Firms to Enhance Value</i>	184
Table 13. <i>Dimensions of Value: Value Creation and Value Appropriation</i>	189

List of Figures

<i>Figure 1. Broad Overview of the Twelve Dimensions of a Business to Drive Innovation.....</i>	27
<i>Figure 2. Definitions and Examples of the Twelve Dimensions of Business Innovation.....</i>	28
<i>Figure 3. Demand and Supply User Sets of the Anesthesia CE Marketplace.....</i>	30
<i>Figure 4. A Sample of Types and Examples of Platforms.....</i>	35
<i>Figure 5. Preparation, Organization, and Result Phases of Content Analysis.....</i>	43
<i>Figure 6. Coding Tree Illustrating Network Effects as a Key Concept, its Dimensions, and Indicators.....</i>	48
<i>Figure 7. Coding Tree Illustrating Segmentation as a Key Concept, its Dimensions, and Indicators.....</i>	67
<i>Figure 8. Viewpoints that Guided the Coding and Analyses of the Dimensional Aspects of Segmentation.....</i>	72
<i>Figure 9. Visual Depiction of a Strategic Service Encounter.....</i>	74
<i>Figure 10. Visual Depiction of Customers Seeking to Hire a Product or Service to Get the Job Done.....</i>	76
<i>Figure 11. Coding Tree Illustrating First to Market as a Key Concept, its Dimensions, and Indicators.....</i>	92
<i>Figure 12. Likelihood of First-Mover Advantage Given the Pace of Market and Technological Changes.....</i>	97
<i>Figure 13. Resource-Based Approach to Business Strategies.....</i>	101
<i>Figure 14. Market Strategies Amidst Market Forces.....</i>	112
<i>Figure 15. Conventional Logic Versus Value Innovation Logic.....</i>	113
<i>Figure 16. Broad Internet Sectors and Their Key Value Drivers.....</i>	116
<i>Figure 17. Coding Tree Illustrating the Evolutionary Phases of Platforms as a Key Concept, its Dimensions, and Indicators.....</i>	123
<i>Figure 18. Platform Growth Model.....</i>	126
<i>Figure 19. Effective Platform Management Strategies.....</i>	127
<i>Figure 20. Activity Patterns, Cognitive Patterns, and Types of Awareness.....</i>	128

<i>Figure 21. Coding Tree Illustrating Platform Structure and Functions as a Unified Concept, its Dimensions, and Indicators.....</i>	146
<i>Figure 22. Common Quality Management Strategies.....</i>	159
<i>Figure 23. Classification of Platforms Based on Consumer Functions.....</i>	166
<i>Figure 24. Classification of Platforms Based on Firm Functions.....</i>	167
<i>Figure 25. Sequence of Platform Development Efforts.....</i>	169
<i>Figure 26. Search Costs, Transaction Costs, and the Potential Post Transaction Costs..</i>	180
<i>Figure 27. Value Creation Efforts Stemming from One Side of the Market.....</i>	181
<i>Figure 28. Commonly Employed Platform Tactics by Specified Firms.....</i>	182
<i>Figure 29. The Five Dimensions of Value.....</i>	187
<i>Figure 30. Value Creation Processes for Platforms.....</i>	188
<i>Figure 31. Platform Business Model.....</i>	190
<i>Figure 32. Guiding Questions to Assess the Value Interactions Between Both Sides of the Market.....</i>	191

Chapter 1: Introduction

Background

Practicing healthcare clinicians are all governed by many regulatory bodies that mandate profession-specific continuing education (CE) requirements. As the healthcare climate continues to change rapidly, regulatory bodies, clinicians, and CE leaders are pressured to adapt the current CE framework. The current CE climate emphasizes a shift from the attainment of medical knowledge to one of ongoing provider self-assessments and practice improvements (Davis et al., 2013). Health information technology serves as the connection and communication between organizations with the goal of providing broader improvements in the competency and performance of clinicians, CE outcomes, and clinical improvements for entire communities (Davis et al., 2013). Newer technologies offer differing modes for delivering content to providers, providing flexibility for CE providers to support point-of-care access and learning, and challenging CE providers to continually assess the content, format, and methodology of their offerings (Lowe, Aparicio, Galbraith, Dorman, & Dellert, 2009). Both health information technology and newer technologies are central to this ongoing CE shift. The anesthesia professions in the United States (US) have various regulatory bodies, profession-specific CE requirements, and a shifting CE climate driven by technological changes. Even with the current technologies available and the shifting CE climate driven by ongoing high-tech advances, to date, no unified resource exists for anesthesia professionals to search and explore the CE offerings available within the marketplace. Understanding the current anesthesia landscape serves as clarification to the oftentimes competitive nature that exists within the industry. This competition and the responsibility of each professional organization to promote the stewardship

of their respective profession serves as a speculative perspective as to why no unification currently exists in the anesthesia industry regarding a unified CE platform.

Broad overview of anesthesia in the US. Over 50,000 Anesthesiologists (ANs), 53,000 Certified Registered Nurse Anesthetists (CRNAs), and 2,000 Anesthesiologist Assistants (AAs) provide anesthesia services across the vast majority of surgical disciplines throughout the country (American Association of Nurse Anesthetists [AANA], n.d.-b; American Board of Anesthesiology [ABA], n.d.-b; Erickson, 2017). Their educational backgrounds, scopes of practice, histories, and CE requirements differ, thus impacting their ability to provide anesthesia care. ANs and CRNAs are the two dominant professions that provide most of these services, and they do so with varying degrees of autonomy. ANs and CRNAs frequently work together as an anesthesia care team and often work as the sole anesthesia providers in facilities across the nation (Kalist, Molinari, & Spurr, 2011). CRNAs can have compensation disbursed for their services independent of ANs and AAs' services can only be compensated when being directed by an AN. Because ANs, CRNAs, and their professional organizations dominate the anesthesia industry, this study primarily provided depictions of their professional interplay without fully excluding AAs and their professional organization. The anesthesia landscape, its encompassing political arena, the historical perspectives of the two dominant professions, and the mechanisms of the current anesthesia CE marketplace contextualize the speculative viewpoint of this study as to why no unified CE resource exists.

ANs, CRNAs, and AAs work within various anesthesia care models. These models have differing reimbursements corresponding to the care model employed. These differing models and the financial ramifications generate diverging behind-the-scenes interests often expressed by ANs, CRNAs, AAs, and their respective professional organizations. Understanding the financial

impact of ANs', CRNAs', and AAs' care models in the US (i.e., independent practice and anesthesia care team) assists in portraying the political incentives within the anesthesia community. The professional organizations have a vested interest in aligning their aspirations with the payment model that enhances the wellbeing of its members and thus perpetuates the political climate that exists today among the anesthesia professions.

ANs: Training and professional organization. ANs are physicians who, in order to become board certified in the US, typically complete four years of undergraduate study satisfying the pre-medical admission requirements, receive four years of graduate education leading to a doctorate degree in medicine or osteopathy, and finish their education with a total of four years in residency including a minimum of three years of clinical anesthesiology training (Accreditation Council for Graduate Medical Education, 2019; American Society of Anesthesiologists [ASA], n.d.-a). The ASA is the professional organization for ANs. Founded in 1905, the ASA is the research, educational, and scientific society for physician ANs, with more than 52,000 members organized to uphold and advance the standards of anesthesiology (ASA, n.d.-b).

ANs: Scope of practice. The reimbursement for ANs varies significantly based on the practice modality in which they are engaged. Table A1 in Appendix A depicts the payment modifiers utilized by ANs for billing purposes and the payment distributions for the various care modalities in which ANs provide services. September 24, 2001 marked the effective date the name of the Health Care Financing Administration (HCFA) was replaced with the Centers for Medicare & Medicaid Services ([CMS]; US Department of Health and Human Services [HHS], CMS, 2001). In the early days of HCFA's regulations, ANs "who directly employed and supervised CRNAs were paid their full allowable charge for each case, no matter how many

cases they were” concurrently overseeing (Kalist et al., 2011, p. 260). This financially incentivized ANs to oversee as many CRNAs as possible. The HCFA soon became concerned that ANs who oversaw several patients at once were providing inadequate anesthesia services (Kalist et al., 2011). A new regulation was soon adopted. In 1983 the new regulation specified the requirements to receive reimbursement for the medical direction and supervision of CRNAs within the anesthesia care team (Kalist et al., 2011). These regulations also defined the number of CRNAs that an AN could oversee for billing purposes. The HCFA’s 1983 regulations specified that ANs could not be reimbursed for the concurrent oversight of more than four CRNAs (Kalist et al., 2011). This oversight of one AN to four CRNAs is still financially incentivized for ANs today. An AN utilizing the anesthesia care team ratio of 1:4 and employing the concept of medical direction is reimbursed “50 percent of the fee in each of up to four concurrent cases that the physician ‘medically directs’, totaling 200 percent over a given period of time, twice what the [...AN] may claim when personally performing anesthesia services in one case.” (AANA, 2014, p. 5). This 1:4 medical direction yields higher compensation compared to medical supervision or when an anesthetic is personally performed by an AN. An AN must perform the following to qualify for medical direction: complete the pre-anesthesia evaluation and exam, prescribe the plan for anesthesia delivery, personally partake in the most demanding aspects of the anesthetic (e.g. induction and emergence), ensure that any portion of the anesthetic not personally performed by the AN is conducted by qualified personnel, monitor the anesthetic delivery at regular and frequent intervals, be physically present and immediately available for the diagnosis and treatment of medical emergencies, and provide the necessary post-anesthesia care as indicated (HHS, CMS, 2019).

CRNAs: Training and professional organization. CRNAs are nurses who possess a Registered Nursing license, have completed a baccalaureate degree in nursing or other suitable major, undergo full-time employment or the part-time equivalent of one year within a critical care setting, and finish their education with a minimum of 24 months or the part-time equivalent of anesthesia training (AANA, n.d.-c; Council on Accreditation of Nurse Anesthesia Educational Programs [COA], 2019). Although 24 months is the educational entry path into the nurse anesthesia profession and minimum educational standard resulting in a master's degree, nurse anesthesia programs continue to transition to awarding doctoral degrees. As of February 14, 2020, there are 97 nurse anesthesia programs approved by the COA to offer entry-level doctoral degrees and 29 programs approved to offer post-master's doctoral degree completion programs. Currently 26 programs remain to be approved to award doctoral degrees to meet the requirement that all students matriculated into entry level nurse anesthesia programs on January 1, 2022, and thereafter be enrolled in a doctoral program. (COA, n.d. para. 1)

Founded in 1931, the AANA is the professional association for more than 54,000 CRNAs and student registered nurse anesthetists (AANA, n.d.-d). The AANA promulgates professional standards and guidelines, and the organization consults with private and governmental entities regarding nurse anesthetists and their scope of practice (AANA, n.d.-d).

CRNAs: Scope of practice. CRNAs “provide anesthesia in collaboration with surgeons, anesthesiologists, dentists, podiatrists, and other qualified healthcare professionals” (AANA, n.d.-c, para. 5). The term collaboration is often utilized by the AANA to refer to the manner in which CRNAs provide anesthesia, but this notion and application by CMS is delineated as either medical supervision or medical direction. The aforementioned HCFA 1983 regulations and the

ensuing reimbursement changes incentivized hospitals to begin shifting employment of CRNAs to ANs, fostered political actions by the AANA to drive changes, and led to the passing of the Omnibus Budget Reconciliation Act of 1986 (Kalist et al., 2011). This act authorized the direct reimbursement for CRNA services under Medicare Part B and marked CRNAs as the first nursing profession to be granted this right to direct reimbursement under CMS (Kalist et al., 2011). Table A2 in Appendix A depicts payment distribution rates for CRNAs utilizing medical direction, medical supervision, and independent practice. The QZ modifier depicts how CRNAs can be compensated independent from ANs. CRNAs can bill directly for their services and this ability is exercised when they are supervised by a physician other than an AN or when working independently. CRNAs can work under the supervision of the operating practitioner (i.e., surgeon, dentist, podiatrist, or other qualified health professional) or an AN who is immediately available if needed (HHS, CMS, 2010). The medical direction of a CRNA is a billing term utilized when working directly with an AN, is utilized for the payment for services rendered, and must be directed by the AN's strict compliance with medical direction mandates. Medical "supervision occurs if the anesthesiologist does not fulfill all the criteria required for medical direction or if the number of concurrent cases exceeds the four case limit" (ASA, 2013, p. 2). If desired, ANs and CRNAs can utilize an anesthesia care team model and may elect to voluntarily utilize the QZ modifier.

CRNAs can work independent of ANs and, in some states, can work without physician oversight. In 2001, CMS changed the federal physician supervision rule for CRNAs to allow state governors to opt-out of the Medicare Part A physician supervision requirement by meeting the following three criteria: consultation occurs with the boards of medicine and nursing regarding access and quality of anesthesia care within their state, opting-out is consistent with

their state's laws, and opting-out is guided by the best interests of the state's citizens (HHS, CMS, 2010). As of December 31, 2019, the following 17 states have opted-out of the federal physician supervision requirement: Iowa, Nebraska, Idaho, Minnesota, New Hampshire, New Mexico, Kansas, North Dakota, Washington, Alaska, Oregon, Montana, South Dakota, Wisconsin, California, Colorado, and Kentucky (AANA, n.d.-c).

AAs: Training and professional organization. AAs are health professionals who have earned a baccalaureate degree with specific prerequisite requirements (i.e., general and organic chemistry, advanced college mathematics, general and advanced biology, and physics) and have completed their didactic and clinical education with a total minimum of two years of anesthesia training (American Academy of Anesthesiologist Assistants [AAAA], n.d.-a). As the professional organization for AAs, the AAAA is a non-profit organization for the Commission on Accreditation of Allied Health Education Programs' [CAAHEP] graduates (AAAA, n.d.-b; CAAHEP, n.d.). The organization is committed to the ethical advancement of the AA profession and is dedicated to excellence in patient care through advocacy, education, and promotion of the anesthesia care team (AAAA, n.d.-b; CAAHEP, n.d.).

AAs: Scope of practice. AAs are the other qualified nonphysician anesthetists that ANs can oversee. They are capable of delivering anesthesia care services in the US, but their professional proliferation has been minimal and their profession accounts for only a fraction of the anesthesia professional community. Not only are their numbers small, but their practice is narrowly restricted. An AA may administer anesthesia only when medically directed by an AN (HHS, CMS, 2010). AAs are limited within their medically directed practice modality, and their profession is further constrained by the geographic locations where they can legally work. As of December 31, 2019, AAs can provide anesthesia services in Georgia, Florida, Ohio, Texas,

Missouri, Wisconsin, Washington D.C., Colorado, New Mexico, North Carolina, South Carolina, Alabama, Vermont, Michigan, Kentucky, Indiana, Guam, and within the Veterans Health Administration system (Erickson, 2017). AAs are licensed in every state and area where they can work except for Texas and Michigan (AAAA, 2019). Licensure for AAs is determined by state legislation that has been enacted and codified into law or through formal regulations adopted by the state's medical board (AAAA, n.d.-a). In Texas and in Michigan, AAs can only practice through delegatory authority (AAAA, 2019). Delegatory authority differs from licensure. Delegatory authority is given to physicians by the medical board in a given state, allowing those physicians to delegate aspects of medical care to qualified personnel as long as the delegating physician ultimately remains responsible for that care and ensures that the individual providing care is qualified (AAAA, n.d.-a).

ANs' and CRNAs' professional organizations. The perspectives of the anesthesia professional coalitions serve as added context and depth into understanding their political incentives. The ASA was formed in 1905 to raise and uphold the standards of the medical practice of anesthesiology (ASA, n.d.-b). The AANA is the professional association for CRNAs but was not organized until 1931 (AANA, n.d.-b). ANs were first to organize in order to influence policy development and implementation. It is important to understand not only who was first to organize and collectively impact the industry, but to understand their current efficacy. Because the most effective demanders of health policies are well-organized interest groups (Longest, 2016), it is also important to assess their ability to affect policy.

Members “are the most important asset of an organization and the most important source of innovation. Thus, it behooves an organization to pay very close attention to this facet of the organization” (Choudhary, 2014, p. 49). Keeping dues-paying members within the ASA and the

AANA engaged is fiscally responsible and aids in their abilities to provide financial, educational, and policy resources that have greatly impacted ANs and CRNAs respectively. Both organizations have been extremely successful with keeping their members gratified, motivated, and engaged within their respective professional organizations. Approximately 90% of ANs and CRNAs are members of their professional organizations (AANA, n.d.-d; ASA, 2018). This also translates into advocacy and involvement within the political workings of their professional organizations. The political action committees (PACs) within the ASA and the AANA are the most prolific within the medical and nursing communities. The ASA's PAC, the ASAPAC, is the top physician PAC in the US and raised \$4,528,927.44 in total receipts during the 2017-2018 fiscal year (ASA, 2018; Federal Election Commission, 2018b). This is a reflection on their leadership and ability to motivate and involve ASA members. This leadership, motivation, and political involvement are also seen within the AANA. The AANA's PAC, the CRNA-PAC, is the top nursing PAC in the US, rivals most other healthcare organizations' PACs, and raised \$1,603,278.62 in total receipts during the 2017-2018 fiscal year (AANA, n.d.-a; Federal Election Commission, 2018a). The advocacy and involvement within the ASA and the AANA have guided the professions into the modern arena of anesthesia politics. The ASA, the AANA, and their leaders have a healthy sense of fear and motivation amid the competitive anesthesia workforce. This sentiment is prominent as the lack of innovation may lead to a nonpromising future and undesired outcomes for each organization and its members (Choudhary, 2014). This is evident in the ability of both organizations to heavily rely on lobbying and PACs to affect policy. This is also seen in the professions' ability to apply altruism and higher calling tactics effectively to achieve their self-interested goals. Higher calling strategies are when an organization motivates its members by promoting societal good (Choudhary, 2014). The ASA utilizes

altruism and higher calling tactics to lobby continuously to retain the ability to control and receive reimbursement from as many practice modalities as possible and to restrict CRNAs' independent practice. The AANA utilizes altruism and higher calling strategies to lobby continuously for the expansion of CRNAs' independent practice and to limit the proliferation of the AA profession. Both organizations' lobbying efforts and tactics are well-known and recognized and opposing views are typically met with significant political force. Themes of the efficacy of the care team approach, patient safety profiles, staffing concerns, access to care issues, continued quality care delivery, and cost-effectiveness are all documented altruistic and higher calling tactics politically utilized by the ASA and the AANA (VA Advanced Practice Registered Nurses, 2016). As professional organizations are stewards of their professions, they are bound to the interests, spread, and advancement of their members. Professional organizations and their success are dependent upon their leaders' abilities to innovate to maintain and advance the organization's competitive advantage (Choudhary, 2014). If the ASA's and the AANA's leadership and actions portray a lack of fear in the competitive market and a lack of innovative persistent political strategies, this could yield a loss of competitive advantage, nongrowing independent practice, and changes to lucrative practice modalities, which, in turn, may propel the opposing organization to a more prosperous future.

ANs' and the ASA's political incentives. Political concerns of ANs and the ASA are in line with limiting the ability of CRNAs to expand their independent practice. Doing so promotes self-preservation and perpetuates their financial health. By preventing the proliferation of the independent practice of CRNAs, ANs and the ASA continually curb movements that could one day aid in impeding their pecuniary interests. The increase in opt-out rulings in states that have not implemented removal of physician supervision from CRNA practice may be perceived as a

threat by ANs. Given the difference in salaries and associated costs to healthcare facilities; biased and conflicting data regarding safety profiles of medical direction, ANs' working independently, and CRNAs working independently; and the full scope of anesthesia practice by ANs and CRNAs, ANs may perceive CRNA independent practice as a means for hospitals to cut expenses. By maintaining the current CRNA practice landscape, ANs and the ASA ensure that no additional precedent is set (i.e., above and beyond the 17 states that have opted-out of physician supervision from CRNA practice) that endorses additional independent CRNA practice. The proliferation of CRNAs' independent practice may be perceived as a threat by the ASA and ANs' lucrative anesthesia care team model (i.e., billing ratio of 1:4). ANs and the ASA are incentivized to limit the proliferation of the independent practice of CRNAs, to promote medical direction for qualified nonphysician anesthetists (i.e., CRNAs and AAs), and to promote the proliferation of the AA profession.

CRNAs' and the AANA's political incentives. Political concerns of CRNAs and the AANA are in line with proliferating the independent practice of CRNAs, and doing so perpetuates their financial health. By promoting the proliferation of their independent practice, the AANA and CRNAs promote their pecuniary interests. Increased independent practice ambitions of CRNAs and the AANA are driven by the potential for higher payment distribution rates for CRNAs and the services they render. CRNAs and the AANA are incentivized to promote the increase in opt-out rulings in additional states, and they are incentivized to limit the growth and spread of the AA profession. AAs serve as competition within the workforce and, since they must work solely under medical direction of an AN, their interests are in line with ANs, the ASA, and promoting the agenda of the anesthesia care team model. The incentive to constrain the growth of AAs is driven by self-preservation.

Varied anesthesia staffing models utilizing ANs, CRNAs, and AAs exist within the marketplace, but the independent practice of CRNAs and the CRNA-only model is the least expensive (North American Partners in Anesthesia, 2015). The literature noting the differences in the safety profile of medical direction, ANs' working independently, and CRNAs working independently is heavily debated, is conflicted by the perspectives of the incentivized professional organizations, and does not seem to provide clarity on the issue. What is evident is that CRNAs pose as a threat to the financial security of ANs because of CRNAs' ability to bill independently for their services. ANs' yearly compensation ranges from \$371,000 to \$437,418 (Merrit Hawkins, 2018). Experienced CRNAs' average yearly earnings are approximately \$192,000 (Stokowski, McBride, & Berry, 2018). Given the fair market salaries of ANs and CRNAs and the CMS reimbursements for anesthesia services (i.e., ANs' 200 percent reimbursement for utilizing a 1:4 medically directed anesthesia care team approach), the expansion of this independent CRNA scope provides a cheaper alternative for healthcare institutions and serves to politically contest ANs' incentives.

AAs' and the AAAA's political incentives. During the 1960s, ANs were able to invent and bring into fruition the AA profession. As conveyed by the ASA (2017), AAs were created as a new profession to help combat the then shortage of ANs in the US. Since the creation of the AA profession, an additional type of anesthesia provider now functions as a direct competitor with the nursing anesthesia profession. Unlike CRNAs who can work independently from an AN, AA's are mandated (i.e., licensed or delegated) to work within an anesthesia care team and can only perform anesthesia care services under the direction of an AN (AAAA, n.d.-a), which aligns the AAAA's and AAs' political interests with ANs. Beyond altruism, this tactic by the ASA was instrumental in shaping the anesthesia industry. It served as an innovative approach to

the nursing anesthesia profession by providing an alternative provider tethered to ANs' interests. The AA profession is restricted and bound to ANs in practice modality. CRNAs view AAs as a threat to their profession and a challenge to the AANAs' and CRNAs' incentives. CRNAs and the AANA have sought modifications, restrictions, and confinements to the AA profession since its inception. Table A2 in Appendix A also depicts the payment distribution for AAs' services.

Population

Professional organizations working to advance their professions, privatized CE companies, hospital and other health related organizations, anesthesia professionals seeking CE, and various organizations outside of the CE market choosing to reach anesthesia professionals broadly encompass the various groups within the anesthesia CE marketplace. Strategic considerations for each group are reflected within the amalgamations and syntheses of the literature. The anesthesia CE marketplace is made up of a demand and supply side of the market. Anesthesia professionals seeking anesthesia CE and guided by their profession's CE mandates serve as the primary prong within the demand side of the market. Specifically, the demanders of anesthesia CE are ANs, CRNAs, and AAs continuously seeking CE offerings based on a multitude of preferences (i.e., content, format, methodology, quantity of educational hours, pricing, brand recognition, and successful marketing strategies of CE providers). Anesthesia CE providers serve as the primary prong within the supply side of the market. The suppliers of anesthesia CE are the national and state societies, associations, and academies of ANs, CRNAs, and AAs respectively. Organizations outside of the CE marketplace, privatized anesthesia CE companies, hospitals who provide anesthesia CE, and other healthcare delivery organizations who provide CE for anesthesia professionals in compliance with the profession-specific CE requirements also serve on the suppliers' side of the anesthesia CE marketplace.

ANs, CRNAs, and AAs actively practicing in the US are the demanders of anesthesia CE and are mandated to profession-specific CE requirements. CE providers are also bound to these profession-specific CE requirements because their CE offerings need to fulfill the CE requirements of the targeted anesthesia professions and must be appropriately accredited. Multiple attempts were made to obtain complete listings of approved CE providers from the anesthesia professional organizations with none willing and/or able to furnish the information. Speculatively, it may be that this content is proprietary, or the information serves a marketing competitive advantage for the professional organizations. Perhaps the correct people in the organizations were never reached. Emails, telephone messages, and telephone conversations from February 2019 to September 2019 with the professional organizations' CE departments, leadership personnel of the professional organizations, and leadership personnel of the certifying bodies for ANs, CRNAs, and AAs (i.e., the ABA, the National Board of Certification and Recertification for Nurse Anesthetists [NBCRNA], and the National Commission for Certification of Anesthesiologist Assistants [NCCAA]) yielded no results in obtaining a complete profession-specific listing of approved and accredited CE providers. Detailing the CE mandates for anesthesia professionals and accreditation requirements for CE providers scopes the CE provider prong of the marketplace and answers the following question: What are the profession-specific CE and accreditation requirements? The question not able to be answered within this study is: Who are all of the anesthesia CE providers? This information is important to the marketing considerations of a potentially successful anesthesia CE platform and marketing strategies would need to account for this lack of information.

ANs: Anesthesia profession-specific CE and accreditation requirements. The ABA is the certifying body for ANs who wish to obtain (i.e., not mandated to attain) or maintain board

certification, utilizes a web-based platform relevant and personalized to help diplomates with ongoing self-assessments of their knowledge, and addresses knowledge gaps to improve clinical practice (ABA, n.d.-a; ABA, n.d.-b). This web-based platform is called Maintenance of Certification in Anesthesiology program 2.0 (MOCA 2.0), encompasses four parts with fees, and includes mandates by year five and ten within the ten-year recertification cycle (ABA, n.d.-a). All diplomates with current certificates in anesthesiology and/or in anesthesiology subspecialties can participate in MOCA 2.0, and they must meet the following requirements: hold an active and unrestricted license to practice medicine in at least one jurisdiction of the US or Canada, complete the Continuing Medical Education (CME) requirement of 250 Category one CMEs of which 20 must be ABA-approved Patient Safety CMEs, complete the MOCA Minute (i.e., an interactive learning tool with ongoing assessment of knowledge, judgment, and skills) where diplomates must answer 30 questions per calendar quarter, complete and document quality improvement activities (i.e., 25 points in years one to five and 25 points in years six to ten for a total of 50 points per 10-year cycle), perform an attestation of clinical activities for each subspecialty certification, and pay the annual fee for the MOCA 2.0 program for the first and additional subspecialty certificates maintained (ABA, n.d.-a; ABA, n.d.-e; ABA, n.d.-f). In defining Category one CME's for ANs, the ABA will only grant full credit from CE sponsors approved by the Accreditation Council for Continuing Medical Education, the American Medical Association's Physician Recognition Award Program, and activities approved as Category 1-A by the American Osteopathic Association (ABA, n.d.-c). Appendix B depicts the MOCA 2.0 quality improvement activities that are approved by the ABA.

CRNAs: Anesthesia profession-specific CE and accreditation requirements. The NBCRNA is responsible for the development and implementation of credentialing programs for

CRNAs, fosters lifelong learning to help maintain a current body of knowledge for CRNAs, and promotes patient safety (NBCRNA, n.d.-a; NBCRNA, n.d.-b). The NBCRNA dictates the requirements for recertification and ongoing CE requirements but leaves the state boards of nursing or their regulatory equivalents and facility-specific credentialing bodies to determine practice requirements (i.e., minimum practice hours and the determination of active anesthesia practice as either clinical, educational, research-based, and/or administrative in nature) for CRNAs (NBCRNA, n.d.-c). The NBCRNA's ongoing recertification program is called the Continued Professional Certification [CPC] Program and encompasses five parts with fees, includes check-ins every two years, and includes additional mandates by year four and eight within the eight-year recertification cycle (NBCRNA, n.d.-b). All CRNAs who wish to practice are required to participate in the CPC Program, and they must comply with the following requirements: meet the practice and licensure requirements by state boards of nursing or other regulatory equivalents and facility-specific credentialing bodies, complete 60 Class A CE credits (i.e., CE credits that are prior approved by the AANA, include some type of assessment, and are related to the practice of nursing anesthesia) every four years within the eight-year recertification cycle, complete 40 Class B CE credits every four years within the eight-year recertification cycle, complete four core modules (i.e., CE programs that focus on the four core domains of anesthesia practice applicable to all CRNAs: airway management, applied clinical pharmacology, human physiology and pathophysiology, and anesthesia equipment and technology) every four years within the eight-year recertification cycle, complete a CPC assessment (i.e., 150 question performance standard assessment in the four core domains of anesthesia practice) within the eight-year recertification cycle, and perform the 2-year Check-in (i.e., validation of state licensure, confirmation of continuing practice, updating contact

information, reviewing progress towards CPC Program compliance, planning for the next two years, and paying the CPC fee) every two years within the eight-year recertification cycle (NBCRNA, n.d.-b; NBCRNA, n.d.-c; NBCRNA, 2018). Appendix C depicts the NBCRNA's Class B credit activities and corresponding credits.

AAs: Anesthesia profession-specific CE and accreditation requirements. Accredited AA program graduates may (i.e., are not mandated in all eligible practice locations across the US) take a national certification exam administered by the NCCAA (Erickson, 2017). The NCCAA ensures the public that AAs possess the knowledge and its application to the duties of practicing as a certified AA, and they oversee the certification and recertification process for AAs in the US (i.e., the initial certifying examination, ongoing CME oversight, and interval examinations for continued demonstration of qualifications; NCCAA, n.d.-b). The NCCAA's recertification process entails AAs' completion of 40 hours of CME every two years, registering the CME activities with the NCCAA, passing the Continuing Demonstration of Qualification Exam every six years, and paying the corresponding fees (AAAA, n.d.-a). NCCAA's approved CME credits are from the following organizations: the American Medical Association, certificate credits given to ASA CME attendees, the American Association of Physician Assistants, and the Accreditation Council for Continuing Medical Education (NCCAA, n.d.-a).

Study Need and Problem Statement

This study was conducted as an integrative review of the literature, utilized inductive content analysis as the organizational method for the qualitative data, and derived at conceptual frameworks from amalgamations and syntheses of the literature. The study assessed the value generation created from a unified potential platform that promotes a marketing reach and aids anesthesia CE providers in connecting with anesthesia professionals (i.e., the value of suppliers

connecting with demanders; Fu, Wang, & Zhao, 2017). The anesthesia CE industry is fragmented in how it currently reaches anesthesia professionals. The professional organizations reach their respective members in order to portray CE offerings but do so without an inter-professional reach. The aforementioned political angst as well as profession-specific stewardship are the primary speculative drivers of this divided inter-professional reach. The national and state professional societies, associations, and academies have a specific duty to their respective professions (i.e., stewardship) and frames this division.

Privatized CE companies, hospitals, and other healthcare delivery organizations promote anesthesia CE offerings individualized and independently of one another. Their offerings often cross professions, but their limitations are based on what is offered within one sole organization. These fragmented approaches serve as the only methods available to anesthesia professionals to currently explore the CE marketplace. Regarding how suppliers reach the demanders of anesthesia CE, it has not been explicitly and directly conveyed in the literature, but it is common practice within the industry that national and state professional organizations, privatized CE companies, hospitals, and other healthcare delivery organizations providing anesthesia CE offerings reach anesthesia professionals through direct mailings, profession-specific websites, advertisements within professional publications, organization-specific websites, and anesthesia-specific social media forums diverged by various dimensional aspects within the industry. These marketing efforts frame the lack of unification within the anesthesia CE marketplace.

Research Questions

Platforms function to bring people and/or businesses together by enriching the social and commercial exchanges of goods, services, and information (Oxera, 2015). This study proposes that value can be generated from the unification of the anesthesia CE industry into a sustainable

unified potential platform using platform processes. The research was guided by the following two questions:

1. What are the concepts, dimensions, and indicators from the differing literary sources that portray and structure platform successes?
2. What are the potential impacts and implications for the application of the concepts, dimensions, and indicators onto the anesthesia CE industry and beyond?

For the purposes of this study, concept is the mental image or perception of an idea or object, dimension is an aspect of a concept typically measured by specific variables, and an indicator is the measure or degree of dimensional characteristics (Shi, 2019). The analyzed concepts, dimensions, and indicators of platform successes and their applications potentially facilitate anesthesia professionals' CE explorations, CE providers' marketing efforts, and contextualize the overarching impacts and implications onto the anesthesia CE industry and beyond. Context was also considered from the perspectives of the varied platform user sets, the key platform concepts, and the strategic platform framework.

Chapter 2: Literature Review

Defining Platforms

Online platforms use information and communication technologies to enable interactions between users, collect and use data about those interactions, establish network effects, drive innovations, and play a vital role in digital economies and societies (Organisation for Economic Co-operation and Development [OECD], 2019). The literature defined online platforms by many aspects. Their capabilities, benefits, features, and what their usage generates for its users are some of the characteristics found within the literature. An internet search for the term *online platform* using Yahoo and Google also generated multiple varied definitions. Additionally, it was used to describe services like “marketplaces, search engines, social media, creative content outlets, app stores, communications services, payment systems, services comprising the so-called ‘collaborative’ or ‘gig’ economy, and much more” (OECD, 2019, p. 20). Not only were the definitions wide-ranging across mediums, but different groups of people were noted to have different concepts of platforms. Software engineers often referred to a platform as a common set of technologies or interfaces available to a broad base of users to build things on it and with it (i.e., operating systems), merchants regularly referred to a platform as an environment in which products or services are bought or sold (i.e., e-commerce), and many jurisdictions provided different legal descriptions within the context of regulatory interventions (OECD, 2019). Even this study refers to platforms and online platforms synonymously. For the purposes of this endeavor, an online platform is a digital interface that facilitates communications “between two or more distinct but interdependent sets of users”, brings them together, and enables beneficial interactions for the users as well as the online platform itself (OECD, 2019, p. 20). This two or more distinct and interdependent sets of users refers to a two-sided or multisided market

respectively. A multisided platform market has distinct sets of users, has at least one set of users benefit from having their demands coordinated and met with a different set of users, and acts as an intermediary (i.e., interface) in facilitating interactions for demands more efficiently compared to bilateral interactions with the differing sets of users (Evans, 2003; OECD, 2019). The terms *demand*, *demanders*, *supply*, and *suppliers* are primarily used within this research endeavor (i.e., instead of buyers and sellers respectively). Other pieces of literature referred to these concepts in terms signifying that one or more sets of users are consumers or use the interface solely for commerce. Consider a major company maintaining a profile on a social media site like Facebook to interact with the public (OECD, 2019). This interaction with the public, through Facebook as the interface for multiple user sets, is a demand for publicity and not necessarily and directly commerce. It relays business information for future transactions. *Demand*, *demanders*, *supply*, and *suppliers* are primarily used to avoid limiting the type of interactions that can be had with online platforms. OECD (2019) also depicted the importance of using the term *users* broadly to “not just individual consumers, but also employees, governments, and businesses both large and small, which may be acting as” suppliers, demanders, or employers (p. 21).

In one regard, the potential anesthesia CE platform serves as a multisided market because of the eventual multiple stakeholders involved and the subsequent strategies required for each user set. An argument can also be made that on a broad and conceptual scale, or at least initially, the demanders and suppliers of anesthesia CE make up only two primary prongs within a market and thus can also be described as a two-sided marketplace. The evolutionary phases of platforms impact a platform’s strategic applications regarding a two-sided versus a multisided market strategy. Strategic considerations within this study account for the various user sets that

accompany growth and maturation. For the purposes of this endeavor, we portrayed the initial potential anesthesia CE platform as a two-sided market. Depictions were made with the understanding that the anesthesia CE industry encompasses demanders and suppliers but also encompasses varied user sets within each market prong (i.e., supply and demand side of the market) during different evolutionary phases. This requires distinct strategic considerations. The multisided market considerations help to account for the future strategic approaches regarding the varied user sets within the supply and demand sides of the anesthesia CE marketplace.

Strategic Platform Framework

The strategic framework of platforms sets the groundwork for the aspects explored within this study. Broadly, platform strategies focus on openness, pricing, innovative products and services, advertising, and quality (Fu et al., 2017; Rysman, 2009). These strategies contextualize the many concepts, dimensions, and indicators explored within this endeavor.

Openness. Rysman (2009) referred to openness as having the following two strategic issues: A potential platform has to decide whether to be one-sided, two-sided, or a multisided platform, as well as how to relate to competitors within the marketplace (i.e., incompatibility, compatibility, or integration). The multisided market depictions within the literature help to convey the considerations needed regarding the varied user sets within one side of the market and the interplay of user sets within and across the sides of the market, thus allowing for strategies to emerge. An important concept of multisided platforms is how the value to one set of users increases as the quantity of users on the other prong increases (Hagiu, 2014). This value is termed as the network effect and serves as the driving force of platforms (Fu et al., 2017). The network effect stems from the concept of openness and directly and indirectly impacts other strategic frameworks within the platform. The impact of openness onto the varied user sets; the

ability of the platform owner to strategically manage the relationships of the multisided marketplace; and the impact onto pricing, innovative products and services, advertising, and quality are all considerations that stem from the openness decisions (Chesbrough, 2017; Fu et al., 2017; Rysman, 2009). A successful platform must simultaneously consider these aspects as firms plot their business approaches. The evolutionary phases of platforms, as a strategic consideration, are also important. Some platforms begin with a one-sided market interaction, then switch to a two-sided or multisided market approach by providing value with complementary goods or services, and do so to overcome the chicken-or-the-egg problem (i.e., no one side of the market will join without the other/s) and create platform utility (Chesbrough, 2017; Hagiu, 2014; Rysman, 2009).

The second openness strategic issue for platform owners are the considerations for inclusiveness with competitors, which is akin to horizontal integrative relationships (Rysman, 2009). This strategy is not always desired by platform owners. If one user set uses solely one platform at a time, platforms can charge monopolistic prices to the opposing prong for access (Rysman, 2009). What determines a winner-take-all approach, coexistence, or failure varies amongst different openness considerations. Access and entry across multiple platforms with easily managed technological standards, offering complimentary goods to different user sets, and competitively differentiated standards yield benefits for platform firms (Rysman, 2009). This differentiation is important for platforms to thrive within the marketplace. The “lack of opportunities for differentiation is a common explanation for the failure of many websites that were meant to facilitate business-to-business sales” (Rysman, 2009, p. 134). How platforms decide to engage competitors and apply competitive tactics influence their ability to thrive or fail.

Pricing. The primarily two-sided market within the anesthesia CE marketplace (i.e., suppliers and demanders of anesthesia CE) and the unusual strategic pricing considerations impact multiple aspects of the potential platform. In any market,

prices typically fall as the price elasticity of demand increases, but in a two-sided market the effect can be even larger: The low price on one side not only attracts elastic consumers on that side but also, as a result, leads to higher prices or more participation on the other side. The increased value extracted from the other side magnifies the value of having consumers on the first side, which leads to a yet bigger price decrease and quantity increase for the side that experiences the increase in elasticity. (Rysman, 2009, p. 130)

Price anomalies can be seen with two-sided markets in several different scenarios. Two-sided markets can have pricing below marginal cost or negative pricing, and competitive markets serve to increase pricing irregularities within the marketplace (Rysman, 2009). This competition is seen for good cause. Platforms strongly compete for one user set utilizing a one-sided market approach to charge monopolistic pricing to the opposing user set that is trying to reach them (Rysman, 2009). Weyl (2010) conveyed the following key platform features and their impact on price: Platforms are a multi-product firm (i.e., a platform provides different services to suppliers and demanders within the marketplace and they can be charged differently), platforms generate cross network effects (i.e., a user set benefits from participation dependent on the magnitude of user set participation from the other side of the market and differs with varying market conditions), and platforms have bilateral market power (i.e., platforms act as price setters with suppliers and demanders). This bilateral market power is often wielded to generate price discrimination. The manipulation of prices for platform participation and usage from one user set

allows a platform to acquire more of the surplus on the side of the market with price discrimination (i.e., increases the value obtained on one side with increased participation and usage from initially lowered prices and eventually fosters lower prices on the other side of the market which becomes more valuable itself; Rysman, 2009). Primarily two-sided markets also foster a different type of price discrimination. Although not an online entity at the time, consider supermarkets resisting accepting credit card payments, but potentially served as desirable clients to credit card businesses because of their transaction volume and because consistent usage would foster usage by consumers in other industries (Rysman, 2009). Price discrimination offered a solution. Supermarkets were offered low credit card processing fees, yielded low banking fees, and fostered the commonplace implementation of consumer credit card usage within supermarkets (Rysman, 2009). Also, pricing strategies need to be considered from the evolutionary phase of a platform, its products, and services. Penetration pricing is also a pricing strategy and is when an intermediary (i.e., interface) reduces the price of a product or service early on in the product life cycle and increases the price after establishing a successful base or peripheral products (Rysman, 2009). Pricing strategies, in harmony with a given platform's business model, help solve the chicken-or-the-egg problem (Kim & Yoo, 2019).

Innovation. Technology is central to online platforms. It serves as the interface in which suppliers and demanders interact. As numerous businesses in two-sided markets depend on new technologies, it is a main concern for such platform owners to invest in technological innovations (Rysman, 2009). Direct technological improvements to the platform are driven by the strategic platform framework. Organizations make product and service offering decisions in response to technological and market forces as well as changes to the business models (Evans & Webster, 2007).

This study sought to depict the potential value of a unified anesthesia CE resource. This endeavor analyzed how to cultivate a sustainable unified CE platform to potentially improve how anesthesia professionals search and explore the CE offerings available within the marketplace and to potentially improve how anesthesia CE providers reach anesthesia professionals.

Sawhney, Wolcott, and Arroniz (2006) defined business innovation as the “creation of substantial new value for customers and the firm by creatively changing one or more dimensions of the business system” (p. 76). They also depicted the following important three characterizations: Innovation is only relevant when value is created for customers (i.e., customers decide the value of innovation by whether they are willing to pay for the product or service), any dimensional aspect of a business system can be the birthplace of innovation, and successful innovation requires the prudent consideration of all aspects of a given business (Sawhney et al., 2006). The question presented from the aforementioned depiction is: What are the dimensional aspects of a business? Figure 1 shows the broad dimensional aspects of innovation “anchored by the offerings a company creates, the customers it serves, the processes it employs[,] and the points of presence it uses to take its offerings to market” (Sawhney et al., 2006, p. 76-77). The broad overview of the dimensions of business innovation serves as identification of the dimensional aspects.

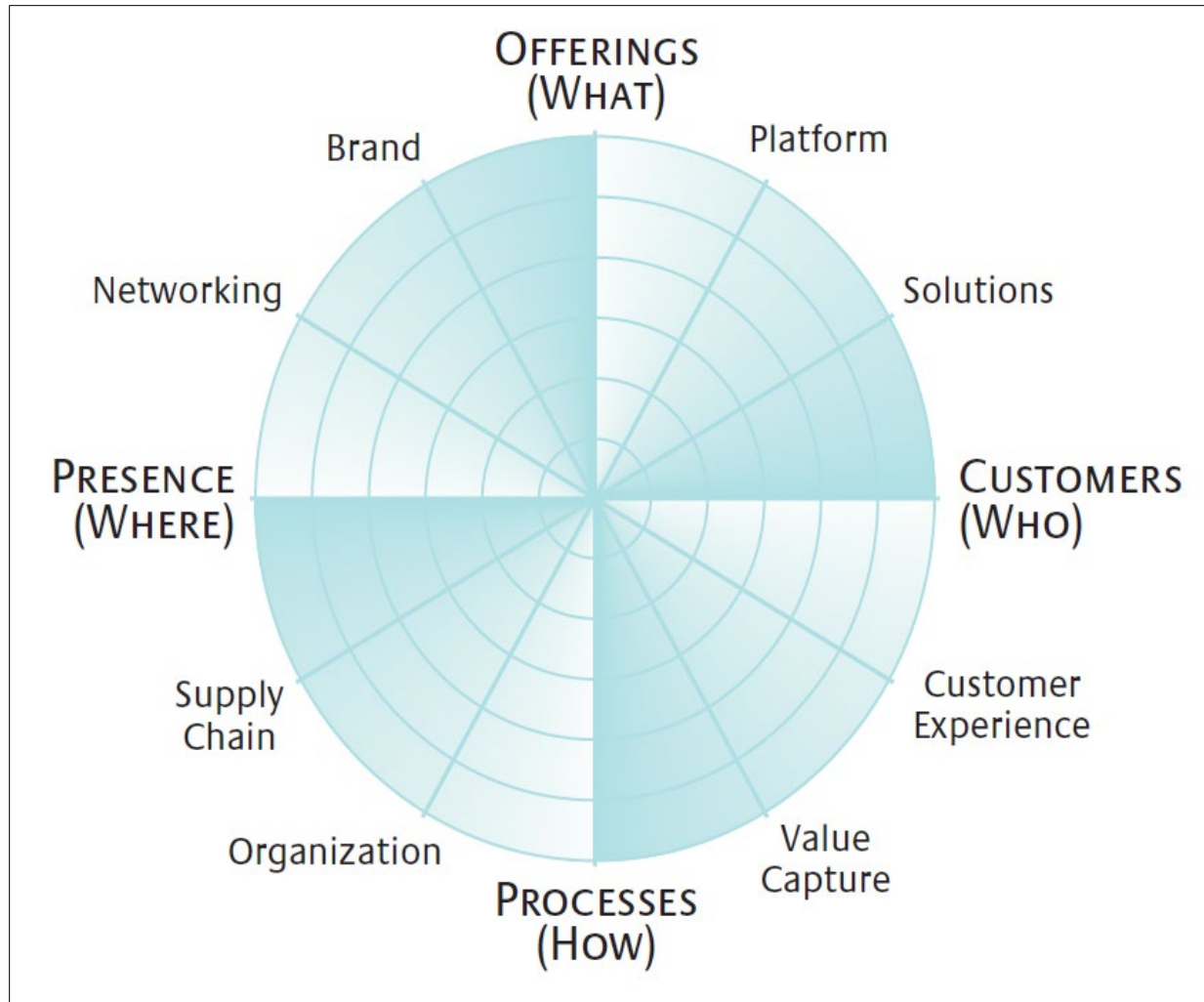


Figure 1. Broad Overview of the Twelve Dimensions of a Business to Drive Innovation. From “The 12 Different Ways for Companies to Innovate,” by M. Sawhney, R. C. Wolcott, and I. Arroniz, 2006, *MIT Sloan Management Review*, 47(3), p. 77. Copyright 2006 by the Massachusetts Institute of Technology.

Figure 2 serves to define and give examples of each of these dimensional aspects. The utilization of the dimensional aspects of business innovation can aid organizations in determining how it compares to competitors, in identifying aspects to focus on, and in prioritizing their efforts (Sawhney et al., 2016). These dimensional aspects were considered when evaluating platform facets. They were considered in context with the other platform strategies. According to Evans and Webster (2007), the most profitable service and product lines balance the benefits and costs for consumers and businesses.

Dimension	Definition	Examples
Offerings	Develop innovative new products or services.	<ul style="list-style-type: none"> • Gillette Mach3Turbo razor • Apple iPod music player and iTunes music service
Platform	Use common components or building blocks to create derivative offerings.	<ul style="list-style-type: none"> • General Motors OnStar telematics platform • Disney animated movies
Solutions	Create integrated and customized offerings that solve end-to-end customer problems.	<ul style="list-style-type: none"> • UPS logistics services Supply Chain Solutions • DuPont Building Innovations for construction
Customers	Discover unmet customer needs or identify underserved customer segments.	<ul style="list-style-type: none"> • Enterprise Rent-A-Car focus on replacement car renters • Green Mountain Energy focus on "green power"
Customer Experience	Redesign customer interactions across all touch points and all moments of contact.	<ul style="list-style-type: none"> • Washington Mutual Occasio retail banking concept • Cabela's "store as entertainment experience" concept
Value Capture	Redefine how company gets paid or create innovative new revenue streams.	<ul style="list-style-type: none"> • Google paid search • Blockbuster revenue-sharing with movie distributors
Processes	Redesign core operating processes to improve efficiency and effectiveness.	<ul style="list-style-type: none"> • Toyota Production System for operations • General Electric Design for Six Sigma (DFSS)
Organization	Change form, function or activity scope of the firm.	<ul style="list-style-type: none"> • Cisco partner-centric networked virtual organization • Procter & Gamble front-back hybrid organization for customer focus
Supply Chain	Think differently about sourcing and fulfillment.	<ul style="list-style-type: none"> • Moen ProjectNet for collaborative design with suppliers • General Motors Celta use of integrated supply and online sales
Presence	Create new distribution channels or innovative points of presence, including the places where offerings can be bought or used by customers.	<ul style="list-style-type: none"> • Starbucks music CD sales in coffee stores • Diebold RemoteTeller System for banking
Networking	Create network-centric intelligent and integrated offerings.	<ul style="list-style-type: none"> • Otis Remote Elevator Monitoring service • Department of Defense Network Centric Warfare
Brand	Leverage a brand into new domains.	<ul style="list-style-type: none"> • Virgin Group "branded venture capital" • Yahoo! as a lifestyle brand

Figure 2. Definitions and Examples of the Twelve Dimensions of Business Innovation. From "The 12 Different Ways for Companies to Innovate," by M. Sawhney, R. C. Wolcott, and I. Arroniz, 2006, *MIT Sloan Management Review*, 47(3), p. 78. Copyright 2006 by the Massachusetts Institute of Technology.

As applied to the potential anesthesia CE platform, this balance was considered when drawing from the strategic platform framework, when assessing the dimensions of business innovation for a new technological interface, and when analyzing the various costs and benefits for suppliers and demanders of the anesthesia CE marketplace.

Advertising. Advertising within a two-sided market has different effects within the marketplace compared to a typical one-sided market approach. With a two-sided market, advertising "on one side of the market raises participation and usage on that side, which raises demand on the other side, and so advertising on one side can lead to higher prices on the other"

(Rysman, 2009, p. 135). This interdependent relationship seems to repeat throughout the literature yet tends to yield different results based on the types of advertising strategies implemented. Persuasive advertising increases the overall utility of a given product and informative advertising serves to inform consumers about a given product or its features (Rysman, 2009). Strategic considerations vary based on the type of advertising and on the effect desired. Persuasive advertising “most often increases the mark-up a firm may charge by raising utility, whereas informative advertising can reduce the mark-up by attracting relatively low-demand consumers” (Rysman, 2009, p. 136). Persuasive and informative advertising also tend to impact the outcomes to price. Persuasive advertising “on one side can lead to lower prices on the other side, whereas informative advertising on one side leads to higher prices on the other” (Rysman, 2009, p. 136). As advertising strategies are contemplated within the platform research endeavor, the interconnectedness of the strategic framework must also be contemplated given a platform’s evolutionary phase. This study sought this interconnected approach as part of the review of the literature in order to assess the applications within an anesthesia CE platform.

Quality. This strategy focuses on more than just the quality of the platform itself. It focuses on the quality of its users. A platform needs to be concerned not only with its own quality, but also that of the suppliers who seek demanders across the interface (Rysman, 2009). From the perspective of an anesthesia CE platform, applied strategic considerations are centered on a quality platform, quality suppliers, and quality demanders of anesthesia CE.

User Sets Within the Potential Platform

Identifying the specific user sets within the anesthesia CE market guided strategic considerations and tailored their implementations within the potential platform. Figure 3 shows the considered interplays between the user sets, the supply, and the demand side of the market.

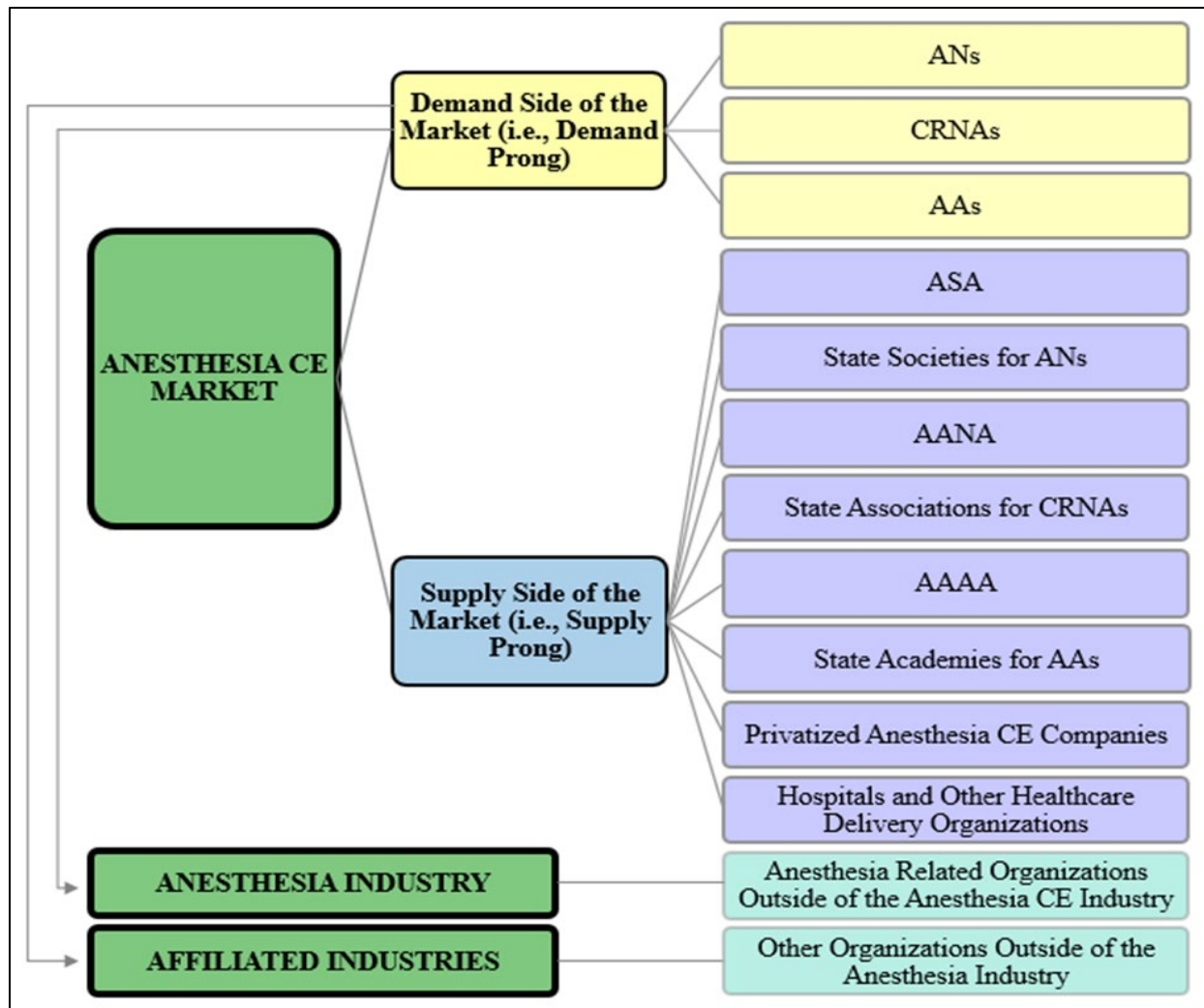


Figure 3. Demand and Supply User Sets of the Anesthesia CE Marketplace.

All user sets were considered within the context of the key concepts explored, the strategic platform framework, and specific tactical implementation strategies for a successful platform. The differences between each user set were explored and maneuvered for potential optimal platform execution.

The demand side of the market has ANs, CRNAs, and AAs as the demanders of anesthesia CE. For the purposes of this study, each profession was classified as a unique user set as considerations for the execution of specific tactics from the strategic platform framework accounted for the quantity of providers within each profession, their political incentives, and

their CE mandates. The demand side of the market was also considered as the chief driver of non-CE related anesthesia organizations (e.g., anesthesia staffing companies, anesthesia product companies, pharmaceutical companies, etc.) and affiliated organizations as the growth and maturation of the potential platform was considered. Affiliated organizations within this study are organizations outside of the anesthesia industry wishing to reach anesthesia professionals for other affiliated services considered potentially applicable to the demand side of the market as the target audience (e.g. travelling accommodations, cardiopulmonary resuscitation course offerings, etc.). This aspect may best be categorized as a multisided market approach. These organizations do not directly offer anesthesia CE, but the capitalization of anesthesia providers as the audience from the potential utility of an anesthesia CE platform and the marketing reach of advertisers was considered as a potential enticement for affiliated organizations. Not only were platform strategies explored with the demand side of the market driving these advertising efforts, but particular attention was given to the successful evolutionary transition of platforms. The goal was to assess the direct impact of the demanders of anesthesia CE who drive the potential desired marketing reach of the anesthesia industry and the affiliated industries.

The supply side of the market consists of multiple user sets. Their workings within the market aided in contextualizing the functions of the key concepts explored and the various applicable strategies. The professional organizations and their state component organizations all vary in history, size, impact, and efficacy on wielding policy changes within the anesthesia industry, as well as economic abilities. They also vary in their approach to marketing their own CE course offerings to anesthesia professionals. Strategies were contemplated accounting for these attributes and the key concepts explored. Privatized anesthesia CE companies and hospital and other healthcare delivery organizations vary from professional organizations in their goals

and quantity of CE offerings; thus, particular attention was given to market segmentation within these various suppliers of anesthesia CE. In conceptually structuring the platform, much attention was given to segmentation. Pre-research thoughts centered on solving the chicken-or-the-egg problem by initially incentivizing CE offerings through market segmentation prior to engaging the demand side of the market.

Additional focus on the demand and supply sides of the anesthesia CE market centered around the concept of first-to-market. The anesthesia CE market is fragmented. Multiple CE providers supply anesthesia CE in a disconnected fashion and with no unified resource. This study paid much attention to the first-to-market concept, the suppliers of anesthesia CE and their role within a platform economy, the impact of a first-to-market anesthesia CE platform, and sought to answer the following questions:

1. Do any of the anesthesia CE suppliers vaguely operate a platform?
2. Could the suppliers of anesthesia CE be enlarged by utilizing a platform?
3. Could the suppliers of anesthesia CE be supplanted by an outside entity who provides an online venue that successfully deploys a unified anesthesia CE platform?

This study sought to answer the last two supplier of anesthesia CE questions after review of the literature. This study sought to thoroughly answer the last two questions by addressing *how*. This *how* was answered by the explorations of the key concepts and the applicability of various broad strategies from the strategic platform framework, thus assessing the impact on the anesthesia CE marketplace.

Platforms Within the Anesthesia Industry

Anesthesia CE platforms. Multiple privatized anesthesia CE companies, hospitals, and other healthcare delivery organizations offer an online medium in which anesthesia professionals

can explore their organization's CE offerings. Privatized anesthesia CE companies, hospitals, and other healthcare delivery organizations utilize a one-sided market strategy and use an online medium to reach CE demanders. They use their online presence to market their CE offerings. An essential component of an online platform, as depicted by this study, is meaningful interactions between two or more distinct but interdependent sets of users (OECD, 2019). This one-sided market approach does not meet this study's definition and requirement for classification as an online platform. No known anesthesia CE platform exists from privatized anesthesia companies, hospitals, and other healthcare delivery organizations. The only known anesthesia CE platform is from the ASA and only serves ANs. It is called the Calendar of Events. Figure D1 in Appendix D depicts a screenshot of the ASA's CE platform.

The AANA has a product also called the Calendar of Events. Figure D2 in Appendix D depicts this product. This product is a printed section within the *AANA Journal* and the *AANA NewsBulletin*, includes a synopsis of the CE offerings paid by advertisers to post, and is also posted as a PDF on the AANA's website. This product is not considered an online platform (i.e., it does not enable beneficial interactions for the users as well as the online platform itself; OECD, 2019) but does serve in a static capacity to portray the posted CE offerings. Also, it too only serves half of the anesthesia professional community.

The anesthesia industry and platforms. Anesthesia online platforms are also bountiful throughout social media mediums. These social media sites are stratified by anesthesia professions, anesthesia topics, parenting advice, financial and investment advice, and an array of other topics. These sites typically have the desired new member verify credentials prior to being accepted into these closed-member social media groups. These platforms serve as social platforms. The only known and broadly utilized anesthesia related online platform that services

all anesthesia professions and utilizes a multisided market approach between suppliers and demanders is Gaswork.com. Although not explicitly expressed within the literature, it is well-known within the industry that Gaswork.com is a highly utilized employment website for ANs, CRNAs, and AAs. Regarding Gaswork.com, anesthesia professionals act as the demanders within the market. Anesthesia employment agencies, hospitals and other healthcare delivery organizations, and recruiters utilize the site to post anesthesia employment opportunities based on various search criteria specific to the anesthesia industry. The structural similarities between suppliers, demanders, and the value proposition for anesthesia professionals are closely related and Gaswork.com serves as a distinct example of a successful anesthesia online platform. Not only was Gaswork.com considered as an industry specific platform when evaluating platform taxonomies and the platform strategies needed for successful implementations, but this study also considered how an anesthesia CE platform fits within the broad online marketplace.

Figure 4 shows some of the common successful online platforms and one classification strategy reviewed within this endeavor. The figure shows a classification system for online platforms that fostered strategic considerations within the research endeavor. It also shows some of the more successful platforms on the market. The possibility of utilizing one or multiple named platforms as key concepts (e.g., Google, Facebook, etc.) was also considered as this may have provided specific and detailed evaluations regarding successful platforms on a large scale. Although contemplated, this fell out of the scope of this research endeavor. Named platforms were utilized to contextualize this endeavor. They were utilized as compliments within this research (i.e., this is not a research study specifically on Google, Facebook, Uber, etc.). Regarding existing platforms, this research endeavor focused on analyzing concepts and strategies pertinent within the broad online marketplace, evaluated the classification system of

platforms to assess strategies relevant to the type of platform that the potential anesthesia CE platform could be, and considered Gaswork.com for industry specific applications.

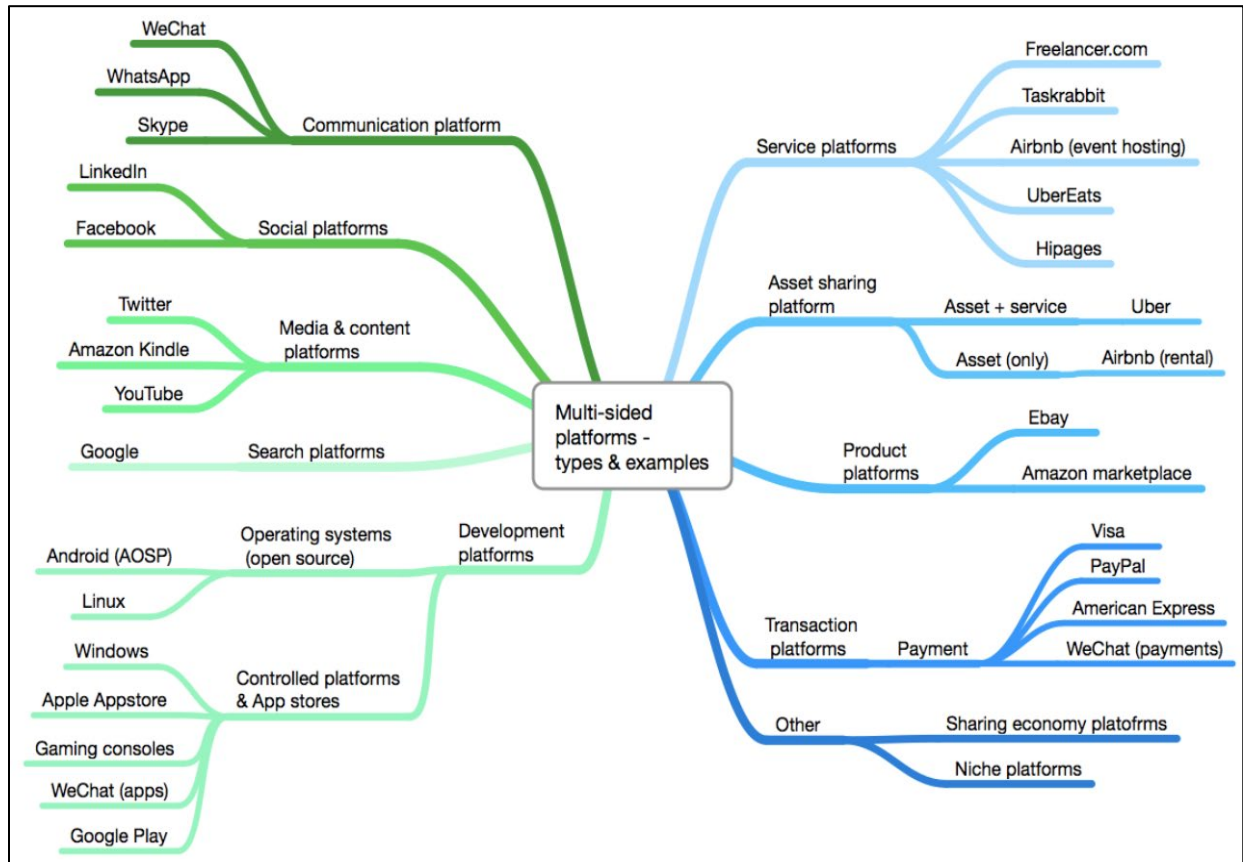


Figure 4. A Sample of Types and Examples of Platforms. From “The Complete Guide to the Revolutionary Platform Business Model,” by M. Uenlue, 2017 (<https://www.innovationtactics.com/platform-business-model-complete-guide/>). In the public domain.

Chapter 3: Methodology

Research Method

This qualitative study was conducted utilizing an integrative review of the literature. An integrative literature review “is a form of research that reviews, critiques, and synthesizes representative literature on a topic in an integrated way such that new frameworks and perspectives on the topic are generated” (Torraco, 2005, p. 356). It is broadly inclusive of experimental and non-experimental research to enhance the understanding of a phenomenon (Whittemore & Knafl, 2005) This study reviewed the literature on platforms and its various attributes and amalgamated new frameworks and perspectives relevant to the anesthesia CE marketplace. The review examined and extrapolated concepts, theories, and models of platform processes. As it pertains to the problem statement, the value assessment onto the anesthesia CE marketplace was derived from evaluating the potential applicability of the findings into one sustainable platform utilizing platform processes.

Sample Selection

An integrative literature review “addresses the need for a review, critique, and the potential reconceptualization of the expanding and more diversified knowledge base of the topic as it continues to develop” (Torraco, 2005, p. 357). This study addressed the need for a review of the literature by identifying strategies utilized by platform owners and applying these strategies to the aspects and facets of platforms deemed important by this research (i.e. the key concepts of platforms). The network effect, segmentation, first to market, best of breed, search costs, transaction costs, minimally viable product, evolutionary phases of platforms, platform theory, platform business model, platform economy, and types of platforms were the key concepts explored. Conceptually, these platform attributes (i.e., facets) were investigated to assess their fit and potentially added depth as reconceptualized platform strategies.

As the wide-ranging aspects and facets of platforms deemed important were explored, they were analyzed with considerations to their function within a strategic platform spectrum. Not only were the various facets examined, but the study aspired to have platform strategies themselves become more apparent, detailed, and contextually grounded regarding applicability within the anesthesia CE marketplace. These amended and potentially applicable anesthesia CE platform strategies are depicted within this study's discussion. All applicable platform strategies were considered with each facet exploration. Further conceptualizations not only took into account the strategic platform framework and the key concepts of platforms, but the perspectives of the varied user sets were also considered with each vetted facet.

During the review of the literature, no research was encountered that integrated comprehensive platform strategic considerations, the various multidimensional key aspects of platforms, and contemplated the strategic perspectives for the users within a marketplace. This study sought to go one step further in contextualizing these conceptualizations within a specific applicable setting and explicated the value generation for the applicable user sets. This endeavor sought to create an understanding of how to strategically model a unified sustainable anesthesia CE platform through syntheses of the literature. This study also pursued conveying value via a CE platform for all user sets.

A hallmark of a good integrative literature review is that it has a methodology that clearly outlines (a) where the literature was found (databases and search engines), (b) when the search was conducted (database contents change frequently), (c) who conducted the search, (d) how the literature was found (keyword combinations), (e) what number of articles appeared from each combination of keywords and the final count of included

articles (data set), and (f) why some articles were chosen for inclusion over others (selection criteria). (Callahan, 2010, p. 301)

This research includes the aforementioned aspects of a high-quality integrative literature review.

Data Collection Instrumentation

This review was conducted with a systematic English-language search of empirical literature, gray literature, and theoretical works published between January 1995 and December 2019. Given the internet boom of the mid to late 1990's (Moncarz, 2002), this review searched publications from 1995 to coincide with the internet's booming growth and the potential ensuing research. Google and Google Scholar were utilized for the initial literature review and accounted for the strategic platform framework and the key concepts to be explored. Google and Google Scholar were not utilized as search engines/databases for the systematic review of the literature. Only applicable content from the initial and preliminary literature review thought to add depth to the study was considered for inclusion from these search engines/databases. Relevant content from the initial Google and Google Scholar inquiries explored during the literature review are included within Table 1 and termed as *Other Databases*. The Scopus database; ProQuest employing the Healthcare Administration database; and EBSCOhost employing the Academic Search Premier, Business Source Premier, and Computer Source databases were utilized for the systematic literature review. These databases were accessed through the Medical University of South Carolina (MUSC) Libraries' database subscriptions. The initial review of the literature was conducted by the author from February 2019 to September 2019. The subsequent systematic review of the literature was conducted by the author from September 2019 to June 2020.

Table 1

Initial Key Concepts, Search Terms, Databases, and Quantity of Results per Database Considered for the Review of the Literature

Key Concepts	Search Terms	Databases and Initial Quantity of Results			
		Scopus	ProQuest (Healthcare Administration Database)	EBSCOhost (Academic Search Premier, Business Source Premier, & Computer Source)	Other Databases (Google & Google Scholar)
Network effect	"network effect" and "indirect" and "direct" and "critical mass"	2	26	0	10
Segmentation	"platform" and "market segmentation" and "demographic" and ("online" or "digital" or "ecommerce" or "e-commerce" or "internet")	1	91	25	2
First to market	"platform" and "reach" and "fit" and "focus" and ("first mover" or "first-mover" or "first to market" or "first-to-market")	0	98	0	2
Best of breed	("best of breed" or "best-of-breed") and ("first mover" or "first-mover" or "first to market" or "first-to-market")	0	20	1	1
Search costs and transaction costs	"platform" and "search cost" and "transaction cost"	3	5	1	0
Minimally viable product	"platform" and "minimally viable product"	0	3	0	0
Evolutionary phases of platforms	("phases of platforms" or "stages of platforms" or "platform phases" or "platform stages") or ("platform lifecycle" or "lifecycle of platform" or "platform life cycle" or "life cycle of platform" or "cycle of platform" or "platform cycle") and "growth"	32	7	27	4
Platform theory	"platform theory"	63	7	23	2
Platform business model	"platform business model"	91	28	28	0
Platform economy	"platform economy"	149	40	106	2
Types of platforms	("types of platforms" or "platform types" or "platform typologies" or "typology of platforms" or "taxonomies of platforms" or "platform taxonomies") and ("online" or "e-commerce" or "ecommerce" or "digital" or "internet")	120	43	38	3

Data Collection Procedure

The process for the systematic review of the literature began with the key concepts of platforms as the first terms searched. This led to thousands of resultant articles to be reviewed and considered. To be more precise and concise, the key platform concepts were explored with a combination of terms that were felt to add depth and applicability to the research efforts. Table 1 depicts the key concepts, the search terms utilized to explore the key platform concepts, and the initial quantity of results within the Scopus, ProQuest (i.e., Healthcare Administration), and EBSCOhost (i.e., Academic Search Premier, Business Source Premier, and Computer Source) databases. As aforementioned, *Other Databases* utilized Google and Google Scholar and only included applicable content from the initial review of the literature thought to add depth to the study. Each database differed in its featured abilities and options to be inclusive and exclusive regarding the search efforts. Scopus was utilized with the key concepts' search terms located within the articles' titles, abstracts, or keywords; the date range was set from 1995 to 2019; included all document types; and included all access types. This served as the initial search approach for each key concept. Once each key concept search resulted, the individual key concept results were further filtered and limited to be inclusive of English-language articles only and exclusive of editorials and letters as the document type. ProQuest was utilized with the key concepts' search terms located anywhere within the article; the date range was set from January 1, 1995 to December 31, 2019; was inclusive of English-language articles only; and excluded advertisements, editorials, editorial cartoons/comics, and letters to the editor. EBSCOhost databases were utilized with the key concepts' search terms not specified as a search field, utilized the Boolean/phrase search mode, had the Boolean/phrase search mode solely applied to equivalent subjects, had the date range set from January 1995 to December 2019, and excluded

editorials and letters as the document type within the Academic Search Premier, Business Source Premier, and Computer Source databases. English-language only articles were considered for the review of the literature. Exclusions from the Scopus, ProQuest, and EBSCOhost databases also comprised sources that were unavailable or not openly and freely attainable through the MUSC Libraries' interlibrary loan program and staff.

The research interests were directed towards content that added understanding to platform processes. Some of the retrieved search results were unrelated to the research or mentioned the key concepts but added very little to the comprehension of the concept at hand. The research interests focused on depth of content, applicability to the strategic platform framework and online platforms as the desired platform medium, and potential relevance to the anesthesia CE marketplace. The review of the literature was conducted utilizing a uniform approach. The review of the literature began with reviewing the resultant titles and abstracts from the databases' searched for each key platform concept explored. The search results were then examined for duplicates and excluded. Next, titles and abstracts deemed unrelated or unsubstantial to the research efforts were excluded. The remaining articles were read in full for inclusion consideration within the study. Unrelated articles or pertinent articles that failed to meet the research interests focused on depth, applicability, and relevance were also excluded. The remaining articles were included within the integrative review. Additional publications from the references of the eligible articles were also reviewed and included if they were in line with the research interests and added additional depth or insights into the topic at hand. This inclusion and exclusion logic criteria were applied to each key platform concept and each key concepts' search results. The details can be found within this study's results section.

Data Analysis

The inclusion data were used to amalgamate a strategic and sustainable platform paradigm for the anesthesia CE marketplace. Content analysis makes replicable and valid inferences from the data, its intended context, and has the goal of providing knowledge and new insights, depicting facts, and serving as a practical guide to action (Elo & Kyngäs, 2008; Krippendorff, 2004). The aim of content analysis,

is to attain a condensed and broad description of the phenomenon, and the outcome of the analysis is concepts or categories describing the phenomenon. Usually the purpose of those concepts or categories is to build up a model, conceptual system, conceptual map[,] or categories. (Elo & Kyngäs, 2008, p. 108)

Content analysis was utilized to identify and understand the meaning of the various pieces of literature reviewed, the critical platform processes, the consequences of the diverse platform strategies and key concepts, and the context for strategic applications (Elo & Kyngäs, 2008). The goal for the analysis was to create a conceptual, practical, and strategic platform paradigm for the anesthesia CE marketplace driven by the insights from the literature.

Elo and Kyngäs (2008) described the process of content analysis as a three-step method. The approach entails preparation, organization of the data, and a resulting model, conceptual map, conceptual system, or categories of emergent themes extrapolated from the literature (Elo & Kyngäs, 2008). Figure 5 details this three-step method and the data analysis approach utilized for this research endeavor.

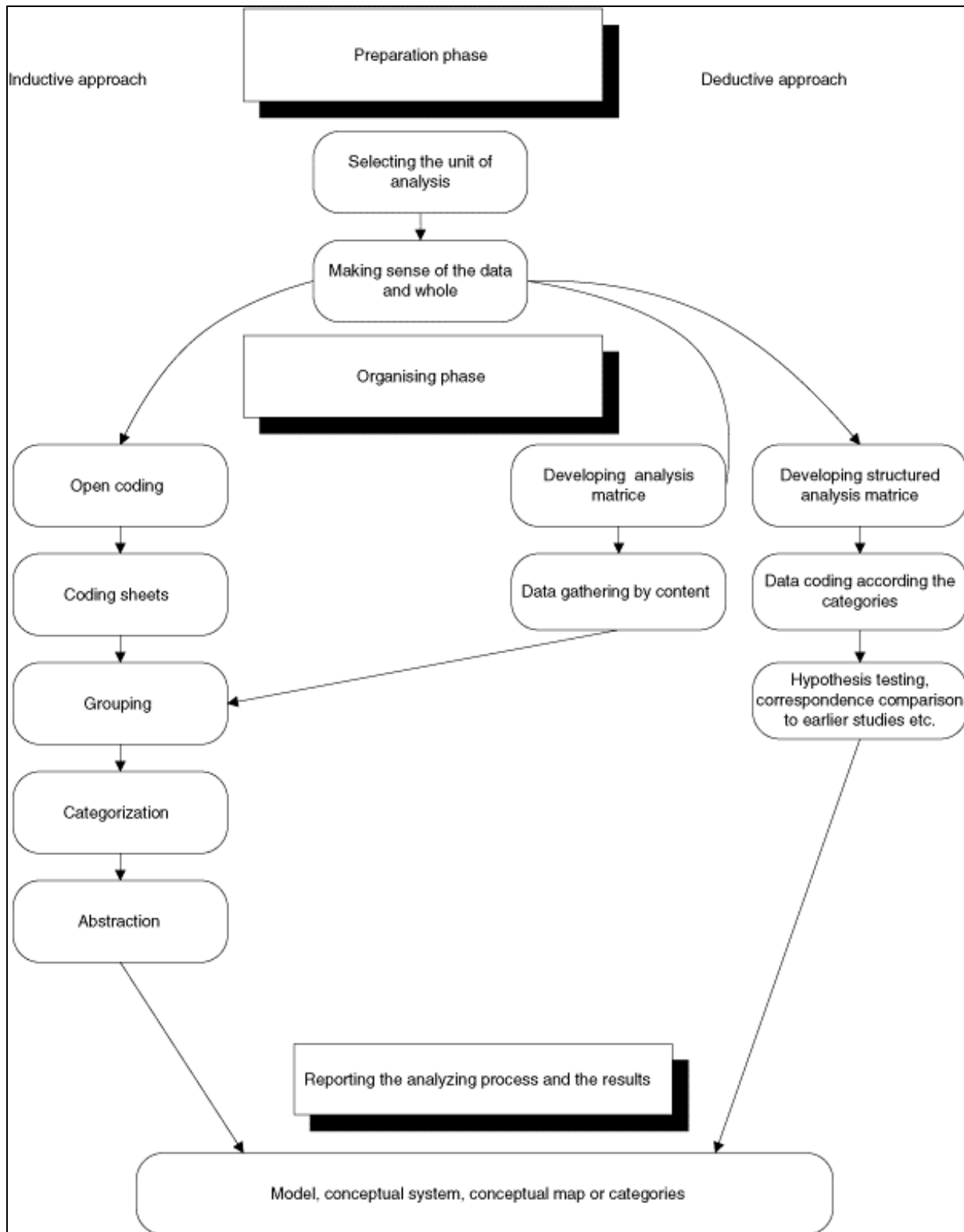


Figure 5. Preparation, Organization, and Result Phases of Content Analysis. From “Content Analysis: An Introduction to its Methodology,” by S. Elo and H. Kyngäs, 2008, *Journal of Advanced Nursing*, 62(1), p. 110. Copyright 2007 by Blackwell Publishing Limited.

Clarifying the study's aims and research questions was an essential initial step to preparing appropriate content for analyses (Elo & Kyngäs, 2008; Robson, 2002). The emphasis was on how to strategically model a unified sustainable anesthesia CE platform and the content chosen for analyses facilitated this undertaking. Selecting a unit of analysis and making sense of the data (i.e., the many words of the text being maneuvered into smaller content groupings) allowed for a context of meaning during the analysis to be derived (i.e., included words, sentences, themes, lines of words, or portions of pages within the reviewed text; Elo & Kyngäs, 2008; Polit & Beck, 2004; Robson, 2002). Moreover, the following research questions guided the selection of meaningful studies for review and content analyses: What kind of data is being analyzed?, How can this data be characterized?, What are the analytic objectives?, Why has this data been selected?, How is the data representative or exceptional in some fashion?, Who wants to know this content?, and What do they want to know? (Dey, 1993). Inductive content analysis was chosen as the organizational method for the resultant qualitative data. Inductive content analysis was utilized with open and loosely depicted themes defining the concepts to foster meaningful applicational insights into platforms (Kyngäs, Mikkonen, & Kääriäinen, 2020). This process included open coding, creating categories, and abstraction (Elo & Kyngäs, 2008). Specifically, codes were assigned to the initial materials from the literature review; comments and reflections were added; the material was further reviewed for categorization based on comparable themes, patterns, phrases, sequences, relationships, and variances between sub-groups (i.e., belonging or not belonging to a particular group based on explorations and comparisons of the data); respective data were grouped into general categories; and linkages from these generalizations were formalized into a body of knowledge in the form of constructs, theories, and themes to enhance the understanding and applicational effects of a platform for the

anesthesia CE marketplace (Elo & Kyngäs, 2008; Robson, 2002). The results and discussion sections of the study provide further details.

Protection of Human Rights

No prior approval from MUSC or any other organization's institutional review process for protecting human subjects in research was necessary. This integrative literature review utilized non-human subjects, and the analysis of the content was solely derived from the review. Nevertheless, MUSC mandated the completion of the following prior to approval for this research: the Collaborative Institutional Review Board Training tutorial titled "Group 2: Social & Behavioral Investigators & Key Personnel" sponsored by the Collaborative Institutional Review Board Training Initiative. This training was completed by the author on August 29, 2019 and expires on August 28, 2022.

Chapter 4: Results

Coding from the literature was centered on portraying the concepts, dimensions, and indicators for meaningful applicational insights into platforms. The overarching goal from the review of the literature was to depict strategic platform perspectives. The content from the review of the literature was organized and depicted within coding trees to visually represent the data. The study assessed the key concepts of network effect, segmentation, first to market, best of breed, search costs, transaction costs, minimally viable product, evolutionary phases of platforms, platform theory, platform business model, platform economy, and types of platforms; their dimensional aspects; and the measure, degree, or strategic tactics of the depicted dimensional characteristics (i.e., indicators).

Defining Coding Trees

Hierarchical categorized data is used as a means of organizing rich content into general and specific expressions, serves as a vertical and directional representation of thoughts, and encompasses structural relationships (Richards & Richards, 1995). Hierarchical categories were utilized within this study to convey the amalgamated data. Hierarchies (i.e., trees, or as termed within this study, coding trees) have a unidirectional branching nature and served as a means of structurally representing the literature reviewed (Richards & Richards, 1995). The key concepts, their dimensional aspects, and the measure, degree, or strategic tactics of the depicted dimensional characteristics (i.e., indicators) are conveyed within the amalgamated coding trees.

Coding Tree for Network Effects

A coding tree was conceptually constructed for network effects as a key concept explored. The dimensional aspects of network effects were depicted as relationships and platforms as products. The literature review portrayed these aspects and their important

connections to network effects. The indicators of relationships as a dimensional aspect of network effects were coded as openness, focused launch, valued interactions, and pricing. The indicators of relationships served to convey applicable measures, degrees, and/or strategic tactics. The indicators of platforms as products as a dimensional aspect of network effects were coded as quality, pre-announcement, product differentiation, and complementary products. The indicators of platforms as products also served to convey pertinent measures, degrees, and/or strategic tactics. Figure 6 serves as a visual representation of the data and illustrates the coding tree amalgamated from the literature for network effects.

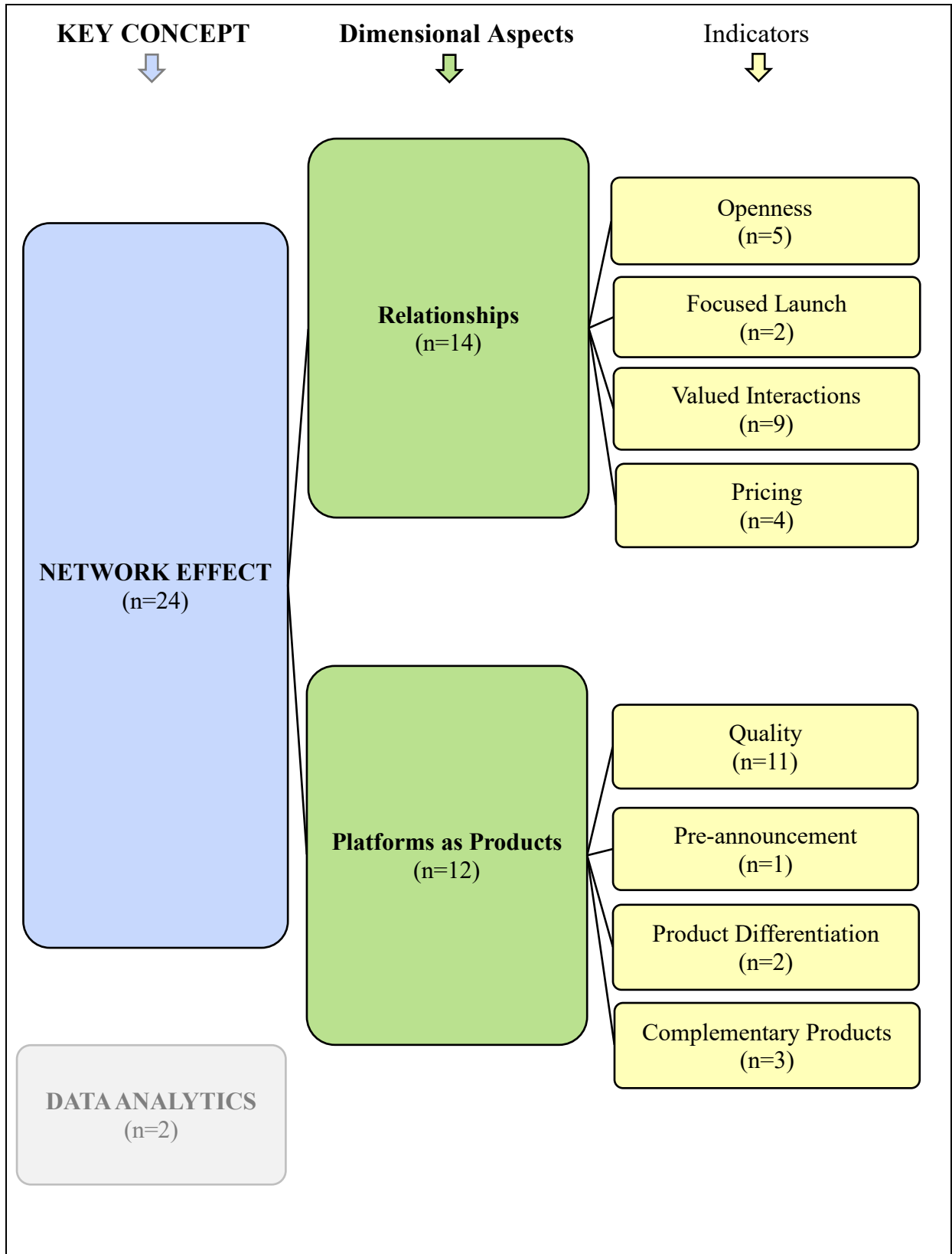


Figure 6. Coding Tree Illustrating Network Effects as a Key Concept, its Dimensions, and Indicators.

Network Effects

After searching the Scopus, ProQuest, EBSCOhost, and other databases (i.e., the preliminary research efforts that utilized Google and Google Scholar) and after narrowing the search by applying the search terms as well as inclusion and exclusion criteria, 19 sources were included for network effects as a key concept explored. After the review of the literature and references for the included sources were explored, five additional sources fostering potential added insights into network effects were included within the study. The remaining unrelated articles or pertinent articles failed to meet the research focus on depth, applicability, and relevance. Those 19 articles were excluded from the review of the literature. Appendix E shows the excluded and included articles for network effects within the study. Appendix F shows the included articles that were utilized to construct the coding tree for network effects. The content utilized for the review of the literature served to broaden the understanding of the network effect with the desired research aims taken into account.

The initial research focused on strategic aspects of direct network externalities, indirect network externalities, and achieving a critical mass within a platform. These notions informed the search terms used to explore studies on network effects and yielded various unanticipated considerations. Interestingly, there was consistency throughout the literature regarding the primary reason why successful digital platforms have effectively amassed utility in their respective markets. The network effect has been termed as the “driving force behind our internet economy” (Van Alstyne & Parker, 2017, p. 25). The literature was clear in depicting the importance of the network effect and its crucial role in the success of the online economy, but the literature varied in the numerous dimensional attributes and indicators pertinent to network effects that support platform approaches to establishing and maintaining utility. The literature

primarily portrayed the need to stimulate network effects to attain critical mass. Fu et al. (2017) also portrayed how the “network effect needs to be stimulated over the whole of a platform’s lifecycle” (p. 351). The longitudinal contexts of the network effect are depicted within the explorations of the key concept of the evolutionary phases of platforms.

Pertinent definitions. The network effect has been inconsistently defined in the literature by many different names like negative network externalities, positive network externalities, decentralized network externalities, centralized network externalities, and interactive network externalities to name a few (Molina-Castillo, Munuera-Alemán, & Calantone, 2011). Not only are there several different terms for these concepts, but one source identified 13 different types of network effects (Currier & NFX, n.d.). Many other sources examined within this study detailed this concept as indirect and direct network effects. Therefore, this study focused on indirect and direct network effects.

Defining network effects. Network effects are when “the utility of a product depends not only on its attributes, but also on the number of other consumers who have adopted the product (Shankar and Bayus, 2003) and the availability of complementary products (Basu, Mazumdar, and Raj, 2003)” (Molina-Castillo et al., 2011, p. 916). One classic example commonly conveyed within the literature is the example of the telephone. A telephone is “worthless if only one person has one, since there’s no one to call. If two people have telephones, they now have some value. And if a million people have telephones, the phone network suddenly becomes enormously valuable” (Surowiecki, 2017, p. 31).

Defining direct network effects. Direct network effects are when the value of a product increases as the quantity of further and additional adopters increases (Molina-Castillo et al., 2011). In other words, the more people on a platform, the greater the value of the platform. The

“implication is that the more users a network has, the easier it becomes to add more users” (Surowiecki, 2017, p. 31).

Defining indirect network effects. Indirect network effects are also important for platforms to succeed. Indirect network effects occur when the value of a platform increases as a result of one type of platform participant benefitting another type of platform participant directly, but not directly benefitting the platform participants of the same type (Currier & NFX, n.d.). Same-side platform participants “indirectly benefit each other because they create an increased incentive for complementary users on the other side” of the platform to use the platform, and in turn benefits all the platform participants on the same side (Currier & NFX, n.d., Indirect Network Effects section, para. 1). Consider Amazon with “such a critical mass of customers” as a “natural place for third-party sellers to gravitate” towards (Surowiecki, 2017, p. 31). When

Amazon made the decision to allow third-party sellers on its site, competing with its own wares, the decision seemed crazy to many at the time. But it positioned the company to benefit from the network effect: having third-party sellers made Amazon more appealing to customers, which in turn made it more appealing to sellers, creating a virtuous cycle for the company. (Surowiecki, 2017, p. 31)

Defining critical mass. Critical mass is another important concept examined within the study. It is defined as the “minimum user-base size necessary to initiate the mass adoption process” (Arroyo-Barrigüete, Ernst, López-Sánchez, & Orero-Giménez, 2010, p. 649). This mass adoption process heavily depends on who the first adopters of a platform are (Arroyo-Barrigüete et al., 2010). Critical mass was portrayed throughout the literature as an important attribute of the network effect as this inflection point drives growth and new business opportunities. In considering strategies to drive first adopters to attain critical mass, special consideration should

be given to the structure of the network with a focus on marketing to individuals with the best chance of providing mass adoption and causing a chain reaction on specific sides or joint entry into the market (Arroyo-Barrigüete et al., 2010).

Relationships. Van Alstyne and Parker (2017) portrayed relationships as a key dimensional aspect of network effects. Successful “platforms seek to maximize the overall value of the whole system in a circular, revolving[,] and feedback-driven process” (Van Alstyne & Parker, 2017, p. 26). Value co-creation is one term conveyed in the literature that addresses the importance of relationships between consumers and providers. Value co-creation is the “benefit realized from integration of resources through activities and interactions with collaborators in the customer’s service network (McColl-Kennedy et al., 2012, p. 375)” (Fu et al., 2017, p. 349). It stresses the increased importance of relationships within a platform compared to other business models. Platform participants are

both consumers and resource providers within the platform ecosystem. As resource providers, they use their resources and capabilities to participate in the design and delivery of services or products, but they also consume the products and services provided by other participants. Different participants share their abilities and resources to form a value co-creation network. This endows participants with new responsibilities. Therefore, compared with traditional contexts, platform participants have more autonomy and power in value co-creation activities. (Fu et al., 2017, p. 351)

Openness. To be open and promote the desired interactions from participants, product features such as ratings, tools to prevent stalking, and tools to filter out low-quality platform elements can be employed (Van Alstyne & Parker, 2017). Openness was also depicted when platforms utilized platform envelopment as a strategy. Platform envelopment leverages joint

relationships with more established platforms to unite its own functionalities with those of targeted platforms in an attempt to grow (Stummer, Kundisch, & Decker, 2018). Nowadays,

customers pay attention not only to individual product benefits, but also to the possible benefits of using a product in combination with other products or customers. Therefore, managers [*sic*] should aim their efforts at developing new products in accordance with existing or potential new products. (Molina-Castillo et al., 2011, p. 926)

Although shared relationships were portrayed as beneficial, the literature also showed that the span of successful openness strategies ranged from leveraging shared relationships to exclusive arrangements in order to be competitive in the marketplace (Stummer et al., 2018). Exclusivity agreements on one side of the market can stimulate network effects and draw users from both sides of the market (Stummer et al., 2018). Winner-takes-all dynamics also play a crucial role in the decision to be open, to endeavor into shared relationships, or to draw upon exclusivity and competition in the marketplace. The prospect of “increasing returns to scale in network industries can lead to winner-take-all battles, so an aspiring platform provider must consider whether to share its platform with rivals” (Eisenmann, Parker, & Van Alstyne, 2006, p. 7). In

most industries, platform businesses will fight for share in different parts of the value chain: distribution, production, [or] supply. [...There is a myth within the online platform economy that all platforms vie for a winner-takes-all dynamic and this] myth stems from the massive growth and market dominance of mature platform businesses such as Airbnb, Amazon, and Uber. But even these market makers are being challenged by incumbents, competitors, and regulators. (Schadler, 2018, para. 2-3)

The decisions to share the platform or compete with a rival are also augmented “when a networked market has room for fewer rival platforms” (Eisenmann et al., 2006, p. 7). Homing

costs comprise all of the expenses platform users encounter (i.e., the cost of time, adoption, and usage) in order to start, sustain, and affiliate with a platform, and the utilization of multiple platforms (i.e. multihoming) consequently increases users' outlays (Eisenmann et al., 2006).

When "multihoming costs are high, users need a good reason to affiliate with multiple platforms" (Eisenmann et al., 2006, p. 7). Many other depictions were noted in the literature that portrayed strategic approaches to dealing with fighting a winner-takes-all corporate and competitive battle. Although important, these depictions fell outside of the realm of this study. This endeavor focused on applicational insights pertinent to the current anesthesia CE market. Currently since there is no unified anesthesia CE platform, these depictions were not considered for inclusion within this study.

Focused launch. Focused launch addresses the importance of size and value to the initial platform interactions. A narrowed focus, emphasis on the right side of the market (i.e., the demand side of the market, supply side of the market, or both), and valued interactions from the start aid platforms with successful launches (Van Alstyne & Parker, 2017). This narrowed focus was also depicted throughout the literature in a different aspect. Stummer et al. (2018) portrayed focusing on one side of the market before reaching critical mass and then strategically opening the platform mediating between two or more groups of users. Stummer et al. (2018) also conveyed focused launch through single target strategies as a means to segment the market (i.e., a single city or state). Although market segmentation was considered as its own key concept to be explored, market segmentation, in respect to the network effect, encompasses strategies that stimulate network effects and help attain a critical mass. Stummer et al. (2018) identified marquee users and loyal users as a means to strategically focus the launch of a platform (i.e., segment the market to facilitate platform launches). Marquee users are "users whose participation

brings extraordinary value for other platform users, thereby potentially attracting a higher number of new users (Eisenmann, Parker, & Van Alstyne, 2006; Rochet and Tirole 2003)” (Stummer et al., 2018. p. 169). Loyal users aid platforms in a specific way. Loyal users have a lower willingness to stop using a platform and aid platforms in reaching the required critical mass at a lower cost (Stummer et al., 2018).

Valued interactions. Valued initial interactions were commonly depicted throughout the literature. Quality metrics should go beyond merely assessing the quantity of participants and their interactions and “metrics like engagement, interaction failure[,] or match quality should be defined and monitored” (Van Alstyne & Parker, 2017, p. 29). Valued interactions were described in the literature as important for all platform participants. The

consumer, the producer[,] and the platform all win if the division of value works for everyone. If one party gets insufficient value, they have no reason to stay on board. A simple rule for platform managers is to take less value than they make and to share value fairly with all participants. (Van Alstyne & Parker, 2017, p. 29)

Positive and strong network effects draw platform users to come together on one platform (Eisenmann et al., 2006). The value of the installed user base (i.e., the cumulative quantity of users at any point in time during a product’s lifecycle) is not just because of a platform’s design aspects or technology, but it is the distinct structure of the established social network that connects its users, the intricacies of the social relationships shaped among the users, and the intensity of their connections within their online community that enables a successful platform to differentiate itself from its competitors (i.e., it is the power of social dynamics that aid in creating network effects; McIntyre & Subramaniam, 2009). Amit and Zott (2001) also depicted the importance of valued interactions and their applicational strategies focused on loyalty (e.g.,

loyalty programs, special bonuses, or bonus points); dominant proprietary standards for processes, products, and services (i.e., enabling a high quantity of quality and pertinent business transactions); and trust by offering transaction safety and reliability from credible and independent third-party companies. Fu et al. (2017) expressed how rewards fortify users' sense of pride, create increased engagement, promote actions to acquire a critical mass, and these customer binding tactics can be utilized to prevent multi-homing activities. Xiao, Fu, and Liu (2018) explain how consumers expect trusted platforms to "institute regulations and enforce appropriate rules and penalties with integrity, competence, and reliability in order to restrict opportunistic behavior by merchants" (p. 739). Network effects do not come solely from the quantity of users, but from overall usage (Currier & NFX, n.d.). Regarding digital platforms, consumers purchase products or services on a platform similarly to how purchases are made in a physical store, but they conduct payments and transactions on the platform (Xiao et al., 2018). If consumers do not trust the vendors that collaborate with the platform, they are not likely to repurchase (Xiao et al., 2018). Growing a network's size is not enough to promote retention within a platform and tactics that focus on increasing usage, capitalizing on positive network effects, and mitigating negative network effects are important to cultivating a successful platform (Currier & NFX, n.d.; Voigt & Hinz, 2015).

Manne and Wright (2011) discussed Google, network effects, and the valued interactions they have with advertisers. Transactions comprising complementary products (i.e., indirect network effects) internalize the advantages of utilizing complementary goods (Manne & Wright, 2011). This is the case with Google. While

additional end users may increase the value of Google's (or any other search engine's) platform to its advertisers, this increase in value is internalized by the platform, and

advertisers are charged accordingly. Typical ‘feedback effects’ seen in many multisided platforms are attenuated or absent in Google's business because the effects are generally unidirectional: advertisers want more end users, but end users care little or nothing about the number of advertisers. [... To] the extent that advertisers care about end users, they care about many of their characteristics. An increase in the number of users who are looking only for information and never to purchase goods may be of little value to advertisers. Thus, because online search advertisers target customers and sales[,] they care about the size of the end user network only to the extent that this size correlates with increased sales. (Manne & Wright, 2011, p. 208)

Platforms looking to utilize advertising as a revenue stream need to deliver more than quantity of users. Not only is scale important, but value created on the dimensional aspects of its users and the platform’s ability to properly match users and advertisers establishes the willingness and the extent to which advertisers will pay (Manne & Wright, 2011).

Pricing. Pricing was conveyed throughout various aspects of the literature review. As an indicator of relationships and in an effort to stimulate network effects, pricing was depicted as a strategic approach when subsidized. Subsidizing strategies show “some pattern of market penetration strategy with a low starting price, and increase their price once a user base has been established (Cennamo and Santalo 2013; Rysman 2009)” (Stummer et al., 2018, p. 170). Also important are decisions about which side of the market to subsidize, offer a lowered price, or freely offer a product. The challenge for platform owners with pricing power on both sides of the market is to “determine the degree to which one group should be encouraged to swell through subsidization and how much of a premium the other side will pay for the privilege of gaining access to it” (Eisenmann et al., 2006, p. 4). The literature was clear in depicting the side of the

market that should be subsidized. Rather than charge the side of the market that strongly demands quality, platforms should charge the side that supply it (Eisenmann et al., 2006). This strategy brings in revenue and also helps to filter out low quality offerings (Bhargava, 2014). Bakos and Katsamakos (2008) explained the purpose for this type of pricing strategy as cultivating one side to maximize participation and the other to maximize revenues. The literature also cautioned about utilizing this strategy. When a subsidized product has “appreciable unit costs, as with tangible goods, platform providers must be more careful. If a strong willingness to pay does not materialize on the money side, a giveaway strategy with high variable costs can quickly rack up large losses” (Eisenmann et al., 2006, p. 5). Side switching was another strategy discussed within the literature review. Although pertinent to platforms, it was not considered as a strategic approach within this endeavor. Side switching does not sufficiently apply to the anesthesia CE market and its potential platform. Side switching is a strategy to make a two-sided platform one-sided by formatting a platform’s strategic design and have users fill both sides of the market simultaneously within a multisided platform (Stummer et al., 2018). Etsy was described in the literature as effective in utilizing this early-stage platform strategy. Stummer et al. (2018) conveyed how “people who are likely to buy handmade goods are also likely to sell them[, ... and how] Etsy focused on this target group to fill both sides of its [... platform] simultaneously before expanding to other target groups that fill only one side of the market” (p. 171). This concept may have worked for Etsy, but it does not apply to the anesthesia CE market because of the significant mismatch between the number of anesthesia professionals seeking CE and the potential quantity of anesthesia CE providers. Conceivably, there is also an insufficient quantity of anesthesia CE providers to fill both sides of the potential platform market with enough volume to aid in driving network effects.

Platforms as products. The indicators for platforms as products as a dimensional aspect of network effects were coded as quality, pre-announcement, product differentiation, and complementary products. The “main asset of a platform is its network of producers and consumers. In contrast to pipeline strategies, resource orchestration is more important than resource control, and facilitating interactions and managing relationships have a higher priority than internal optimization” (Van Alstyne & Parker, 2017, p. 26). Notably, relationships drive network effects and were portrayed throughout the literature as the most important dimensional aspect of network effects. Nevertheless, the important nature of platforms as products were still depicted throughout the literature.

Quality. Platforms had quality as an indicator and, thus, were shaped not only by the actions of others (i.e., the quantity and characteristics of other users), but also on product characteristics like speed, size, texture, and features (Bhargava, 2014). Quality had specific strategic considerations mentioned within the literature. Quality was associated with short-term and long-term corporate aspirations. If a platform wants to be competitive, it needs to focus on quality short-term and long-term product performance, as well as how quality decreases users’ perceived switching costs (Molina-Castillo et al., 2011). Switching costs can be defined as “costs consumers perceive they will incur if they replace one product with another” (Sheremata, 2004, p. 368). For a new platform to overcome switching costs and for an existing platform to remain competitive, lock-in effects must be strategically managed. Varying types of lock-in effects exist and understanding these effects help guide a platform’s strategic approaches within a market. Table 2 displays the types of lock-in effects depicted within the review of the literature.

Table 2

Types of Lock-In Effects

Reason for lock-in effect	Defining characteristics	Reference
Lock-in because of contractual costs	Long-term contracts facilitate a customer's inability to easily switch to a different platform without paying a contractual penalty for breaking the contract	Beck (2006); Farrell (1987); Farrell & Shapiro (1989); Klemperer (1987)
Lock-in because of learning costs	There is learning required to utilize a new standard or technological platform and until new knowledge is acquired, the new skills required decrease productivity	Beck (2006); Klemperer (1987)
Lock-in because of conversion costs	New technological standards and swapping data standards translates into potentially differing or new syntax or data semantics (i.e., data may vanish or be inappropriately converted yielding different, unintended, and/or incorrect meanings)	Beck (2006)
Lock-in because of transaction costs	Differing standards may utilize similar functions but searching, switching, and utilizations from one platform to another yields increased transaction costs	Beck (2006); Klemperer (1987)
Lock-in because of brand loyalty	Loyalty programs aid binding customers to a given product or platform and switching can be perceived as a loss of accumulated benefits, perks, and/or discounts from the original product or platform	Beck (2006); Farrell & Shapiro (1988)

Understanding the reasons for lock-in can aid new potential platforms in mitigating these effects when attempting to generate network effects and amassing new users. Strategies should focus on competitively overcoming these aspects when attempting to amass new users by reducing switching costs (Beck, 2006) as well as intrinsically intensifying lock-in effects to retain and grow a competitive advantage.

In the short-term, or at least when initially launching a new product or service, Boni (2018) depicted how not to get the entire job done with a complete initial product launch but rather to use the product entry to validate the business concept prior to introducing more elaborate and extensive features and covering additional market segments. This minimum

product launch is referred to as a minimum viable product (MVP). A MVP is a product or service that fills a customer/user validated need and a target market entry point (MEP) is the target entry market where the customer/user need is the greatest (Boni, 2018). Simply put, the MEP refers to “who has the most ‘pain’ and is willing to pay” (Boni, 2018, p. 15).

Understanding this targeted product and market is challenging. Boni (2018) showed the importance of identifying what constitutes a validated MEP, service, and/or market segment for an innovation. To understand and describe a MVP, once

the job to be done is identified and validated via user interviews and/or observations, a product/solution that contains the minimum feature set required to do the most important job components would comprise the MVP. Those job executors that have the most compelling need to get this job done comprise the [... MEP]. (Boni, 2018, p. 15)

Although quality has been depicted as an important indicator of platforms as products, the importance of relationships as a dimensional aspect of the network effect should not be undervalued. Molina-Castillo et al. (2011) argued that the the long-term impact of the network effect and switching costs are more important than the objective and tangible product quality itself. Thus, while product quality is important, it is necessary to stress the crucial and long-term nature of relationships as a dimensional aspect of the network effect. Network size has been described as an essential and a critical metric for platforms, especially in the startup phase of a product (Bhargava, 2014). One strategy to gain size has been depicted as giving the product away. Because

so much of a network good’s perceived value depends on network size (and a large size requires initial adoption despite the lack of a viable network), it becomes almost essential

for the firm to give away the product and sacrifice margin in order to mobilize the network. (Bhargava, 2014, p. 201).

Quality in the literature has also been described as standalone benefit. Stand-alone benefit is the “value component which depends primarily on product characteristics” (Bhargava, 2014, p. 200).

In the short term, the importance of quality has been deemed as important as network effects.

While

network effects are often the highlight and most visible aspect of a network good, a careful design and combination of standalone benefits is necessary for successful adoption and revenue growth for a network good. This is because the network benefit is zero or very low in the earliest stages of a network good’s life. Hence if there is a separate standalone benefit -and especially if potential customers are heterogeneous in their standalone value - then the firm can kickstart product adoption by achieving early sales on the basis of a standalone benefit, attracting those customers who have highest value for standalone features. Over time, the firm attracts customers because of the product’s network benefits. (Bhargava, 2014, p. 201-202).

Quality can also be applied to platforms as products when opportunities for customization, personalization, and specialization are exploited (Amit & Zott, 2001; Lee, Kim, Noh, & Lee, 2010). Platforms prevent the migration of customers to competitors by empowering consumers with the ability to tailor services, products, or information to their specific needs (Amit & Zott, 2001; Lee et al., 2010).

Pre-announcements. Pre-announcements were also noted within the literature as an indicator of platforms as products. They can catalyze initial adoption of a platform. Bhargava (2014) described the benefits of a pre-announcement as building expectations of a sizeable

network, deterring competitors, preempting customers from purchasing an alternative product or service and then being subjected to switching costs, enabling the production of complementary products/services, and positions a company in a perceived and forthcoming standards war. The literature also conveyed caution in implementing this strategy. With a pre-announcement, competitors have an early warning of competition in the market and have more time to respond (Bhargava, 2014). The competitive outlook of a company determines its ability to employ this strategy successfully. Firms in “dominant competitive positions derive greater advantage from this tactic, while early announcements can hurt firms in a weak competitive position by giving competitors more time to react and respond” (Bhargava, 2014, p. 203).

Product differentiation. Product differentiation was also discussed within the review of the literature and depicted as an indicator of platforms as products. This study debated whether this aspect should be classified as a strategy of quality as an indicator or as an indicator on its own merit. This research endeavor decided to classify product differentiation as an indicator on its own merit because of its depiction within the literature. Bhargava (2014) depicted the concept as having a high-priced or premium version and a low-priced, free, or basic version of the product. The portrayal of this aspect in the literature indicated product differentiation as not solely a feature within a platform but depicted the possibility of differentiation as a different version of the product entirely. Bhargava (2014) depicted this as a “freemium strategy” (p. 204). This strategy has the low-end, low-priced, or free version

targeted at highly price-sensitive consumers, while a higher-priced premium product serves the more quality-sensitive segment of the market. The premium product includes some features that are valuable to the high-end users, and these features are omitted from the free version. (Bhargava, 2014, p. 204)

The benefits to this strategy were also discussed within the literature. Product differentiation indirectly segments the market; increases sales with the free features, version, and/or product; maintains a high margin for the premium features, version, and/or product; increases profits; and acts as a trial device by increasing customers' value and willingness to pay for the premium features, version, and/or product (Bhargava, 2014). In deciding to employ this strategy, platforms face two different options. Platforms can either sell their highest-quality features, version, or product, or they can introduce and grow the product line with the cheaper and lower-quality alternative (Bhargava, 2014). The decision is complex and should be considered in light of the implications. The advantages of

an expanded product line are tempered by the additional complexity and costs, including operations costs (additional plant, managing multiple sets of inventory, increased complexity in distribution), marketing costs (data collection and price optimization, segment development and management, and advertising to multiple customer segments), and cannibalization costs due to increased competition within the product line.

(Bhargava, 2014, p. 204)

Arguments varied for the application of this strategic approach. Bhargava (2014) depicted how differentiation in pricing may serve as a useful strategy compared to designing multiple products (i.e., because it is less expensive to carry out, create various products, and segment customers via differentiated prices compared to the costs associated with designing multiple physical products). When to expand and who should implement early expansion were also considerations for this strategic approach. When product line growth costs are high, early expansion is less desirable and beneficial for startups compared to established companies (Bhargava, 2014). Even given the potential high costs, the literature repeatedly portrayed the importance of product differentiation.

Fu et al. (2017) described how a premium service leads to increases in cultivating marquee users, how product differentiation and segmented services function as a vertical service deepening strategy and aids in retaining old customers and attracting new ones, and how a standardized approach ensuring the matching efficiency of the platform as a whole should be simultaneously considered to effectively stimulate network effects.

Complementary products. Complementary products as an indicator of platforms as products were also depicted in the literature. Complementary goods or services provide more value collectively than each of the goods or services could individually (Amit & Zott, 2001; Lee et al., 2010). Amit and Zott (2001) portrayed this indicator and its value addition to platforms when online products or services are related to a core transaction, when online products or services that enhance the value of the core products or services are offered, when offline benefits are derived from complementary online products or services (i.e., when interconnectivity fosters the online utilization of a platform for offline products or services to be purchased or sold), and when unrelated products or services are offered within the platform but fit well with the community aspect created from the online platform. The literature briefly depicted complementary products as adding value in a few additional ways. Supply chain integration and linking technologies between multiple products or services were also depicted in the literature as types of complementary products (Amit & Zott, 2001). Lee et al. (2010) conveyed how collective intelligence serves as the most advanced type of complementary activity available for online platforms. Fu et al. (2017) expressed how complementary products that act to integrate products or services establish an installed user base, retain users, decrease user churn rates, and entice consumers and providers to onboard to a one-stop solution.

Data analytics. Surowiecki (2017) depicted how top online platforms go beyond network effects and utilize data for competitive advantage through the corporate data flywheel (i.e., data analytics improves products and services, which in turn helps corporations grow their customer base, and gives them access to more data). Amit and Zott (2001) described how the analyses and tactful implementations of submitted customer information, click streams, past purchases, personalized interfaces, directed and focused advertising, targeted emails, targeted cross selling, and recommendations based on inferred tastes all enhance customer interactions with the platform, yield more accurate matching results, and thus perpetuates high incentives to utilize the platform. Notably, the literature depicted the utilization of data analytics as beyond network effects. Thus, this study recognizes and depicts the importance and implications of data analytics throughout the explorations of the key concepts.

Coding Tree for Segmentation

A coding tree was conceptually constructed for segmentation as a key concept explored. The dimensional aspects of segmentation were depicted as identified segmentations and product positions. The literature review portrayed these aspects and their important connections to market segmentation. The indicators of identified segmentations as a dimensional aspect of segmentation were coded as geographic segmentation, demographic segmentation, firmographic segmentation, behavioral segmentation, and psychographic segmentation (Qualtrics, n.d.). The indicators of identified segmentations served to convey applicable measures, degrees, and/or strategic tactics. The indicators of product positions as a dimensional aspect of segmentation were coded as segmentation processes and ensuring effective segmentation. The indicators of product positions also served to convey pertinent measures, degrees, and/or strategic tactics.

Figure 7 serves as a visual representation of the data and illustrates the coding tree amalgamated from the literature for segmentation.

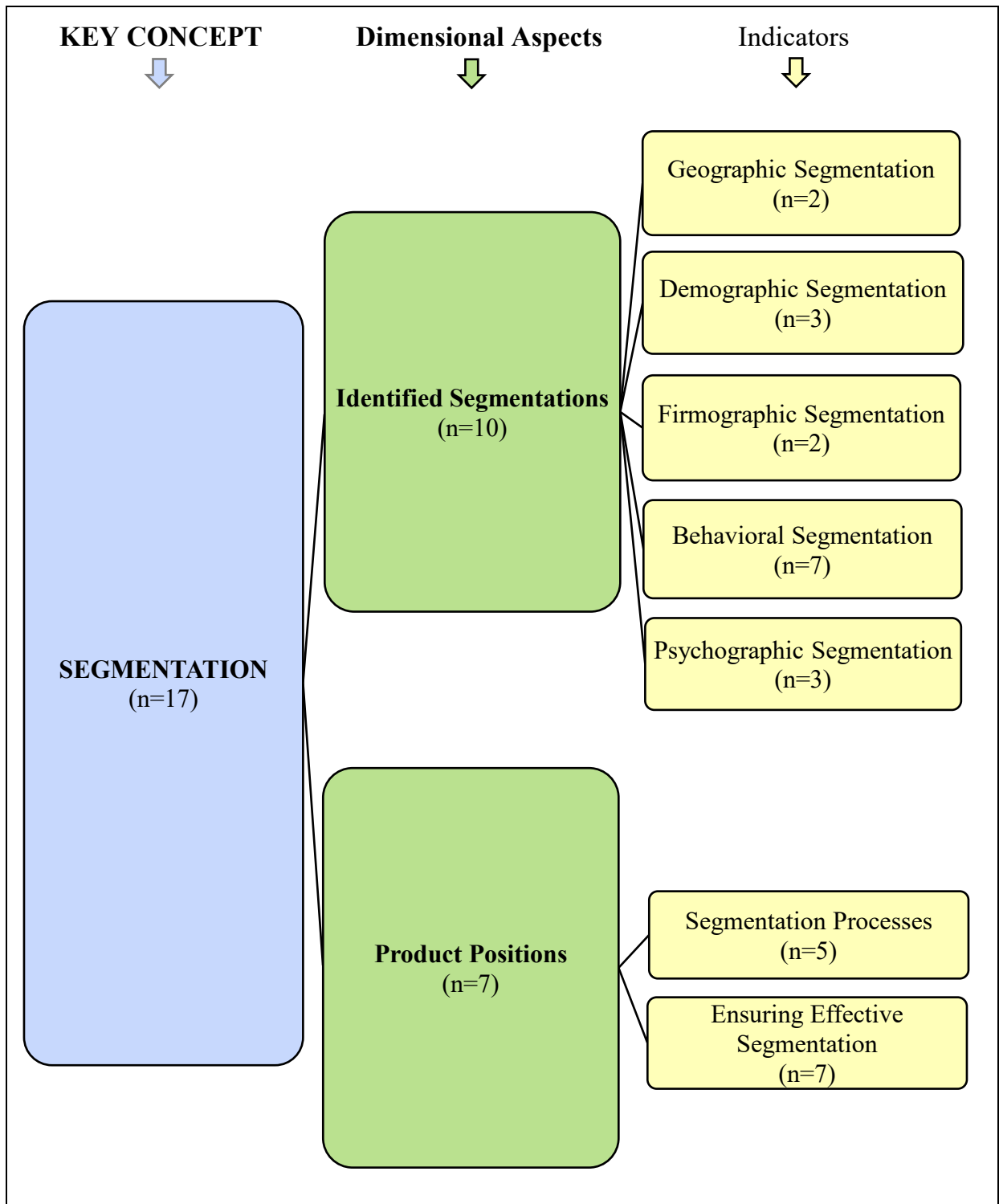


Figure 7. Coding Tree Illustrating Segmentation as a Key Concept, its Dimensions, and Indicators.

Segmentation

After searching the Scopus, ProQuest, EBSCOhost, and other databases (i.e., the preliminary research efforts that utilized Google and Google Scholar) and after narrowing the search by applying the search terms as well as inclusion and exclusion criteria, 14 sources were included for segmentation as a key concept explored. After the review of the literature and references for the included sources were explored, three additional sources fostering potential added insights into segmentation were included within the study. The remaining unrelated articles or pertinent articles failed to meet the research focus on depth, applicability, and relevance. Those 105 articles were excluded from the review of the literature. Appendix G shows the excluded and included articles for segmentation within the study. Appendix H shows the included articles that were utilized to construct the coding tree for segmentation. The content utilized for the review of the literature served to broaden the understanding of segmentation with the desired research aims taken into account.

The initial research focus for segmentation as a key concept was centered on comprehensively depicting and conceptually layering the various aspects of segmentation. This study also sought to relay its pertinence to online platforms. These notions guided the search terms employed to explore segmentation and yielded various considerations within the broad platform research endeavor. Interestingly, there was consistency throughout the literature regarding effective methods of market segmentation. Shaw (2011) depicted segmentation as a classification exercise where marketers design products and services to target specific market divisions based on a multitude of variables. Segmentation is the “practice of dividing your target market into approachable groups. Market segmentation creates subsets of a market based on demographics, needs, priorities, common interests, and other psychographic or behavioral

criteria used to better understand the target audience” (Qualtrics, n.d., para. 1). Segmentation is “about positioning brands and targeting customers using various marketing mixes” (Shaw, 2011, p. 261). This technique divides total demand for a product or service into relatively homogenous segments (i.e., selected characteristics) and these segments are “relevant in explaining and in predicting the response of consumers, in a given segment, to market stimuli” (Tynan & Drayton, 1987, p. 301). Succinctly, segmentation “determines what that company decides to produce, how it will take those products [or services] to market, who it believes its competitors to be[,] and how large it believes its market opportunities to be” (Christensen, Anthony, Berstell, & Nitterhouse, 2007, p. 38). Understanding segmentation’s characteristics and how to strategically benefit from their implementations were at the core of this key concept’s explorations. Platforms can “leverage this targeting in product[s], sales, and marketing strategies” (Qualtrics, n.d., para. 2). In marketing terms and as specified by this research endeavor, divided segments either refer to divisions of customers with comparable needs or to groups of products/services with comparable characteristics (Tynan & Drayton, 1987). In a “multi-dimensional market, companies can increase profitability by utilizing market segmentations” (Lin, 2002, p. 250). Personalized and targeted “advertising operates through a common identity paradigm whereby a featured actor or model is perceived as representing some aspect of the target’s identity” (Harmon-Kizer, 2016, p. 321). This “personalization has a long tradition in marketing - especially in any type of direct marketing - by adapting the content of, for example, an email to the individual consumer’s characteristics” (Risius & Aydingül, 2018, p. 2). Understanding how and what specifically to adapt to serves to underpin this study’s investigation into the concept of segmentation and its applicational implications.

One such example was 7-Eleven, as conveyed within the review of the literature, and their approach to integrating transactional consumer data with customer segmentation (Overby, 2015). Their newly developed loyalty program allowed 7-Eleven to customize their offerings to targeted customers. The system enabled the organization to tailor their promotions and offers by assessing variables like what customer's purchase and don't, offers redeemed and unredeemed, time of day, and weather (Overby, 2015). Consumers provide a wealth of usable data when purchases are made and the application of this data can benefit both the supply and demand side of the market. This benefits the organization and the consumers as data analytics fosters a tailored and strategic approach to marketing, promotional product offers, and long-term sales and growth strategies (Khwaja, 2015).

According to the Schultz (2011) article, benefits arise from utilizing consumer data from variables like recent purchases, frequency of purchases, dollars spent in terms of activity, and via integrated multi-channel marketing streams. Consistency of information across channels was also conveyed as important to integrate business solutions and offerings (Rogers, 2006). The review of the literature also expressed how it is not merely pre-determined variables that drive segmentation strategies. According to Raphael (2013), segmentation strategies should be centered around what is relevant and meaningful to the organization, beset with new growth opportunities, and be aligned with the mission of the organization. The ability to convey mission-aligned and dissected consumer data infused with strategy via multi-channel marketing streams helps to promote and drive business solutions uniformly across mediums (Schultz, 2011; Raphael, 2013; Rogers, 2006).

Divided segments refer to divisions of customers with comparable needs or to groups of products/services with comparable characteristics (Tynan & Drayton, 1987). Tynan and Drayton

(1987) portrayed the concept of product differentiation, and how it is only partially successful because it does not appeal to the needs of the consumer. The researchers also conveyed how product differentiation offers variety to buyers but lacks appeal to different targeted segments (Tynan & Drayton, 1987). By grouping products with similar characteristics, product differentiation considers the perspective of the product or services and their functions but does not wholly account for the potential multifaceted needs of consumers. Different consumer segments may very well need products or services with diverse capabilities. According to Staudt et al. (1976), product differentiation is conducted as follows: physical differentiation of a product or service, psychological differentiation of a product or service, differences in the purchasing environments for a given product or service, differences in the physical distribution capabilities for a given product or service, differences in the after-purchase guarantee of satisfaction during the use of a product or service, and/or differences in the prices and/or conditions of sale for a given product or service (as cited in Tynan & Drayton, 1987). The perspective of the consumer is paramount. Product differentiation focuses on mass marketing approaches and market segmentation strategies focus on tailoring a product or service to meet the needs and preferences of a targeted group (Tynan & Drayton, 1987). Stakeholders need to be satisfied before a market can be truly engaged (Shaw, 2011). Serving the multi-layered needs of consumers may require simple or complex products or services. Understanding the needs of consumer segments takes precedence and should be the driving force behind segmentation strategies over differentiating a product or service based on their grouping characteristics.

Figure 8 shows the viewpoints taken, after the review of the literature, in analyzing the dimensional aspects of segmentation and the ensuing indicators.

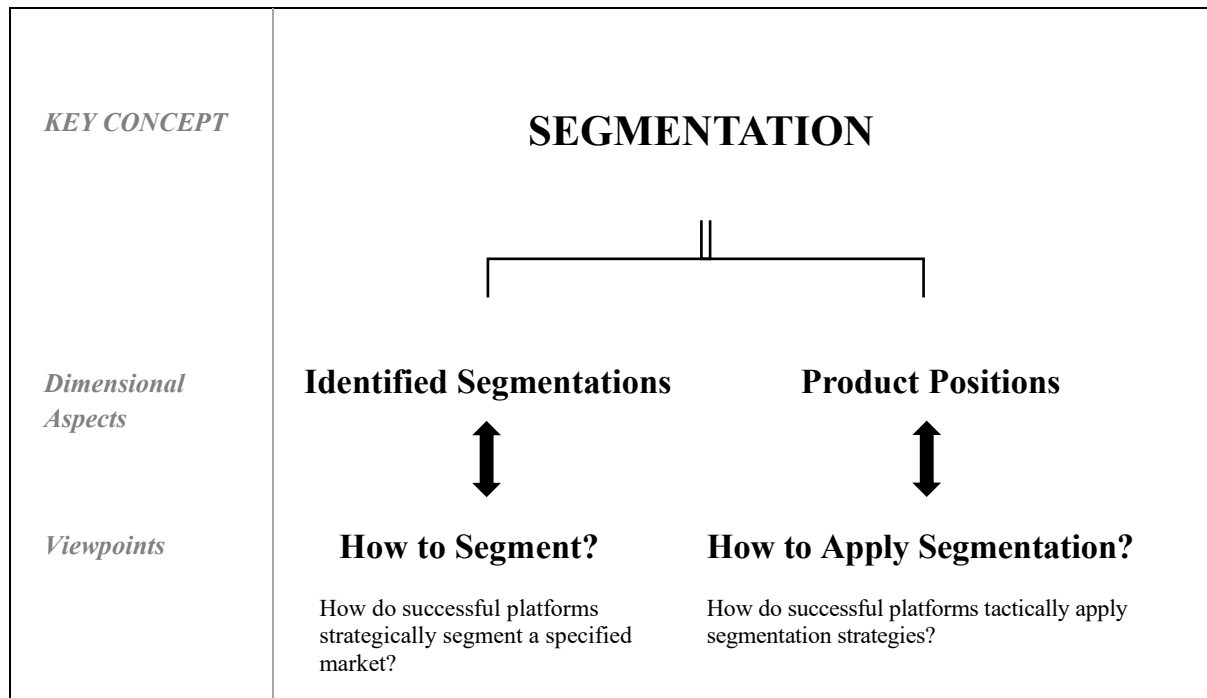


Figure 8. Viewpoints that Guided the Coding and Analyses of the Dimensional Aspects of Segmentation.

For this review, data were coded to convey how to target strategically within a given market.

Data coding and interpretation were guided by the following questions:

1. How do successful platforms strategically segment a specified market?
2. How do successful platforms tactically apply segmentation strategies?

The literature was clear in depicting the importance of user patterns, the resulting refined products, and advertising, but the literature varied in the portrayals of the pertinent dimensional attributes and ensuing indicators that support platforms with segmentation proficiencies.

Understanding why segmentation is important and what it yields can also influence organizations in developing effective targeting strategies. Segmentation serves as an effective strategy for “selecting a target market for a given product and designing an appropriate marketing mix” (Tynan & Drayton, 1987, p. 301). The economic viability of segmentation is also important for organizations to consider. Economically “viable [... segmentation] may be understood as being of sufficient size to enable a marketer to earn adequate profit by catering to

the specific needs of its members” (Tynan & Drayton, 1987, p. 302). Although the needs of consumers are paramount and should take precedence for organizations seeking effective segmentation strategies, considerations for divisions or groups of products/services with similar characteristics also need to be taken into account. Understanding and strategically implementing product/service divisions, contextualized by the needs of consumers, can help yield economically viable service delivery systems (Coltman, Gattorna, & Whiting, 2010; Tynan & Drayton, 1987). Coltman et al. (2010) discussed the importance of segmentation in service operations management, which allows for effective operational deployments through a well-defined “internal strategic service vision based on (1) targeted market and customer segments, (2) the notion of a service concept as a complex product bundle (or offering to customers), and (3) the design of their service delivery systems” (p. 176). These strategic service vision components are all important and produce a positive impact on organizations. When

organizations focus their attention on the customer market, the service concept, and the delivery system, they create value during the service encounter that can drive customer satisfaction with the product or service and enhance the purchasing experience. In turn, increased customer satisfaction enhances customer loyalty and firm profitability.

(Coltman et al., 2010, p. 177)

Figure 9 serves as a visual representation and depicts the relationships between the components of a service encounter (i.e., the differentiated product/service concept, a segmented and targeted market, and a service delivery system) and the yielding impact and result of a strategic service encounter (i.e., enhanced customer satisfaction and loyalty, revenue growth, and profitability).

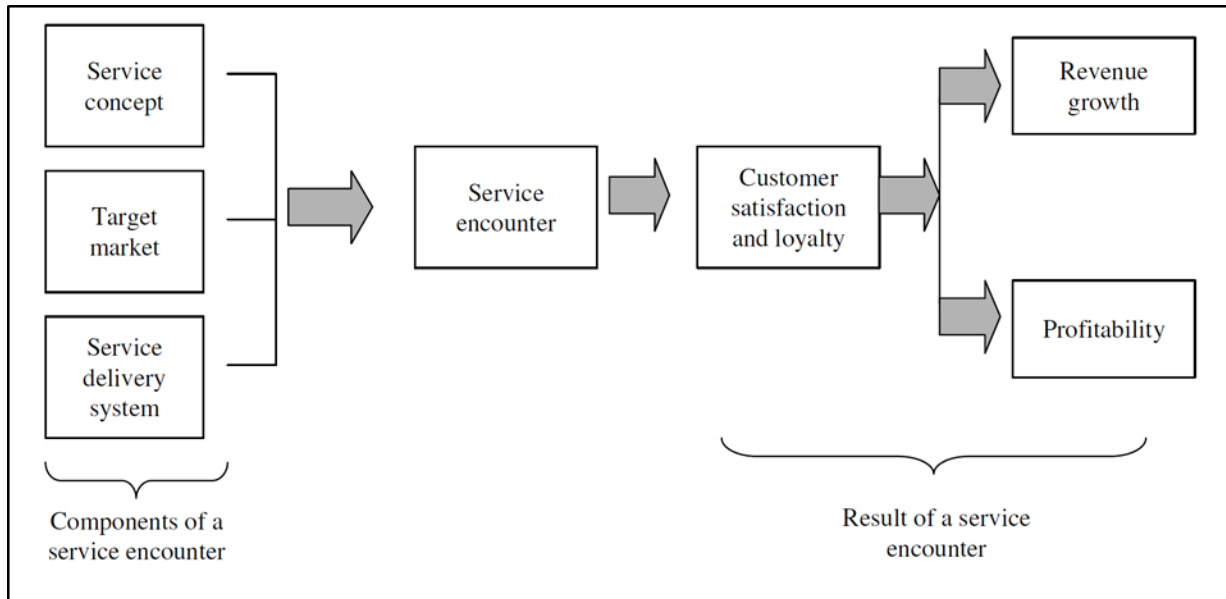


Figure 9. Visual Depiction of a Strategic Service Encounter. From “Realigning Service Operations Strategy at DHL Express,” by T. Coltman, J. Gattorna, and S. Whiting, 2010, *Interfaces*, 40(3), p. 177. Copyright 2010 by INFORMS.

The service concept “reflects the way an organization would like its services to be perceived by customers (Heskett 1986)” (Coltman et al., 2010, p. 177). This concept addresses the magnitude of segmentation and a necessity to alter one or multiple components of a service encounter tailored to customers’ needs.

Another approach to segmentation that addresses serving the customers’ needs was depicted by Christensen et al. (2007), who conveyed a job-defined market and strategies to navigate customer behavior. The researchers depicted customers as needing a product or service in order to complete a job and portrayed this need within the dimensions of customer experience (Christensen et al., 2007). Because

segmenting by job clarifies who the other job candidates really are, it helps marketers to compare the strengths and weaknesses of each of the products that compete, in the customer’s mind, for the job and to derive the attributes and experiences that would be required to do the job perfectly. Marketers who segment by product and customer

category just can't see as clearly the competition that comes from outside their product category and therefore are not in an informed position to compete effectively.

(Christensen et al., 2007, p. 41)

Figure 10 shows the amalgamated viewpoints expressed by Christensen et al. (2007) regarding segmentation tailored to customers' needs.

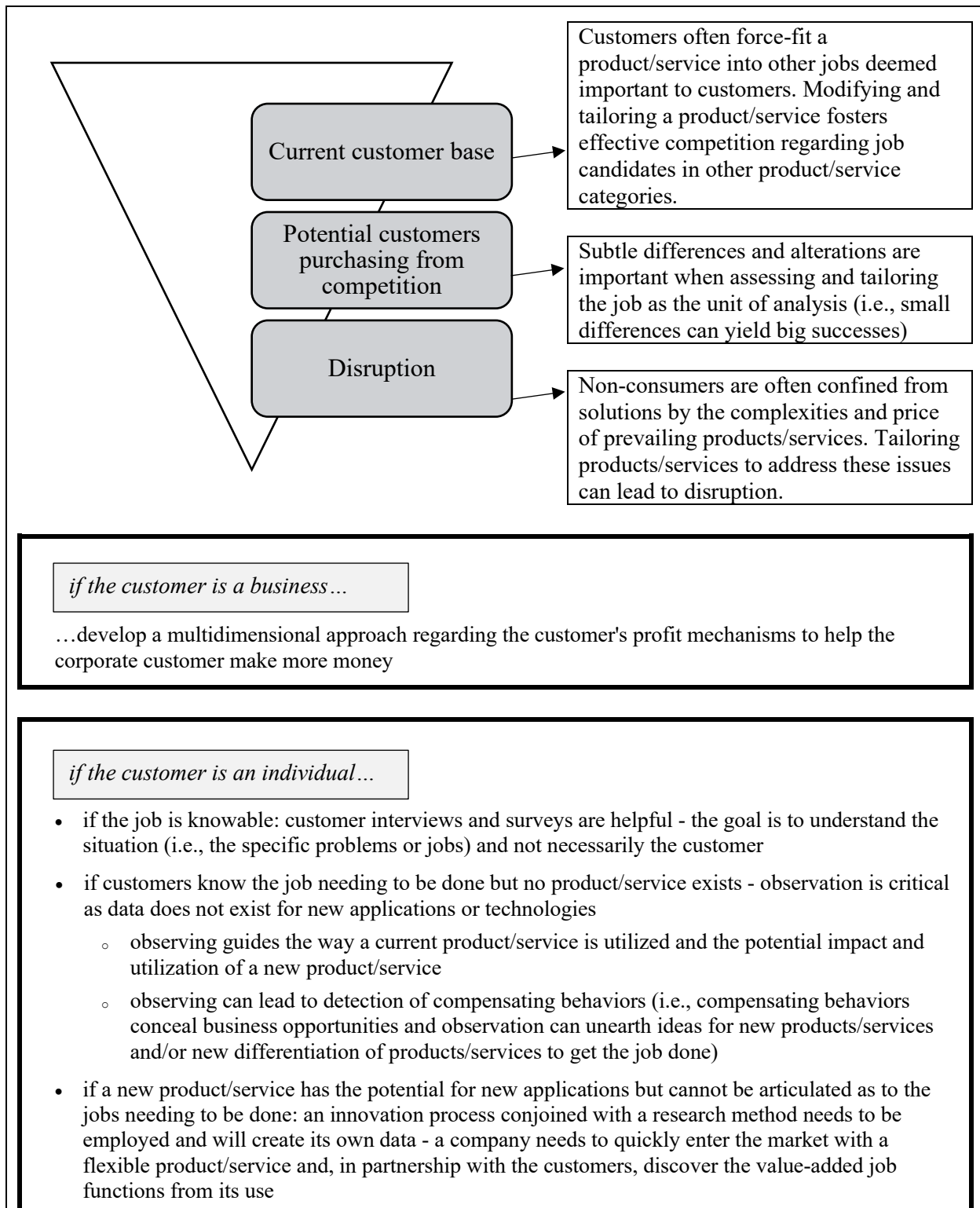


Figure 10. Visual Depiction of Customers Seeking to Hire a Product or Service to Get the Job Done. Adapted from "Finding the Right Job for You Product," by C. M. Christensen, S. D. Anthony, G. Berstell, and D. Nitterhouse, 2007, *MIT Sloan Management Review*, 48(3), p. 41-44. Copyright 2007 by the Massachusetts Institute of Technology.

Identified segmentations. The “grouping [of] customers into clusters based on their purchasing and consuming habits” guided the research efforts in depicting the various segmentations and the ensuing implications regarding the anesthesia CE stakeholders (i.e., user sets; Shaw, 2011, p. 261). This study amalgamated proven tactics applicable to the anesthesia CE marketplace. It also depicted strategic considerations that encompass additional market inquiries beyond the scope of this study and require calculated data analytics. Portrayals regarding the applicability of the findings on the supply and demand sides of the anesthesia CE market and its corresponding user sets are found in the discussion section of this study.

Segmentation categories are as follows: geographic, demographic, firmographic, behavioral, and psychographic (Qualtrics, n.d.). These segmentation categories and their depictions served as the indicators for identified segmentations within this study. Tynan and Drayton (1987) conveyed geographic, demographic, psychological, psychographic, behavioral, industrial, and product segmentation as segmentation categories. Psychological and product segmentation were omitted from this study as segmentation categories.

Omitted segmentation category: *Psychological segmentation.* Psychological segmentation combines the works of sociologists, anthropologists, and psychologists and assimilates segmentation strategies for consumer markets centered on variables like risk, personality, reference groups, and attitudes (Tynan & Drayton, 1987). Tynan & Drayton (1987) conveyed how “an individual has an enduring set of tendencies to behave in a given way to given classes of stimuli” (p. 314). Based on by Tynan and Drayton’s (1987) observations regarding psychological segmentation, this study omitted this segmentation category as a classification approach to segmentation. Tynan and Drayton (1987) concluded their portrayals of psychological segmentation by noting that “much of the published work on psychological bases

of segmentation is in conflict. Although these variables influence buying behaviour [*sic*] there is no reason to believe there exists a generalised [*sic*] pattern of influence” (p. 317). Thus, this study focused on strategically pertinent and applicable patterns of influence relevant to the anesthesia CE market.

Omitted segmentation category: Product segmentation. Product segmentation allows for the clustering of products instead of consumers (Tynan & Drayton, 1987). Barnett (1969) portrayed stopping consumer segmentation and focusing on “deriving product field specific criteria by which consumers themselves distinguish between brands and products” (as cited in Tynan & Drayton, 1987, p. 327). Although useful, the concept of product segmentation is too limited. Lunn (1978) conveyed how the extent to which products satisfy these requirements is the true value for organizations (as cited in Tynan & Drayton, 1987). Christensen and authors also depicted this notion. When

customers find that they need to get a job done, they “hire” products or services to do the job. This means that marketers need to understand the jobs that arise in customers’ lives for which their products might be hired. Most of the “home runs” of marketing history were hit by marketers who saw the world this way. The “strike outs” of marketing history, in contrast, generally have been the result of focusing on developing products with better features and functions or of attempting to decipher what the average customer in a demographic wants. (Christensen et al., 2007, p. 38)

Understanding the customer-centric *why* serves in “improving the product on dimensions of the experience so it does the job better” (Christensen et al., 2007, p. 40). As per Christensen et al., (2007), “job-defined markets are generally much larger than product category-defined markets” (p. 40).

Although product segmentation can help to identify gaps for new product developments and can aid in assessing product competition within the marketplace (Tynan & Drayton, 1987), depictions of this segmentation category as a classification approach to market segmentation were omitted from this study. Tynan and Drayton (1987) conveyed how, in perspective to market segmentation, product segmentation was deemed insufficient in addressing the breadth of needs of consumers. Once

unique features of an augmented product become commonly expected, companies are saddled with the costs of providing those features but cannot sustain premium pricing for offering them. The root reason for this entrapment is the pervasive practice of positioning products in categories that are defined by the properties of products, so that “better” is achieved by copying features and stretching functionality. When a company begins to view market structure by job, however, it can break away from the traditional treadmill of positioning and differentiate itself on dimensions of performance that are salient to jobs that customers need to get done. This differentiation seems to stick much longer.

(Christensen et al., 2007, p. 40)

Although this study and Tynan and Drayton (1987) refer to divided segments as either divisions of customers with comparable needs or to groups of products/services with comparable characteristics, the latter serves this study solely as a strategic approach to developing new products/services and identifying gaps in the market. The amalgamations from the literature focus on potentially yielding long-term success strategies and thus excludes product segmentation as a segmentation category (i.e., as an indicator of identified segmentations).

Geographic segmentation. Geographic segmentation was portrayed as a simpler method of segmenting a market and accounts for differing needs, preferences, and interests based on

geography (Qualtrics, n.d.). Strategic considerations accounting for the “climates and geographic regions of customer groups can help determine where to sell and advertise, as well as where to expand” (Qualtrics, n.d., para. 7). As applied to the focus of this study, market segments can be “analysed [*sic*] nationally, regionally[,] or locally” (Tynan & Drayton, 1987, p. 307).

Demographic segmentation. Demographic segmentation “sorts a market by demographic elements such as age, education, income, family size, race, gender, occupation, nationality, and more” (Qualtrics, n.d., para. 8). Demographics serve as the building blocks of market segmentation for distinguishing customer groups, and this type of segmentation can serve as a basis for contextualizing more in-depth segmentation approaches (Lin, 2002; Tynan & Drayton, 1987). Independent demographic variables are poor predictors of behavior and provide limited value (Tynan & Drayton, 1987).

Firmographic segmentation. Firmographic segmentation was described similarly to demographic segmentation but reflects organizational elements instead of individual demographic characteristics (e.g., company size and number of employees; Qualtrics, n.d.). Tynan and Drayton (1987) portrayed this type of segmentation termed as industrial segmentation. Although firmographic segmentation was utilized as the term depicted within this endeavor, the portrayals of the Tynan and author’s 1987 study are still applicable across industries. Their depictions show firmographic segmentation (i.e., industrial segmentation) as a two-step process. First, macro-segmentation includes industry demographics, size, commercial or public organizational structure, Standard Industrial Classification code, and the usage of a product/service (Tynan & Drayton, 1987). The second stage focuses on micro-segmentation as the strategic applicational approach. This includes the demographic and behavioral aspects of organizational decision buyers (Tynan & Drayton, 1987).

Behavioral segmentation. Behavioral segmentation “divides markets by behaviors and decision-making patterns such as purchase, consumption, lifestyle, and usage” (Qualtrics, n.d., para. 10). Consumers are divided by their usage or response to a product/service (Tynan & Drayton, 1987). Miller and Granzin (1979) rendered a simple process for utilizing behavioral segmentation as follows: define the market, determine the benefits needed by the targeted market, and provide the products or services to fill those needs (as cited in Tynan and Drayton, 1987). Tsotsou (2016) depicted consumer behavior with the notion that the “social aspects of consumption (consumer-to-consumer relationships) play a significant role in creating valued service experiences and outcomes expressed as trustworthy and loyal service relationships” (p. 93). This suggests that organizations need to not only focus on behavior at the individual consumer level but need to also reflect on the potential impact of consumption at the community or group level (Tsotsou, 2016).

Behavioral segmentation was depicted by Coltman et al. (2010), with their portrayals of target market segmentation strategies regarding DHL’s revenue and profit aspirations established by its Asia-Pacific regional board. Their study demonstrated the advantages of segmenting markets based on the “customer operating platform (i.e., global, regional, or local) and the revenue potential (i.e., customers [... who were] identified as large, medium, or small)” (Coltman et al., 2010, p. 180). Their study identified the importance and demonstrated the positive impact on profitability by aligning DHL’s service encounter with buyer behavior and preferences. Coltman et al. (2010) depicted how DHL classified customers “into meaningful segments and then reverse engineer[ed] the service delivery system to meet the specific needs of each segment” (p. 182). Their study also described the need for ongoing market and corporate change. Change must become “part of the organization’s culture, ever evolving[,] and ever

adapting to the marketplace. Effective alignment of the service operations concept must be dynamic and constantly evolving with the customer's buying behavior" (Coltman et al., 2010, p. 183). Rogers (2006) also argued for taking a joined behavioral and preference-based segmentation approach, noting how community banks assessed their current positions and created growth opportunities regarding their internet banking services. The article viewed customers as more than merely a homogenous group and considered an in-depth basis for consumer identification, which included the attitudes, opinions, practices, and preferences of small businesses and lower-end middle market companies who utilized online banking services at their primary bank's website for transactions (Rogers, 2006). This comprehensive approach allowed the researchers to identify and direct growth efforts for their specified market segments. Taking "a behavioral and preference-based approach to segmentation strategy revealed two distinct small business and lower-end middle market segments that have a proclivity toward doing business with small banks online" (Rogers, 2006, p. 49). Their growth efforts centered on targeted solutions that differed from their competitors. They studied and prioritized platform development and branding efforts that aligned with their targeted segment's attitudes and opinions, online business banking behaviors, feature usage, and feature prioritizations, and they differentiated their small business banking platform from the generic solutions available from their competitors (Rogers, 2006).

Reimer, Rutz, and Pauwels (2014) aimed at generating "new insights into which marketing actions yield long-term benefits for the most valuable customer segments in the digital media space" (p. 272). First, their study assessed segmented customers and their observed digital purchasing patterns utilized four different advertising mediums (i.e., television, radio, print, and internet advertising); then it investigated the long-term responses from segments varied in terms

of purchasing behaviors when purchasing music downloads, and lastly drew conclusions from their findings (Reimer et al., 2014). The results of the study are not necessarily applicable to the anesthesia CE industry, yet the thought process behind their segmentation approach can be utilized across industries. The effectiveness of their marketing efforts differed across segments and their research enables organizations to target high-value segments utilizing the most effective marketing mediums (Reimer et al., 2014). Their approach to segmentation

allows combining customer-level purchase data using the whole customer base and customer level and aggregate-level marketing mix data. The first modeling step [...] involved] segmenting customers based on observed purchase behavior while accounting for unobserved heterogeneity using a latent-class approach. The second step [...] involved] persistence modeling to investigate the short- and long-run effects of marketing in each segment. [...] The authors reported their results and showed] that segmenting instead by an ad hoc approach (such as median or quartile splits) does not allow uncovering the marketing response of the most valuable customers. (Reimer et al., 2014, p. 272)

Concerning the Reimer et al. (2014) article, demographic and firmographic variables in the context of their purchasing behaviors, although vital components, were not included as part of their study. The

mere focus on one kind of segmentation approach constitutes an inappropriate oversimplification since it assumes that, for example, all people of a certain age, gender or location are drawn towards the same product (McDonald and Dunbar 2012). Thus, more comprehensive and sophisticated segmentation approaches are advised to account for the diversity of customers. (Risius & Aydingül, 2018, p. 3)

Also, consumer behavior must be considered from a group level perspective. Tsiotsou (2016) depicted several implications regarding consumer behavior as a group. These aspects need to be considered by organizations looking to capitalize on group behaviors by understanding, assessing, and nurturing constructive group interactions. Table 3 depicts the influences and strategic impacts of strategically cultivated consumer-to-consumer behaviors.

Table 3

Implications and Explanations of Consumer-to-Consumer Behaviors

Implications	Explanations of consumer-to-consumer behaviors
Consumer portfolio management	Compatible composition of consumers (i.e., common interests, needs, and problems) - the greater the compatibility of consumers, the easier it is to establish relationships and the greater the loyalty to service brands Acceptance of reference groups (i.e., friends or peers) - the greater the acceptance of reference groups' consumer participation in consumption communities, the greater the social engagement and the greater the service brand trust and loyalty
Target marketing	Homogeneous segments - the greater the consistency within segmented user sets (i.e., based on functional needs and social benefits gained from the service experience), the easier it is to monitor and assess the image and composition of the consumers to prevent erosion of the brand equity
Consumer-service experience	Relationships built amongst the consumers - the benefits of the bonds developed between the consumers transfer to the service brand and increases loyalty and trust (i.e., relationships built amongst the consumers along with the impacts of the service value and quality, loyalty programs, and employees yield brand loyalty and trust)
Brand community management	Informal and formal consumption communities - the greater the relationships amongst consumers that foster problem solving and increased interactions, the greater the service experience and consumer retention

Note. Adapted from "The Social Aspects of Consumption as Predictors of Consumer Loyalty: Online vs Offline Services," by R. H. Tsiotsou, 2016, *Journal of Service Management*, 27(2), p. 108-109. Copyright 2016 by Emerald Publishing Limited.

Psychographic segmentation. Psychographic segmentation "takes into account the psychological aspects of consumer behavior by dividing markets according to lifestyle, personality traits, values, opinions, and interests of consumers" (Qualtrics, n.d., para. 11). Customers "define their lifestyles by the consumption choices they make in a variety of product

categories. Lifestyle can [...be utilized] as a group identity for market segmentation. In addition, the brand characteristics with which marketers endow their products correspond to consumer personalities” (Lin, 2002, p. 250). In essence, psychographic segmentation utilizes behavioral variables to account for personalities, motivation factors, and related clusters before seeking correlating relationships (Tynan & Drayton, 1987). The application of psychographic variables affects brand strategies and an organization’s comprehension of customer brand preference (Lin, 2002). Tynan and Drayton (1987) conveyed how psychographics are questionable in the following aspects: reliability, validity, applicability to actual and real-world marketing issues, and contributions to the analysis of consumer behaviors.

Product positions. Within this study, product positions serve as a dimensional aspect of segmentation. Successful platforms’ tactical applications of segmentation were reviewed and primarily guided the considerations for product positions within a marketplace. Segmentation processes and ensuring effective segmentation served as the indicators for product positions and guided the research efforts in how to strategically apply segmentation within a market.

Rusetski (2012) described Nintendo’s undisputed dominance within the gaming console industry in the early 1990s. The 1994 entrance of Sony’s PlayStation and the 2001 arrival of Microsoft’s Xbox into the market added new capabilities and targeted young adults (Rusetski, 2012). These new capabilities and targeted marketing efforts led to the decline of Nintendo within the marketplace (Rusetski, 2012). In “the face of such strong moves by its competitors, Nintendo had to respond either with blunt force offering [an] even more powerful system or with some creative strategic move[s]” (Rusetski, 2012, p. 199). Nintendo targeted a new segment of the population and developed a new product to serve it. Sony and Microsoft targeted young adults playing visual and content-elaborate games, but Nintendo targeted neglected market

segments: kids, women, older adults, and families (Rusetski, 2012). Nintendo's approach was centered on prudent and pragmatic analyses. The

fact that Nintendo managed to uncover the new segments of gamers was due mostly to their analysis of the environment, mostly of the demographic environment. Changes in the market that Nintendo was capitalizing on were not specific to the video gaming industry but were the part of global megatrends affecting currently numerous industries and markets. The success of Wii demonstrates the importance and relevance of [...] careful situation[al] analysis on all levels - environment, industry, competition, and firm. (Rusetski, 2012, p. 209)

Although Nintendo strategically traversed new demographic segments in the gaming console industry, applicational insights from Rusetski's (2012) case study go beyond global demographic segmentation to address segmentation processes and ensure effective segmentations as strategic considerations that can be applied across industries.

Segmentation processes. Qualtrics (n.d.) initially described five crucial steps as an effective approach to segment a market: designing the study, determining the segmentation approach/es, conducting the research, analyzing and creating customer segments, and testing and iterating (Qualtrics, n.d.). Table 4 depicts the amalgamated segmentation processes and pertinent actions portrayed by this study.

Table 4

Processes for Segmentation

Processes	Pertinent Actions	Reference
Design the Study (i.e., select possible links between segment descriptors and the basis for segmentation)	Understand the goals for current products/services (i.e., may be to increase market share by growing the purchase rate of current buyers, weakening competitors' positions by converting buyers from competition, and/or protecting/differentiating a product/service from competition by drawing in new market segments)	Tynan & Drayton (1987)
	Consider the existence of other segments beyond the usual and established targets (i.e., customer segments whose needs are being unmet) and the need to possibly cater to multiple important segments (i.e., first consider an in-depth assessment and comprehensive analysis - environment, industry, competition, and at the organizational level)	Rusetski (2012); Tynan & Drayton (1987)
	Assess the market (i.e., from a consumer's viewpoint - a consumer's product/service field may have a significant range or brands from any one field and may not be suitable for a particular set of needs) and construct an assortment of questions from various segmentation approaches by identifying a targeted number of attributes deemed important to the platform organization	Coltman et al. (2010); Qualtrics (n.d.); Tynan & Drayton (1987)
	Specify the levels (i.e., tiers or classifications) of the attributes and consider customer-level and aggregate-level variables	Coltman et al. (2010); Reimer et al. (2014)
Determine Segmentation Approach/es	Consider the basis for segmentation to determine the approach/es to employ (i.e., prioritize resources and align to the level and perspective of the customers and aggregately)	Coltman et al. (2010); Reimer et al. (2014); Qualtrics (n.d.); Tynan & Drayton (1987)
Conduct the Research	Ask the end users initial and open-ended questions (e.g., surveys or interviews)	Coltman et al. (2010); Qualtrics (n.d.)
Analyze and Create Customer Segments	Analyze responses to create segments by organizing the responses into categories	Qualtrics (n.d.); Tynan & Drayton (1987)
	Establish the conditional segments by utilizing a suitable analytical procedure (e.g., multiple regression analysis, multiple discriminator analysis, etc.)	Tynan & Drayton (1987)
Test and Iterate	Evaluate segments to ensure they are valuable and if the segmentation and the ensuing data-driven value is useless or insufficient for the end users and/or the platform, segment on differing criteria (i.e, findings regarding estimated sizes and profiles should yield economically viable segments, modifications of targeted segments, and/or marketing strategies)	Rusetski (2012); Qualtrics (n.d.); Tynan & Drayton (1987)

The processes for segmentation are depicted as an *a priori* approach and are based on prior known characteristics of the population (i.e., respondents) to different segments (Gangurde & Akarte, 2015). *Post hoc* segmentation refers to the segmentation considerations made after the analysis of the population (i.e., segments of homogenous respondents are fashioned from specific and measured characteristics; Gangurde & Akarte, 2015). Tynan and Drayton (1987) depicted a componential segmentation procedure which serves as an analysis of a market segment for a specific product/service along with an evaluation of the sought-after product/service offerings or positioning. This type of segmentation is *post hoc* (i.e., after the segmentation data has been collected, a prediction is generated for utilization of a product or service for a given segment, the segment is rendered by demographic and psychographic variables, and the segment is an extension from conjoint analysis; Tynan & Drayton, 1987). Conjoint analysis primarily helps in the construct of market segments but focuses on the validation of created segments that were formed by different methods (i.e., managers do not have to make intuitive assumptions about the impact of proposed products/services and are better positioned to make more economically viable segmentation conclusions; D'Souza, & Weun, 1997). In understanding the *post hoc* criteria utilized to derive at a componential segmentation model (i.e., a new conceptualization for segmentation offering an analysis of the segmentation for a given product/service and an evaluation of the product offering or positioning), Tynan and Drayton (1987) portrayed the necessary components of a conjoint analysis as follows: preference rank or rating for the hypothetical products or services, rank or rating of the current products or services utilizing the same attributes used to rank or rate the hypothetical products or services, and sets of demographic and psychographic characteristics. Simulations are run from these data points. The development of new product/service offerings along with the data points from the conjoint

analysis permit the simulation of consumer responses to the new product/service offerings (Tynan & Drayton, 1987). The simulations predict which consumer segments will be most receptive to specific hypothetical products or services.

Ensuring effective segmentation. Market segmentation is an imperfect practice and as platforms cultivate their segmentation strategies, the iterative process of effective segmentation development ensures valuable marketing, sales, and product configurations (Qualtrics, n.d.). This iterative process entails continual analysis of current and future segmentation considerations. To “be successful, [...] companies must adapt and apply their strategic and tactical plans to each segment” (Shaw, 2011, p. 261). Measurable, accessible, substantial, and actionable processes ensure that market segmentation strategies are effective (Qualtrics, n.d.). Table 5 outlines these processes and the pertinent actions synthesized from the literature that drive effective segmentations.

Table 5

Processes and Actions that Drive Effective Market Segmentations

Processes	Pertinent Actions	Reference
Measurable	Segmentation variables directly relate to product purchases (i.e., able to evaluate and predict how much a segment will pay for a specific product or service)	Qualtrics (n.d.)
	The purchasing power and the viable size of a segmented market	Tynan & Drayton (1987)
Accessible	How effective can a segment be reached and served (i.e., assessing medium, distribution, and influence of behaviors)	Tynan & Drayton (1987)
	Media mix must reach segment economically and efficiently	Tynan & Drayton (1987)
	Segments' characteristics and behaviors should yield the identification of the best method of reaching the market segment	Qualtrics (n.d.)
	Public relations, advertising, and promotion should focus on customer's needs and promoting profitability	Coltman et al. (2010); Shaw (2011)
Substantial	Segments have the capability to purchase (i.e., identified segments should not merely be interested in the products or services but yields an expectation of purchase and must be large enough, profitable enough, and economically viable for an organization)	Qualtrics (n.d.); Tynan & Drayton (1987)
Actionable	Segmentation must yield a differential response when subjected to a specific market offering (i.e., each segment must uniquely differ and potentially benefit from a specific product, service, and/or via diverse marketing mediums)	Reimer et al. (2014); Qualtrics (n.d.)
	Organizations need to be able to manage and predict future behaviors	Tynan & Drayton (1987)
	Skilled platforms should consider additional subsegments as an opportunity to add value	Shaw (2011)
	Optimize the components of goods or services deemed important to customers	Coltman et al. (2010)
	Consider a new vision for segmentation (i.e., segments are not a given, they require a creative approach to market segmentation, and are a result of a vision of the market)	Rusetski (2012)

When market segmentation is impractical as a strategy. Market segmentation is key to marketing strategies (Tynan & Drayton, 1987). The “idea that all markets can be profitably segmented has now received almost as wide-spread [*sic*] acceptance as the marketing concept itself” (Haley, 1968, p, 30). Although market segmentation is a vital tool and is depicted throughout most of the literature, one source depicted market segmentation as occasionally impractical. Young, Ott, and Feigin (1978) argued that the following market conditions make segmentation ineffective: a market is so small that marketing and advertising to a segment is not profitable, a few heavy users comprise the majority of sales and are the only relevant segments, and a specific brand is the prevailing brand in the market (i.e., that brand draws to all segments and directing a specific product or service to one or two of the segments in the market would not increase sales). No strategies were depicted during the review of the literature to foster overcoming the barriers that make market segmentation impractical as a strategy.

Coding Tree for First to Market

A coding tree was conceptually constructed for first to market as a key concept explored. The dimensional aspects of first to market were depicted as beneficial implementations and as the misconceptions/disadvantages of first to market. The literature review portrayed these important aspects of first to market. The indicators from the beneficial implementations as a dimensional aspect of first to market were coded as leadership in product or process technologies, preemption of assets, and development of buyer switching costs (Lieberman & Montgomery, 1988). The indicators from the beneficial implementations served to convey applicable measures, degrees, and/or strategic tactics. The indicators from the misconceptions and disadvantages as a dimensional aspect of first to market were coded as free-rider effects, resolution of market and design uncertainties, changes in technology and the ensuing impacts on

consumer needs, and incumbent inertia (Lieberman & Montgomery, 1988). The indicators of the misconceptions and disadvantages of first to market also served to convey pertinent measures, degrees, and/or strategic tactics. Figure 11 serves as a visual representation of the data and illustrates the coding tree amalgamated from the literature for first to market.

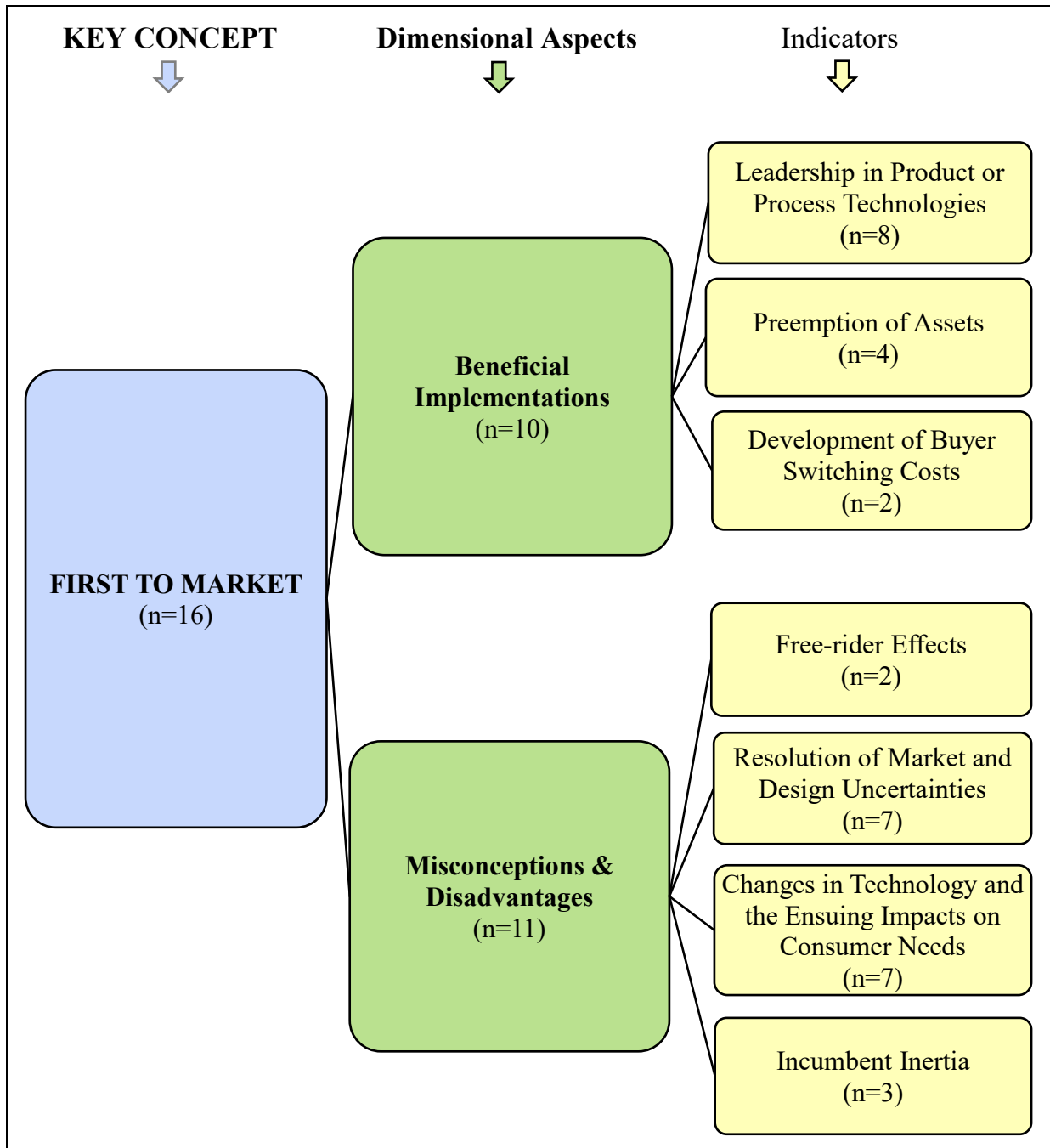


Figure 11. Coding Tree Illustrating First to Market as a Key Concept, its Dimensions, and Indicators.

First to Market

After searching the Scopus, ProQuest, EBSCOhost, and other databases (i.e., the preliminary research efforts that utilized Google and Google Scholar) and after narrowing the search by applying the search terms as well as inclusion and exclusion criteria, 15 sources were included for first to market as a key concept explored. After the review of the literature and references for the included sources were explored, one additional source fostering potential added insights into first to market were included within the study. The remaining unrelated articles or pertinent articles failed to meet the research focus on depth, applicability, and relevance. Those 85 articles were excluded from the review of the literature. Appendix I shows the excluded and included articles for first to market within the study. Appendix J shows the included articles that were utilized to construct the coding tree for first to market. The content utilized for the review of the literature served to broaden the understanding of first to market with the desired research aims taken into account. The review of the literature referred to the concept of first to market additionally as first mover, first to market advantage, and first mover advantage. These terms were also synonymously utilized within this study endeavor.

The initial research focus for first to market as a key concept was centered on comprehensively depicting the concept, portraying the applicational differences between the beneficial implementations and the cautionary misconceptions/disadvantages of its utilization, and relaying its pertinence to online platforms. These notions guided the review of the literature and yielded varying considerations within the broad platform research endeavor. Interestingly, there was consistency throughout the literature as to the effective implementations and what first to market does not provide for the originating organization (i.e., the misconceptions and

disadvantages of first to market). Lieberman and Montgomery (1988) defined first mover advantages

in terms of the ability of pioneering firms to earn positive economic profits (i.e., profits in excess of the cost of capital). First-mover advantages arise endogenously within a multi-stage process[... .] In the first stage[,] some asymmetry is generated, enabling one particular firm to gain a head start over rivals. This first mover opportunity may occur because the firm possesses some unique resources or foresight, or simply because of luck. Once this asymmetry is generated[,] a variety of mechanisms may enable the firm to exploit its position; these mechanisms enhance the magnitude or durability (or both) of first-mover profits. (p. 41)

Ragan and Adner (2001) presented the logic “that one driver of success (if not the key driver) in Internet-related [*sic*] business is being first [and that ...] view has merit” (p. 44). Ragan and Adner (2001) broadly portrayed how being first furnishes the following benefits: frontier-pushing business climates, free publicity, brand recognition, proprietary learning curves, and opportunities for businesses to lock-in unattached consumers and attain critical mass. Mooney (2016) depicted the strategic advantages of first-movers as “economies of scale, the ability to constrain resources and partnerships for latecomers, to create brand loyalty and a reputation for leadership, and to exploit switching costs (Datta et al., 2013; Markides & Sosa, 2013)” (p. 20). Dike and Rose (2017) described how first “movers enjoy high market shares, market dominance, consumer lock-in[,] and enhanced financial performance. [... However, first mover advantages] could be eroded with time, especially if followers have effective catch-up strategies. [... First mover advantages] can be sustained if first movers adopt sound innovative strategies” (p. 313). How these benefits are obtained and the impact of these strategies were at the core of defining

and expounding the indicators and dimensional aspects of first to market. The literature was clear in depicting the important impacts of being first to market and its crucial role regarding initial and continued business successes. However, the literature varied in the dimensional attributes and numerous indicators regarding first to market strategic implementations and the misconceptions and disadvantages of first to market.

Beneficial implementations. The “existence of some initial asymmetry among competitors [...] can be exploited by the first-mover firm. This initial asymmetry is critical; without it, first-mover advantages do not arise” (Lieberman & Montgomery, 1988, p. 42). The indicators for beneficial implementations as a dimensional aspect of first to market (i.e., leadership in product or process technologies, preemption of assets, and the development of buyer switching costs) serve organizations wishing to acquire or progress with being first to market (Lieberman & Montgomery, 1988).

Leadership in product or process technologies. Most “students of first-mover advantage have concentrated on *how* [*sic*] firms achieve them. [...] Creating] a technological edge over competitors” was noted as one of the main methods (Suarez & Lanzolla, 2005, p. 122). Sustainable first mover advantage is gained with two basic approaches: advantages derived from a learning or experience curve and success with research and development (R&D; Lieberman & Montgomery, 1988). The review of the literature depicted specific outcomes from these approaches. The learning or experience curve leads to reduced costs with increasing outputs, and R&D leads to strategic advances in product or process technologies (Lieberman & Montgomery, 1988). Although product and process technologies were conveyed as drivers of sustainable growth, the review of the literature also conveyed the importance of the well-thought-out context of technological advancements. Companies should consider what is strategically desirable versus

technologically feasible, and strategies should be centered on product and production advantages to sustain profitable growth (Porter, 1996; Rangan & Adner, 2001). The importance of the pace of the market and technological changes, and the potential impact of a new technology was also portrayed within the literature. Suarez and Lanzolla (2005) identified

two factors that powerfully influence a first mover's fate: the pace at which the technology of the product in question is evolving and the pace at which the market for that product is expanding. Knowing how fast or slow the technology and the market are moving will allow you to understand your odds of succeeding with the resources you possess. (p. 122)

Figure 12 depicts the relationship between the pace of a given market and technological changes, the potential for first-mover advantages, and the resources required. Figure 12 contextualizes how to achieve first-mover advantages given the environments faced by organizations in specific situations (Suarez & Lanzolla, 2005).

Is a First-Mover Advantage Likely?

Your company's odds of succeeding with the resources it possesses depend on how well you understand the market and the technology. Use this chart to match your company's skills and resources with the environment you face in a particular situation.

The Situation Your Company Faces	First-Mover Advantage		Key Resources Required
	Short-Lived	Durable	
Calm Waters	Unlikely Even if attainable, advantage is not large.	Very likely Moving first will almost certainly pay off.	Brand awareness helpful, but resources less crucial here
The Market Leads	Very likely Even if you can't dominate the category, you should be able to hold onto your customer base.	Likely Make sure you have the resources to address all market segments as they emerge.	Large-scale marketing, distribution, and production capacity
The Technology Leads	Very unlikely A fast-changing technology in a slow-growing market is the enemy of short-term gains.	Unlikely Fast technological change will give later entrants lots of weapons for attacking you.	Strong R&D and new product development, deep pockets
Rough Waters	Likely A quick-in, quick-out strategy may make good sense here, unless your resources are awesome.	Very unlikely There's little chance of long-term success, even if you are a good swimmer. These conditions are the worst.	Large-scale marketing, distribution, production, and strong R&D (all at once)

Figure 12. Likelihood of First-Mover Advantage Given the Pace of Market and Technological Changes. From "The Half-Truth of First-Mover Advantage," by F. Suarez and G. Lanzolla, 2005, *Harvard Business Review*, 83(4), p. 126. Copyright 2005 by the Harvard Business Publishing.

Learning/experience curve. Cumulative outputs can yield sustainable cost advantages due to the learning/experience curve (i.e., unit production costs fall) for the early entrant into a given market if learning and experience remain proprietary and if the first mover can keep market share dominance (Lieberman & Montgomery, 1988). Proprietary knowledge can yield significant benefits. A proprietary learning/experience curve "can generate substantial barriers to entry" (Lieberman & Montgomery, 1988, p. 43). Organizations wishing to compete may need to utilize specific strategies to remain competitive and overcome this barrier. Pricing strategies enter into play. Firms "that do enter may initially sell below cost in an effort to accumulate greater experience, and thereby gain a long-term cost advantage" (Lieberman & Montgomery, 1988, p. 43). The review of the literature gave theoretical and empirical examples as evidence to the impact of leadership in product or process technologies based on the learning/experience curve. One such example is from the article "First-mover Advantages" by Lieberman and Montgomery

(1988) and their depiction of the “Lincoln Electric Company (Fast, 1975); the firm’s early market entry with superior patented products, coupled with a managerial system promoting continued cost reduction in an evolutionary technological environment, [...] enabled the company to maintain high profitability for decades” (p. 43).

As technology diffuses into the market, first mover advantages stemmed from a learning/experience curve diminishes or disappears entirely (Burke, 2002; Lieberman & Montgomery, 1988). Targeting, timing, and product strategies were noted as crucial for early adoption strategies, and collaborative partnerships were depicted as key to blunt the later diffusion of innovation within a marketplace (Mooney, 2016). The review of the literature also described aspects that enhance the diffusion of innovation and diminish first mover advantages for incumbents. Workforce mobility, informal technical correspondences, research and peer-reviewed publications, plant tours, and reverse engineering were depicted as some of these approaches (Lieberman & Montgomery, 1988). Organizations need to consider adapting and serving continuous value to stakeholders as first mover advantages begin to diminish (Burke, 2002). Online business environments require “continuous vigilance, quick responses[,] and versatility as well as willingness to assume risks in order to survive and grow. Surviving the Internet [*sic*] battlefield asks for new strategic thinking and organizational flexibility that [...] fosters] continuous business transformation and innovation” (Constantinides, 2004, p. 102). Several successful online businesses have evolved to thrive within the ever-changing online business climate. Yahoo.com, Monster.com, Priceline.com, Ebay.com, Msn.com, and Amazon.com entered the online market mostly centered on the US marketplace, evolved with substantial growth to their scope and bottom line, and their organizational transformation

currently yields an entirely different business climate compared to their originating virtual ventures (Constantinides, 2004). Their evolution was depicted as vital. Transformation was necessary as survival strategy for these firms. Common elements of the virtual markets where these firms operate are low entry barriers and difficulty to safeguard original ideas from imitation. The initial success of [...these] pioneers quickly attracted competitors with similar offers, eager to acquire their part from the growing Web [*sic*] pie. The competition in the original core markets turned into a price-cutting race that threatened to evaporate profits and first mover advantages of the incumbents. The survival instinct quickly forced the pioneers to look for new markets and products for survival and growth. (Constantinides, 2004, p. 92)

Research and development. When “technological advantage is largely a function of R&D expenditures, pioneers can gain advantage if technology can be patented or maintained as trade secrets” (Lieberman & Montgomery, 1988, p. 43). The review of the literature portrayed this aspect as minimally beneficial, short-lived, and only truly applicable to a small quantity of industries (Lieberman & Montgomery, 1988). As “an empirical matter, such patent-races seem to be important in only a few industries, such as pharmaceuticals. In most industries, patents confer only weak protection, are easy to ‘invent around’, or have transitory value given the pace of technological change” (Lieberman & Montgomery, 1988, p. 43).

The literature did convey how patents offer little benefit to organizations, but conveyed the importance of ongoing product development. The “globalization of markets is a natural result of the steady decline in barriers to free flow of goods, services, and capital that has occurred since the end of World War II. The result has been a substantial increase in foreign competition” (Schilling & Hill, 1998, p. 68). This increase in competition has led to new market strategies.

The “more competitive a market becomes, the more difficult it is for companies to differentiate their product offerings on the basis of cost and quality. As a result, new product development has become central to achieving meaningful differentiation” (Schilling & Hill, 1998, p. 68).

Strategies to derive at successful product developments were also depicted during the review of the literature. Meyer, Willcocks, and Boushell (2008) described how R&D benefits from being centered on “segmenting markets for adjacent growth, brand and product positioning within new targets, user-centered design, validating and market testing concepts, and business modeling” (p. 42). The fit between new product attributes, consumer needs, and reducing the time to market were also portrayed as critical objectives of the product development process (Schilling & Hill, 1998). R&D efforts should be guided by exploring a fit amongst new product development goals, the current resources and competencies of the organization, and by how well the technology areas entered shape new core abilities and skills centered on the organizations’s long-term ambitions (Schilling & Hill, 1998). Also noted within the review of the literature was the applicability of R&D efforts. R&D does not simply apply to products and patents. Organizations may also “make improvements in managerial systems and may invent new organizational forms. Organizational innovation is often slow to diffuse, and hence may convey a more durable first-mover advantage than product or process innovation (Teece, 1980)” (Lieberman & Montgomery, 1988, p. 44).

Preemption of assets. First movers gain “advantage by controlling assets that already exist, rather than those created by the firm through development of new technology” (i.e., the preemption of scarce business assets; Lieberman & Montgomery, 1988, p. 44). Quader (2006) depicted the importance of not only identifying all assets of an organization, but how to marshal them. Figure 13 depicts a resource-based method of applying business tactics.

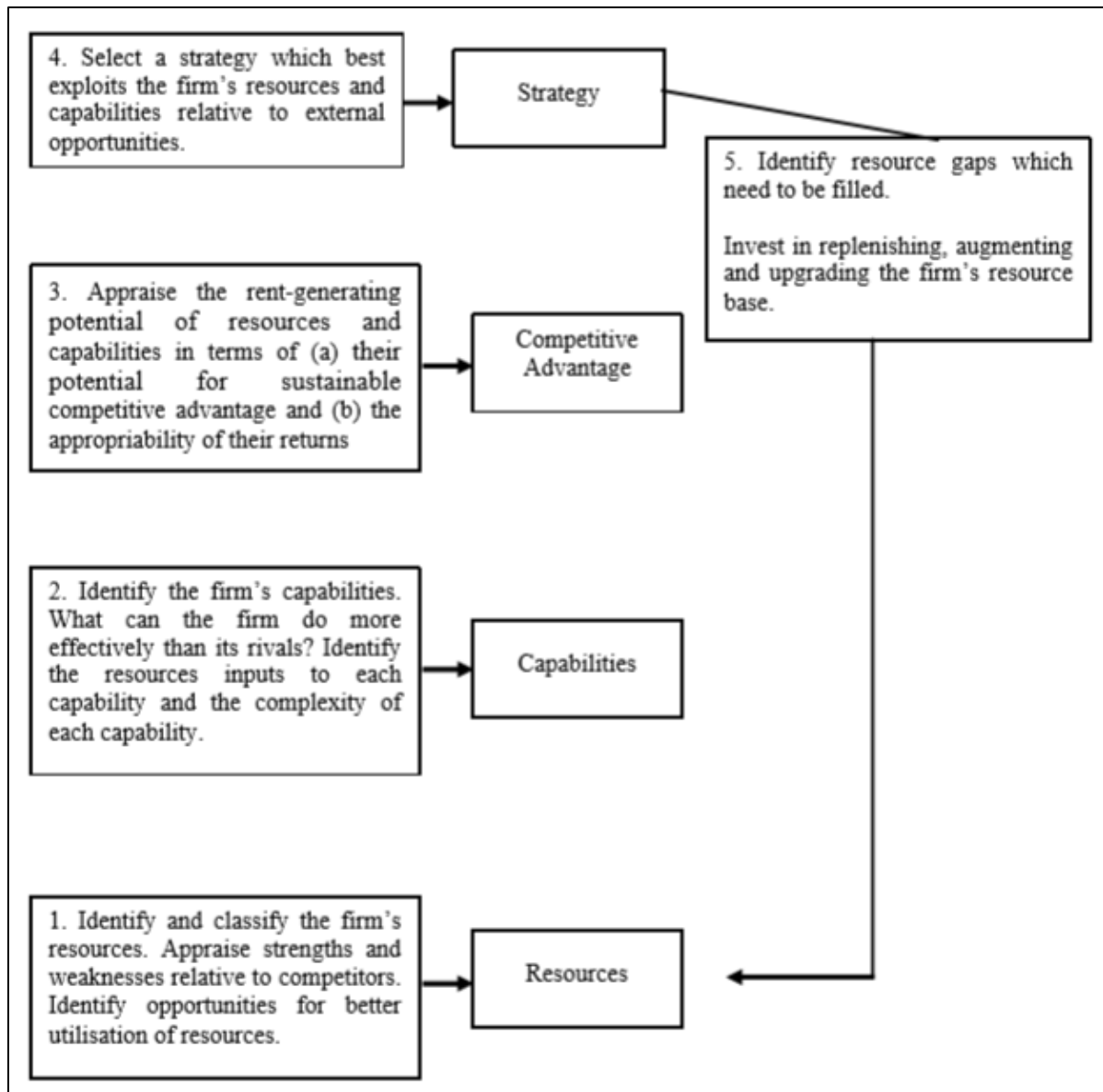


Figure 13. Resource-Based Approach to Business Strategies. Adapted from “The Strategic Implication of Electronic Commerce for Small and Medium Sized Enterprises,” by M. S. Quader, 2006, *Journal of Services Research*, 6(2), p. 35. Copyright 2006 by the Institute for International Management and Technology.

Scarce business assets come in various forms. Such “assets may be physical resources or other process inputs. Alternatively, the assets may relate to positioning in ‘space’, including geographic space, product space, shelf space, etc” (Lieberman & Montgomery, 1988, p. 44). The notions of preemption based on input factors (i.e., geography, product space, and product

characteristics) and investments in plant and equipment serve as advantages for those that are first to market.

The review of the literature also depicted preemption as advantageous for first movers given they have a sizeable and simple enough idea. Rangan and Adner (2001) depicted that the “*strategic [sic]* strain of first-mover advantage rests on preemption - the premise that ‘the early bird gets the worm’” (p. 44). The “Profits and the Internet: Seven Misconceptions” article depicted preemption having the following conditions: 1. the organization must be large enough for the opportunity and the opportunity should be large enough for one single organization and 2. the product/service must be straightforward enough that they are difficult to differentiate (Rangan & Adner 2001). Without these conditions, “later entrants can induce buyers to switch by offering better products and service[s]” (Rangan & Adner, 2001, p. 44). The internet serves as a medium where almost all of the criteria for preemption are unable to be met. Rangan and Adner (2001) portrayed how most “opportunities on the Internet [*sic*] are far from meeting the one-company-is-enough criterion. And even in exchanges and Web [*sic*] portals, where that criterion *might [sic]* hold, products and services are far from simple. In fact, there is tremendous scope for differentiation” (Rangan & Adner, 2001, p. 45).

Input factors. If the first mover organization has “superior information, it may be able to purchase assets at market prices below those that will prevail later in the evolution of the market” (Lieberman & Montgomery, 1988, p. 44). These scarce assets vary. Such assets include “natural resource deposits and prime retailing or manufacturing locations” (Lieberman & Montgomery, 1988, p. 44). Rangan and Adner (2001) also referred to input factors as “information on Web [*sic*] sites” (p. 45). One criticism of input factors, as pertinent to online platforms, was depicted

in “Profits and the Internet: Seven Misconceptions” and its depictions of input factors, cost differentials, and switching costs. Rangan and Adner (2001) considered

Yahoo. In the Internet-portal [*sic*] business, neither the scarcity of inputs (information on Web sites), nor cost differentials (to build and maintain search directories), nor user-switching costs are significant issues. Yahoo is not successful because of being a first mover, but because it is a *best* [*sic*] mover. (p. 45)

This drives at the importance of quality products and services. Being first to market does provide certain advantages, but carefully considered business strategies also determine an organization’s ability to be competitive within a marketplace. Business climates of quality are important for organizations to consider, but still must be applied with strategic market timing. This was noted in “Dynamics of Platform Competition: Exploring the Role of Base, Platform Quality and Consumer Expectations”. Zhu and Iansiti (2007) conveyed how

Park (2004) points out that if an incumbent has a big advantage due to a wide variety of available applications, a potential rival [...] with a significant cost or quality advantage should [... still consider not entering] the market since the incumbent’s installed-base advantage outweighs the cost and quality advantage of the potential entrant. (p. 3)

Geography, product space, and product characteristics. First movers are at an advantage and may deter market entry through spatial preemption strategies (Lieberman & Montgomery, 1988). These strategies do not simply refer to physical space. In

many markets there is ‘room’ for only a limited number of profitable firms; the first-mover can often select the most attractive niches and may be able to take strategic actions that limit the amount of space available for subsequent entrants. Preemptable ‘space’ can be interpreted broadly to include not only geographic space, but also shelf space and

‘product characteristics space’ (i.e. niches for product differentiation). (Lieberman & Montgomery, 1988, p. 44)

Rangan and Adner (2001) depicted how the internet and online businesses have a tremendous available scope of product and service differentiation. Lieberman and Montgomery (1988) described how “Robinson and Fornell (1985) found that new consumer product pioneers initially [...hold] product quality superiority over imitators and subsequently develop[...] advantages in the form of [...] broader product line[s]” (p. 45). Although a tremendous availability for differentiation exists online, there are “pioneers [that] try to reinforce their early lead by filling product differentiation niches (Lieberman & Montgomery, 1988, p. 45). First movers can strategically consider establishing multiple broad product lines so latecomers find it unprofitable to engage in competition (Lieberman & Montgomery, 1988).

Investments in plants and equipment. An “established first-mover can deter entry [...] through preemptive investment in plant and equipment” (Lieberman & Montgomery, 1988, p. 45). This is applicable to manufacturing, but was portrayed as negligible to online ventures. According to Rangan and Adner (2001) and their depictions of Yahoo, “cost differentials [...] to build and maintain search directories” are not significant enough to generate first mover advantages (p. 45). Lieberman and Montgomery (1988) also portrayed how these investment strategies do not seem to be especially important in practice except when applied to large scale economies. When “scale economies are large, first-mover advantages are typically enhanced” (Lieberman & Montgomery, 1988, p. 45).

Development of buyer switching costs. The review of the literature also depicted the development of buyer switching costs as a first mover advantage. With “switching costs, late entrants must invest extra resources to attract customers away from the first-mover firm”

Lieberman & Montgomery, 1988, p. 46). The literature also conveyed many different reasons for switching costs. Switching costs

can stem from initial transaction costs or investments that the buyer makes in adapting to the seller's product. These include the time and resources spent in qualifying a new supplier, the cost of ancillary products [...], and the time, disruption, and financial burdens of training new employees. (Lieberman & Montgomery, 1988, p. 46)

As supplier-specific learning (i.e. the characteristics of a given product and supplier) by the buyer increases with time, the costs associated with changing to another brand also grows (Lieberman & Montgomery, 1988). Contractual switching costs were also described in the literature. Contractual switching costs “may be intentionally created by the seller. Airline frequent-flyer programs fit in this category (Klemperer, 1986)” (Lieberman & Montgomery, 1988, p. 46).

The development of buyer switching costs was portrayed in the review of the literature as leading to brand loyalty. Buyers may

rationally stick with the first brand they encounter that performs the job satisfactorily.

Brand loyalty of this sort may be particularly strong for low-cost ‘convenience goods’

where the benefits of finding a superior brand are seldom great enough to justify the

additional search costs that must be incurred (Porter, 1976). (Lieberman & Montgomery,

1988, p. 46)

As “entrants lack installed bases, consumers tend to hold favorable expectations of the established platforms. [...] This] predicts that incumbents are likely to dominate the markets” (Zhu & Iansiti, 2007, p. 3). Strategic first movers may be able to capitalize on this loyalty. The literature review described how first movers may be able to strategically “establish a reputation

for quality that can be transferred to additional products through umbrella branding and other tactics (Wernerfelt, 1987)” (Lieberman & Montgomery, 1988, p. 46). This serves as a barrier for late entrants into a market. Late entrants “must have a truly superior product, or else advertise more frequently (or more creatively) than the incumbent in order to be noticed by the consumer” (Lieberman & Montgomery, 1988, p. 46). Consumer expectations and its role in shaping a given market were also described by Zhu and Iansiti (2007). When “consumers need to incur large fixed costs for access to platforms, they may take into account not only the current utility but also the expected future utilities from new applications” (Zhu & Iansiti, 2007, p. 13). Consumer preferences can also be influenced by pioneering products or services that enter into the market. If the pioneer of a product or service can establish a significant market share of consumers trialing a new product or service, the organization can define and promote the qualities that are perceived as desirable for a given product or service category (Lieberman & Montgomery, 1988). Pioneers “such as Coca-Cola and Kleenex have become prototypical, occupying a unique position in the consumer’s mind. Their large market shares tend to persist because perceptions and preferences, once formed, are difficult to alter” (Lieberman & Montgomery, 1988, p. 46). Additionally, there are high costs associated with information acquisition, but these benefits were depicted to dissipate over time as the value of the current and competing products and services diffuses into the marketplace (Lieberman & Montgomery, 1988; Wang & Wu, 2012).

Misconceptions and disadvantages of first to market. First mover advantage has been described as “a precarious perch on which to rest strategy and managers should not overrate the importance of early entrance and the durability of the advantages it might bring” (Rangan & Adner, 2001, p. 44). Given “that the Internet [*sic*] offers the potential to significantly reshape many industries, and that many new entrants may be encouraged to enter, there is likely to be

enhanced competition in many markets” (Quader, 2006, p. 31). Lieberman and Montgomery (1988) depicted first mover disadvantages as essentially benefits enjoyed by late movers into a market (Lieberman & Montgomery, 1988). This study also considered the literature to not only depict the misconceptions and disadvantages of first to market, but also describes the advantages that late movers derive from delayed entrance into a marketplace.

Free-rider effects. Late entrants “learn from first mover mistakes and adapt quickly to emerging markets (Vidal & Mitchell, 2013). [...] Late entrants could improve the potential for success by avoiding imitation, disrupting established competitors, and developing innovative business models (Markides & Sosa, 2013)” (Mooney, 2016, p. 21). Lieberman and Montgomery (1988) depicted how late movers “may be able to ‘free-ride’ on a pioneering firm’s investments in a number of areas including R&D, buyer education, and infrastructure development” (p. 47). First movers need to take caution regarding innovations. The “ability of follower firms to free-ride reduces the magnitude and durability of the pioneer’s profits, and hence its incentive to make early investments” (Lieberman & Montgomery, 1988, p. 47). The review of the literature showed how many business aspects can be impacted by late moving organizations within a market. Lieberman and Montgomery (1988) portrayed how late movers exploit marketing, distribution, and reputations to attract already trained employees from pioneering firms who spent resources in training personnel, how the diffusion of new technologies over time may be able to benefit competing firms, and how technological infrastructures (i.e., the implementation of complementary products) drive the magnitude of free-rider effects through the successful development and deployment of complementary products and services from the originating innovations. Mooney (2016) portrayed the disadvantages of

first-mover timing strategies [... as] the high costs associated with R&D and the risks of misjudging technical features or other launch elements that often [... open] the door for late entrants to correct mistakes made by first-movers (Datta et al., 2013; Markides & Sosa, 2013). While some first-movers could have adapted, many firms [... lack] the resources or speed to adjust before other entrants (Vidal & Mitchell, 2013). (p. 20)

Resolution of market and design uncertainties. Lieberman and Montgomery (1988) described how late movers into a market can gain a competitive edge by applying technological and market resolutions to shortcomings of first to market entrants. Late movers may be able to take advantage of first-mover's mistakes. For example, when Toyota was first planning to enter the U.S. market it interviewed owners of Volkswagens, the leading small car at that time. Information on what owners liked and disliked about the Volkswagen was incorporated in the design process for the new Toyota. (Lieberman & Montgomery, 1988, p. 47)

The review of the literature depicted how market entry involves risk, and entry should be determined by reflecting on timing market entry and the ensuing ramifications. Early entry is appealing when an organization can influence how uncertainty in a market or product/service is resolved, or when the resolution of uncertainties may potentially lead to the emergence of a dominant market or product/service standard or process (Lieberman & Montgomery, 1988). As previously mentioned, this strategy also requires an organization's ability to develop and deploy new complementary products and services. The "Model T Ford and the DC-3 are examples of dominant designs in the automotive and aircraft industries. After emergence[, ...] competition often shifts to price, thereby conveying greater advantage over firms possessing skills in low-cost [... processes] (Teece, 1986b)" (Lieberman & Montgomery, 1988, p. 48). Late entry into a

market may be beneficial as organizations can competitively target their efforts in low-cost processes. Firm size was also noted as important to consider as firms assess timing market entry. Large firms “may be better equipped to wait for resolution of uncertainty, or to hedge by maintaining a more flexible investment portfolio” (Lieberman & Montgomery, 1988, p. 47).

As late entrants consider market entry, different strategies have to be considered to compete within the market (i.e., strategic resolutions to compete with first to market entrants). “Competitive Actions and Dynamics in the Digital Age: An Empirical Investigation of Social Networking Firms” by Gnyawali, Fan, and Penner (2010) portrayed how the social networking service industry competes within the market. Because

development and testing of new products often takes a significant amount of time and resources, release of products in traditional industries often takes a long time and requires longer cycle [... times. Social networking service firms,] however, engage in continuous development of new product or service features anytime, anywhere (not constrained by firm boundaries and regular work hours)[,] and release them continuously through the website. (Gnyawali et al., 2010, p. 597)

Firms that competitively employ strategic actions on many fronts can influence industries, portray dominance, create legitimacy within the competitive landscape, and are driven by the prospect that some of their actions will be effective in user adoption and retention (Gnyawali et al., 2010). Late entrants have an advantage compared to market incumbents as they can deliberately consider strategies within the context of competition. The article “An Analysis of the Trilemma Phenomenon for Apple iPhone and Samsung Galaxy” conveyed the steps taken by Samsung to compete within the smartphone marketplace. In

the global smartphone market, the fast follower Samsung Electronics was found lacking in the trilemma phenomenon in terms of market share, business profit rate, and brand innovativeness while chasing the first mover Apple[...]. Based on its management philosophy, Samsung strategically [... emphasized] surviving by controlling the market instead of skillfully pursuing profits. (Yun, Lee, & Aoshima, 2019, p. 780)

As a fast follower (i.e., late market entrant), Samsung was able to assess its position within the marketplace and navigate the market to achieve its business objectives. Samsung was able to make “huge investments in marketing, new market penetration, and new product releases, at a faster pace than Apple to increase its shares in the global market based on its intention to dominate the stage” (Yun et al., 2019, p. 781). As a late market entrant, Samsung was able to assess the market, its competition, and considered tactics to drive their business efforts. Although

Samsung entered the market as the second mover about one year later than Apple, it rapidly attracted the market’s interest and created demand through strategic large-scale marketing investment and technological innovation. As a result, it won a market share advantage within only three years after entering the market. (Yun et al., 2019, p. 782)

The review of the literature revealed how a continuous pursuit for quality is needed as incumbents seek to maintain a market leadership position amidst competition. When market dynamics are driven by quality, a platform with a small quality advantage can also be successful, as [...] both indirect network effects and forward-looking behavior enhance quality advantage. Installed-base advantages thus do not necessarily provide a safety shield for the incumbent. To defend its leadership position, the incumbent needs to constantly enhance its quality. (Zhu & Iansiti, 2007, p. 26)

Schilling (1998) also described the importance of tactically managing corporate technological strategies to prevent lockout and remain competitive within the market. New

product development, learning, and methods of diffusing one's technology (through, for instance, open systems, strategic alliances, licensing arrangements, and aggressive marketing) [... has] shown that the technology adoption process may be strongly influenced by *internal* [*sic*] firm attributes and strategies. The firm's breadth of capabilities, the size of the installed base of its technology, the availability of complementary goods, and its timing of entry are all functions of *strategic choices* [*sic*] made by the firm. (Schilling, 1998, p. 283)

Strategic management was portrayed as key. A "firm that has a greater understanding of [...these] forces driving technology selection, and that effectively manipulates them to its favor, should have a competitive advantage in technology markets" (Schilling, 1998, p. 283).

The review of the literature additionally conveyed a broad level approach to competitively assess and navigate a given market. To "achieve a superior market position, awareness and knowledge of the market place is essential, not only the broad structure should be analysed, but the particular requirements, strength, views[,] and intentions of all the market forces need to be ascertained" (Quader, 2006, p. 29). Figure 14 illustrates the market forces to consider for navigating towards a competitive market position.

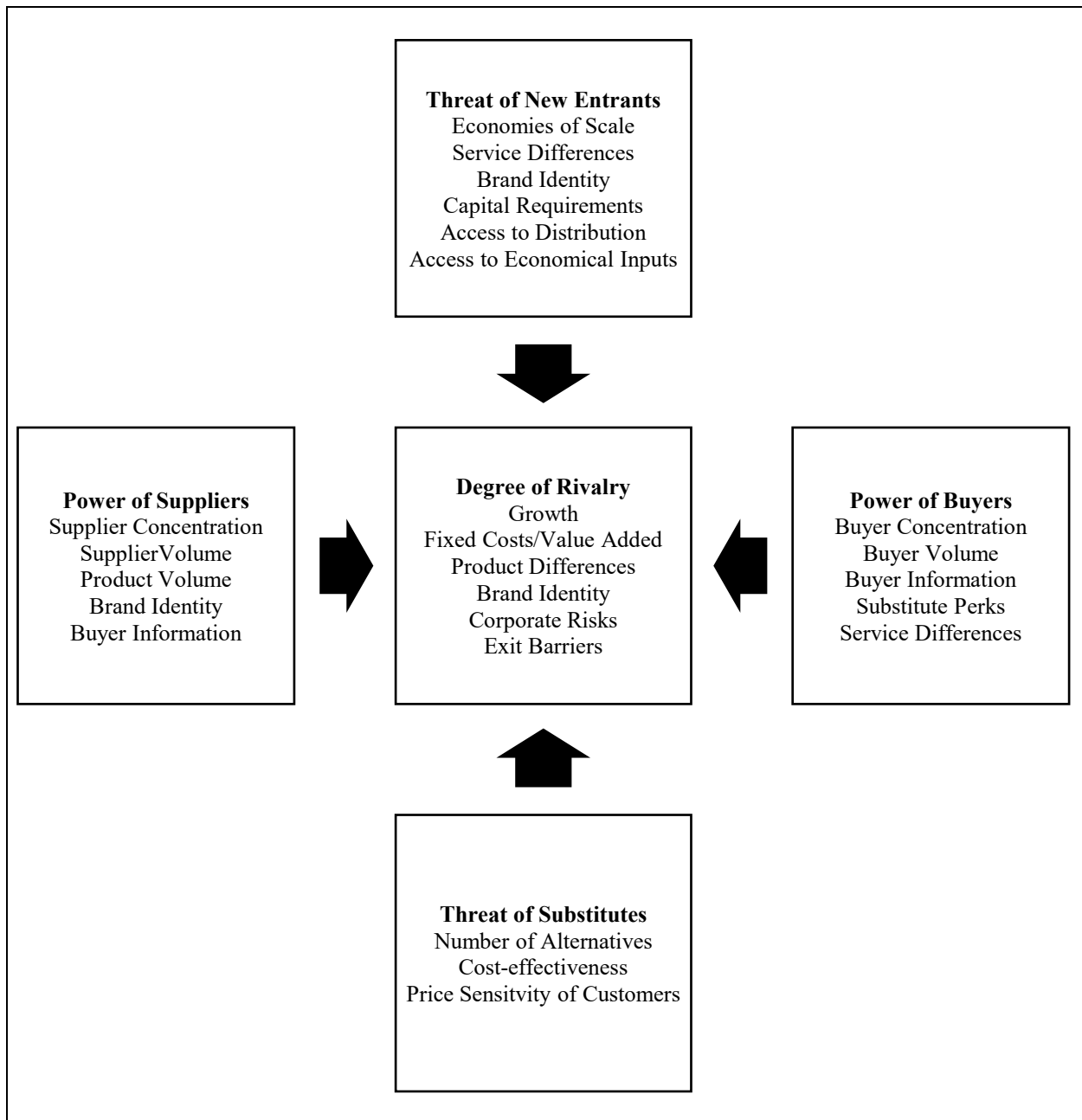


Figure 14. Market Strategies Amidst Market Forces. Adapted from “The Strategic Implication of Electronic Commerce for Small and Medium Sized Enterprises,” by M. S. Quader, 2006, *Journal of Services Research*, 6(2), p. 30. Copyright 2006 by the Institute for International Management and Technology.

Market forces are important to consider, but Kim and Mauborgne (1997) presented an additional step that needs to be taken by firms and entrants who wish to thrive in the marketplace.

Organizations must

stop and think about the industry's assumptions, the company's strategic focus, and the approaches - to customers, assets and capabilities, and product and service offerings - that are taken as given. [... Organizations wishing to reframe] the company's strategic logic around value innovation [...] must ask the four questions that translate into a new value curve: Which of the factors that our industry takes for granted should be eliminated? Which factors should be reduced well below the industry's standard? Which should be raised well above the industry's standard? What factors should be created that the industry has never offered? [...] Value innovation is the simultaneous pursuit of radically superior value for buyers and lower cost for companies. (Kim & Mauborgne, 1997, p. 112)

Figure 15 shows the differences between the conventional logic and value innovation logic that fosters competitive advantages.

Two Strategic Logics		
The Five Dimensions of Strategy	Conventional Logic	Value Innovation Logic
Industry Assumptions	Industry's conditions are given.	Industry's conditions can be shaped.
Strategic Focus	A company should build competitive advantages. The aim is to beat the competition.	Competition is not the benchmark. A company should pursue a quantum leap in value to dominate the market.
Customers	A company should retain and expand its customer base through further segmentation and customization. It should focus on the differences in what customers value.	A value innovator targets the mass of buyers and willingly lets some existing customers go. It focuses on the key commonalities in what customers value.
Assets and Capabilities	A company should leverage its existing assets and capabilities.	A company must not be constrained by what it already has. It must ask, What would we do if we were starting anew?
Product and Service Offerings	An industry's traditional boundaries determine the products and services a company offers. The goal is to maximize the value of those offerings.	A value innovator thinks in terms of the total solution customers seek, even if that takes the company beyond its industry's traditional offerings.

Figure 15. Conventional Logic Versus Value Innovation Logic. From "Value Innovation: The Strategic Logic of High Growth," by W. C. Kim and R. Mauborgne, 1997, *Harvard Business Review*, 75(1), p. 106. Copyright 1997 by the Harvard Business Publishing.

Changes in technology and the ensuing impacts on consumer needs. Technology has made “immeasurable contributions to society and to the success of countless companies. Like electricity 100 years ago, the electronic phenomenon we call ‘digiticity’ is likely to have a profound influence on what, how[,] and for whom companies produce” (Rangan & Adner, 2001, p. 50). This digiticity seems to be a current and thriving driver of new business strategies (Rangan & Adner, 2001). Yet

the fundamentals of economics and strategy have not changed and are not about to.

Technology and strategy are strong complements, *not* [*sic*] substitutes. Companies that understand their technology better than they do their customers and their competition won’t succeed in any economy, new or old. (Rangan & Adner, 2001, p. 50)

Replacements frequently emerge as old technologies are still growing and dominant market incumbents may have a difficult time recognizing the threats and adapting with preventative measures (Lieberman & Montgomery, 1988). The ability of organizations to adapt to shifts in technologies and the ensuing changing needs of consumers is needed to remain competitive. Lieberman and Montgomery (1988) described how “Schumpeter (1961) conceived of technological progress as a process of ‘creative destruction’ in which existing products are superseded by the innovations of new firms. New entrants exploit technological discontinuities to displace existing incumbents” (p. 48). The review of the literature depicted this ability of late market entrants to displace incumbents by a specific term. Lieberman and Montgomery (1988) termed this failure by incumbents as perceptual failure and also noted the impact of this perceptual failure when incumbents fail to recognize the changing needs of consumers. Perceptual failure was also depicted in the literature as organizations seek growth. Companies “have long perceived that the more they can deploy existing activities and resources to pursue

new customer segments and extend reach, the more they can grow their revenues and earnings” (Rangan & Adner, 2001, p. 46). The pursuit of reach is a doubled-edged sword. The “more reach a company attempts, the greater the risk it runs of undermining *fit [sic]*” (Rangan & Adner, 2001, p. 46). Companies with healthy business practices should heed caution regarding reach opportunities that drive changes to core business actions, as these core aspects are key to customer value (Rangan & Adner, 2001). The review of the literature also depicted focus as an important aspect for businesses to consider as new technologies and the ensuing needs of consumers change. Rangan and Adner (2001) described how an enticing strategy for growth delivers on customer solutions (i.e., transcending a simple product or service and offering consumers complements to make better use of the core offerings). As in the reach strategy, “there is an underlying tension to the customer-solutions strategy that many companies don’t see. [... The] tension is between providing a solution and maintaining focus. Focus is about specialization” (Rangan & Adner, 2001, p. 47). As organizations seek to be competitive within a market, customer complements should be centered around value to customers through fit and specialization. Specialization drives effectiveness and efficiency (Rangan & Adner, 2001). If “the market is competitive, it will hurt *not [sic]* to do so. [...] Generalists that fail to confront the what-business-are-we-in question will find success all the more elusive” (Rangan & Adner, 2001, p. 47-48). The lack of focus (i.e., specialization) is a perceptual failure of organizations seeking growth not centered on products or services in line with the mission of the business. It is not first mover or late mover advantages that necessarily drive fit and focus. It is business strategies that drive these aspects. As technologies change, the needs of consumers change and provide new opportunities in the market. Consumer needs are continuously evolving and create openings for late market entrants; the first mover must be vigilant and capable of responding

competitively with value and focus specific to what fits their customers' needs (Lieberman & Montgomery, 1988; Rangan & Adner, 2001). Regarding internet related businesses, Rangan and Adner (2001) expounded on the importance of focus. Figure 16 depicts various internet sectors and the important key value drivers organizations should consider focusing on to be competitive within the marketplace.

Six Broad Internet Sectors			
Sector	Broad Characterization of Focal Offers	Key Value Drivers	Companies That Target the Sector
Infrastructure	Access, communication, interpretation, digitization, interconnectedness, display, storage, retrieval and processing	Availability, security, coverage, speed, scalability, mobility and price	Akamai, AOL, BEA Systems, E Ink, Ericsson, Exodus, Global Crossing, Intel, Lucent, Microsoft, Nortel, Sun Microsystems, Telefonica, Tibco Software and VeriSign
Applications	Organization, simplification, presentation, manipulation, analysis, tracking, matching, and reception and transmission of information	Functionality, reliability, efficiency, compatibility, upgradability, privacy and price	Adobe, Ariba, Commerce One, DoubleClick, Inktomi, Intuit, Marimba, Microsoft, Oracle and SAP
Portals	Internet gateway, search and navigation, links to services and content, and broadcast medium (for advertising)	Exhaustiveness, speed, convenience, privacy, community experience, customizability, size and attractiveness of user base, and price	AOL, CEOExpress, Excite, iVillage, StarMedia Networks, TerraLyco and Yahoo!
Content	Information (general and specific, current and archived), news, entertainment (including games) and databases	Accuracy, timeliness, completeness, appeal, interactivity and price	AOL Time Warner, CNN, Bloomberg, EMI, Multex, Newscorp, Pearson, Reuters and WebMD
Services	An act that satisfies a need or want	Quality of experience, efficiency, reliability, convenience, customization, privacy and price	Amazon, bfinance, ChateauOnline, E*Trade, FreeMarkets, W.W. Grainger, Media Metrix, Merck-Medco, MeritaNordbanken, Travelocity and WebMD
Exchanges	A virtual trading place, and matching and creation of supply and demand	Transaction density, trust, transaction security, privacy, support services (such as insurance and delivery) and price	Bandex, ChemConnect, Covisint, eBay, Elemica, e-Steel, QXL and Ventro

Figure 16. Broad Internet Sectors and Their Key Value Drivers. From "Profits and the Internet: Seven Misconceptions," by S. Rangan and R. Adner, 2001, *MIT Sloan Management Review*, 42(4), p. 48. Copyright 2001 by the Massachusetts Institute of Technology.

Regarding online business ventures, settling

on a focal industry will help a company decide the depth and breadth of each product or service it wants to offer. It also will help when the company evaluates alternatives and changes to its scope. Failure to decide the company's core sector may keep it from being

best - or invite it to conduct potentially dangerous experiments along the dimensions of reach and customer solutions. (Rangan & Adner, 2001, p. 49)

Quader (2006) described how differentiation creates uniqueness within a market, cost leadership within an industry offers a low-cost market position for consumers, and focus should be applied within a particular segment. These strategies, within the context of fit, can help organizations to achieve sustainable competitive advantages (Quader, 2006; Rangan & Adner, 2001). The review of the literature also portrayed a partnering strategy as commonly considered by organizations seeking to be a market leader. To “resolve the tensions between reach and fit, managers are increasingly opting for a partner-leverage strategy - capitalizing on or creating a market opportunity by combining their resources and capabilities with those of other companies” (Rangan & Adner, 2001, p. 49). Capability

acquisitions require considerable commitment of resources and can involve accumulation of unwanted assets (Hennart and Reddy 1997, Reuer and Koza 2000). Therefore, interfirm alliances, often with start-up firms, have been seen as a possible mechanism to alleviate such problems (e.g., Arora and Gambardella 1990, Harrison et al. 2001, Penner-Hahn 1998, Rothaermel 2001, Stuart and Podolny 1996, Vassolo et al. 2004). Such alliance activity permits less-endowed firms to pursue new technologies that would otherwise be beyond their reach. (Anand, Oriani, & Vassolo, 2010, p. 1213)

In “partner leverage, a company identifies and works with one or more partner companies, each of which is called on to make a discrete and complementary contribution toward the pursuit of a target opportunity” (Rangan & Adner, 2001, p. 49). Technology makes these partnerships less difficult. The “Aarikka-Stenroos et al. (2014) [study described how ...] partnerships and alliances contributed to the commercialization process in three key ways: (a) created markets, (b)

performed commercialization tasks, and (c) facilitated new product innovation diffusion or adoption” (Mooney, 2016, p. 29). Gnyawali et al. (2010) described how value co-creation is fostered through enhancing technologies and applicability, and collaborating with other highly regarded competitors builds the organization’s reputation, legitimacy, and access to new markets. Partner “leverage can be a sensible approach, but managers should not elevate it to the status of unambiguous virtue” (Rangan & Adner, 2001, p. 49). The internet makes it easier and cheaper to leverage strategic partnerships, but must be done only with tactically aligned interests (Rangan & Adner, 2001). As organizations look towards possible leveraged partnerships, they must ask themselves the following:

To what extent will our partners’ interests diverge from our own, [to what extent will] the quality of our offering[s] be subject to our partners’ discretion, and [to what extent will] monitoring our partners entail prohibitive cost[s] to us? The lesser the extent to which each condition holds (or can be made to hold), the more sense it makes to rely on partner leverage. (Rangan & Adner, 2001, p. 51)

As organizations choose technologies to obtain through partnerships, they must also evaluate the impact of the learning that could be amassed through the development of the product or service, its timeframe for market entry (i.e., the cycle time), and the implications regarding the organization’s future success (Schilling & Hill, 1998). The review of the literature also noted an important misconception that needs to be considered as organizations seek competitive advantage within an ever-changing technological climate. Rangan and Adner (2001) portrayed the importance of differentiating between technology and strategy. Organizations should first ask:

To what extent are we doing something just because new technology means we *can* [*sic*] do it instead of doing what we *should* [*sic*] do? The more that “should” dominates “can” in your thinking, the lower the risk that you are substituting technology for strategy.

(Rangan & Adner, 2001, p. 51)

Incumbent Inertia. According to Rangan and Adner (2001), it “is time to stop grabbing the land and start cultivating it” (p. 46). Regarding global growth considerations, organizations need to be “successful at home, then move outward in a manner that anticipates and genuinely accommodates local differences” (Rangan & Adner, 2001, p. 49). As organizations seek growth, they must ask themselves: “To what extent do we lead in our home market, understand the market discontinuities we will face abroad, and have competitive advantage over rivals abroad? The more each condition holds, the safer it is to expand into the target foreign market” (Rangan & Adner, 2001, p. 51). Incumbents see the potential for global growth as an effortless endeavor and it is easy to understand why with the fast speed of the internet, accessibility, and low costs associated with global online expansion efforts (Rangan & Adner, 2001). This holds true not only for global growth but for growth efforts into any new market. Incumbent inertia can be a disadvantage if growth efforts are not centered on an organization’s ability to adapt to new competitive landscapes (Rangan & Adner, 2001). Anand et al. (2010) described how firms can be

constrained internally in generating new capabilities due to organizational inertia and path dependence (Cyert and March 1963), so firms that possess capabilities in the traditional technology may not be able to develop capabilities in the emerging technology with ease (Cohen and Levinthal 1990, Nelson and Winter 1982). (p. 1213)

Lieberman and Montgomery (1988) also depicted inertia as a disadvantage of being first to market. Vulnerability

of the first-mover is often enhanced by ‘incumbent inertia’. Such inertia can have several root causes: (1) the firm may be locked-in to a specific set of fixed assets, (2) the firm may be reluctant to cannibalize existing product [or service] lines, or (3) the firm may become organizationally inflexible. These factors inhibit the ability of the firm to respond to environmental change[s] or competitive threats. (Lieberman & Montgomery, 1988, p. 48)

The choice to adapt to new market changes is often instinctively fixated and driven by costs and profits. Incumbent “inertia is often a rational, profit-maximizing response, even though it may lead to organizational decline” (Lieberman & Montgomery, 1988, p. 48). Decisions need to be strategically considered and not simply made because they are the next logical and progressive step. Lieberman and Montgomery (1988) expressed this point in describing how organizational “inertia has often led firms to continue investing in their existing asset base well beyond the point where such investments are economically justified” (p. 48).

Critical “mass and network externalities attract attention because they fuel user adoption and lock-in, and can trigger a winner-take-all dynamic” (Rangan & Adner, 2001, p. 45). The attention these notions foster drives new business opportunities and fuels organizations seeking to develop products and services. The temptation is to trigger a winner-take-all dynamic, but companies may need to heed caution. Rangan and Adner (2001) portrayed how “there is no guarantee that the benefits of user adoption and lock-in will go to the first mover” (p. 45). As first movers seek entry with new business concepts, it is important to remember to drive efforts focused on strategy and not merely on capturing critical mass and network externalities (Rangan

& Adner, 2001). It is important to be adaptable to changes in the market, competitors, technologies, and consumers' needs.

Omitted Key Concepts

Appendices K, L, and M show the excluded and included articles considered for the explorations of best of breed, search costs and transaction costs, and minimally viable product respectively. This study's research interests were focused on depth of content, applicability to online platforms as the desired platform medium, platforms' strategic framework, and on the potential relevance to the anesthesia CE marketplace. The emphasis taken by this endeavor was on how to strategically model a unified sustainable anesthesia CE platform and the content chosen for amalgamation was done to facilitate this undertaking. All of the key platform concepts were explored with a combination of search terms that were felt to fit with the aforementioned research efforts. The review efforts for best of breed, search costs and transaction costs, and minimally viable product yielded the following: Inclusive of five considered sources that primarily discussed general business tactics and the potential applicational content narrowly touched on how platforms can strategically be or become best of breed, inclusive of two considered sources with minimal potential applicational content available on how developing or established platforms can strategically decrease search costs and transaction costs, and inclusive of no sources with potential applicational content that conveyed how to strategically arrive at or design a platform as a minimally viable product. The review of the references from the available inclusive sources produced no additional content in line with the research interests. Due to the lack of depth, applicability, and relevance found during the review of the literature for best of breed, search costs and transaction costs, and minimally viable

product, these concepts were not amalgamated as key concepts within this study. However, these concepts are portrayed via various depictions throughout the integrative review of the literature.

Coding Tree for Evolutionary Phases of Platforms

A coding tree was conceptually constructed for the evolutionary phases of platforms as a key concept explored. The entry, growth, expansion, and maturity stages each served as longitudinal dimensions of the evolutionary phases of platforms (Kim & Yoo, 2019). The indicators of the entry stage were coded as choosing a platform business service, external analysis, and internal analysis (Kim & Yoo, 2019). The indicators of the growth stage were coded as building a two-sided market, subsidization, and cross-subsidization (Kim & Yoo, 2019). The indicators of the expansion stage were coded as promoting network effects, same-sided/cross-sided network effects, and critical mass (Kim & Yoo, 2019). The indicators of the maturity stage were coded as completing the business ecosystem, quality management, and revenue structure (Kim & Yoo, 2019). The indicators of each evolutionary phase of platforms served as measures, degrees, and/or strategic tactics specific to their respective evolutionary phase. Figure 17 serves as a visual representation of the data and illustrates the coding tree amalgamated from the literature for the evolutionary phases of platforms.

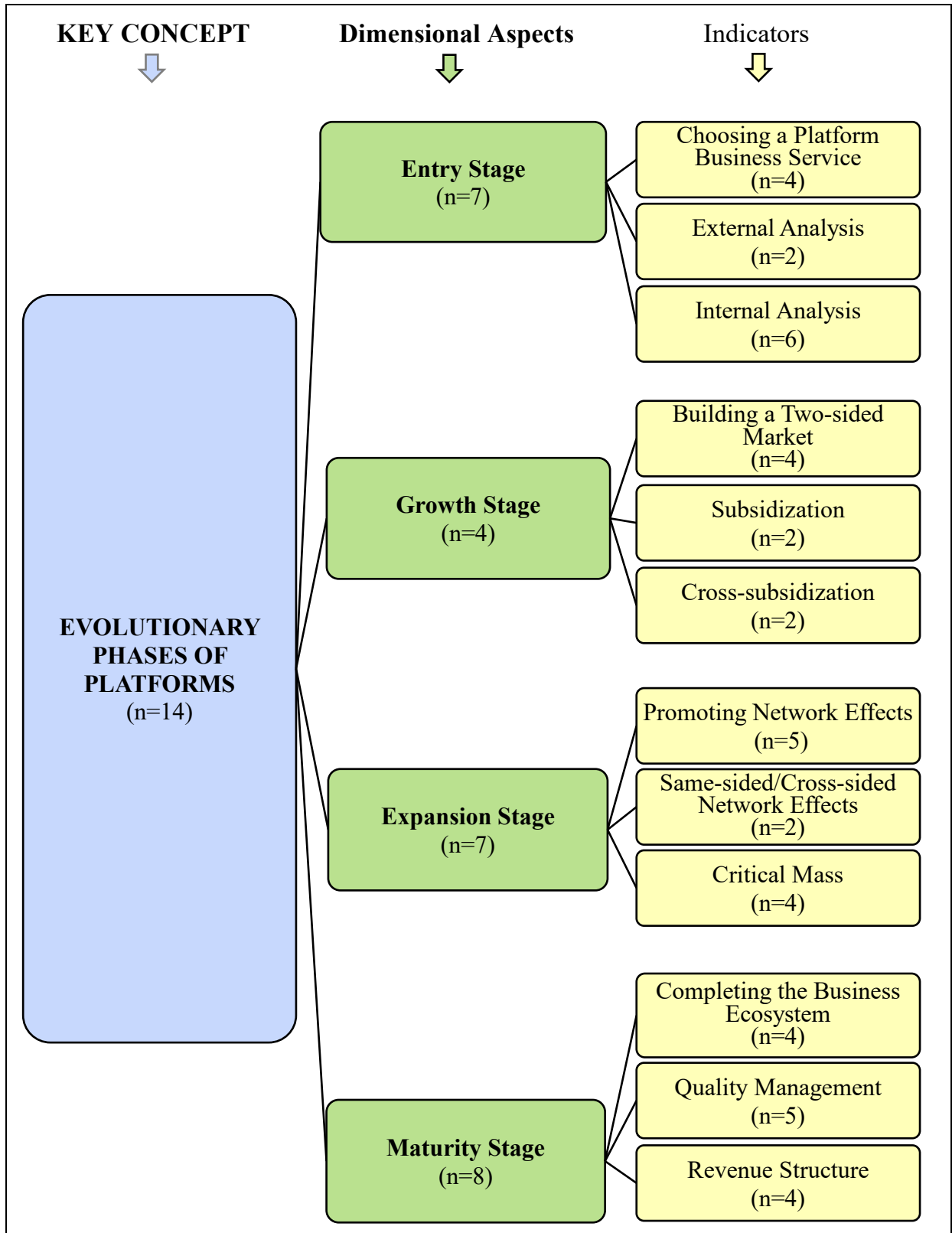


Figure 17. Coding Tree Illustrating the Evolutionary Phases of Platforms as a Key Concept, its Dimensions, and Indicators

Evolutionary Phases of Platforms

After searching the Scopus, ProQuest, EBSCOhost, and other databases (i.e., the preliminary research efforts that utilized Google and Google Scholar) and after narrowing the search by applying the search terms as well as inclusion and exclusion criteria, seven sources were included for the evolutionary phases of platforms as a key concept explored. After the review of the literature and references for the included sources were explored, seven additional sources fostering potential added insights into the evolutionary phases of platforms were included within the study. The remaining unrelated articles or pertinent articles failed to meet the research focus on depth, applicability, and relevance. Those 63 articles were excluded from the review of the literature. Appendix N shows the excluded and included articles for the evolutionary phases of platforms within the study. Appendix O shows the included articles that were utilized to construct the coding tree for the evolutionary phases of platforms. The content utilized for the review of the literature served to broaden the understanding of the evolutionary phases of platforms with the desired research aims taken into account.

The initial research focus for the evolutionary phases of platforms as a key concept was centered on identifying and depicting the lifecycles of platforms. These notions guided the search terms employed to initially explore the evolutionary phases of platforms and yielded varying considerations within the broad platform research endeavor. This study explored the evolutionary phases of platforms considering their differing needs as they progress through their lifecycles and grow seeking long-term business success. The depictions within this study were made promoting “an understanding of how a platform [... evolutionary model] successfully enables business entities to enter a market and continue expansion” (Kim & Yoo, 2019, p. 1). Various terminologies and lifecycle depictions were encountered. This study succinctly conveys these

differing accounts and several pertinent attributes from the review of the literature but focused on thoroughly portraying a unified depiction of the evolutionary phases of platforms and their applicable strategic considerations. This study greatly drew from Kim and Yoo (2019) in structuring the construct of the evolutionary phases of platforms as a key concept and the review of literature primarily served as additional context and augmentations. Like the Kim and Yoo (2019) study, this endeavor centered its portrayals of the lifecycle stages of platforms as entry, growth, expansion, and maturity. A thorough understanding of the strategies for each evolutionary phase is crucial for firms seeking to develop a thriving platform (Kim & Yoo, 2019). The four stages were expounded with depictions of their strategic aims and corresponding core elements. The review of the literature portrayed how each stage “has a different set of tasks, and each task has a different set of decision items and influence factors to be considered” (Kim & Yoo, 2019, p. 5). These notions were amalgamated from the review of the literature. Figure 18 details the four stages of the growth model, the purpose and strategic questions each evolutionary phase strives to meet, and the corresponding essential aspects of each stage.

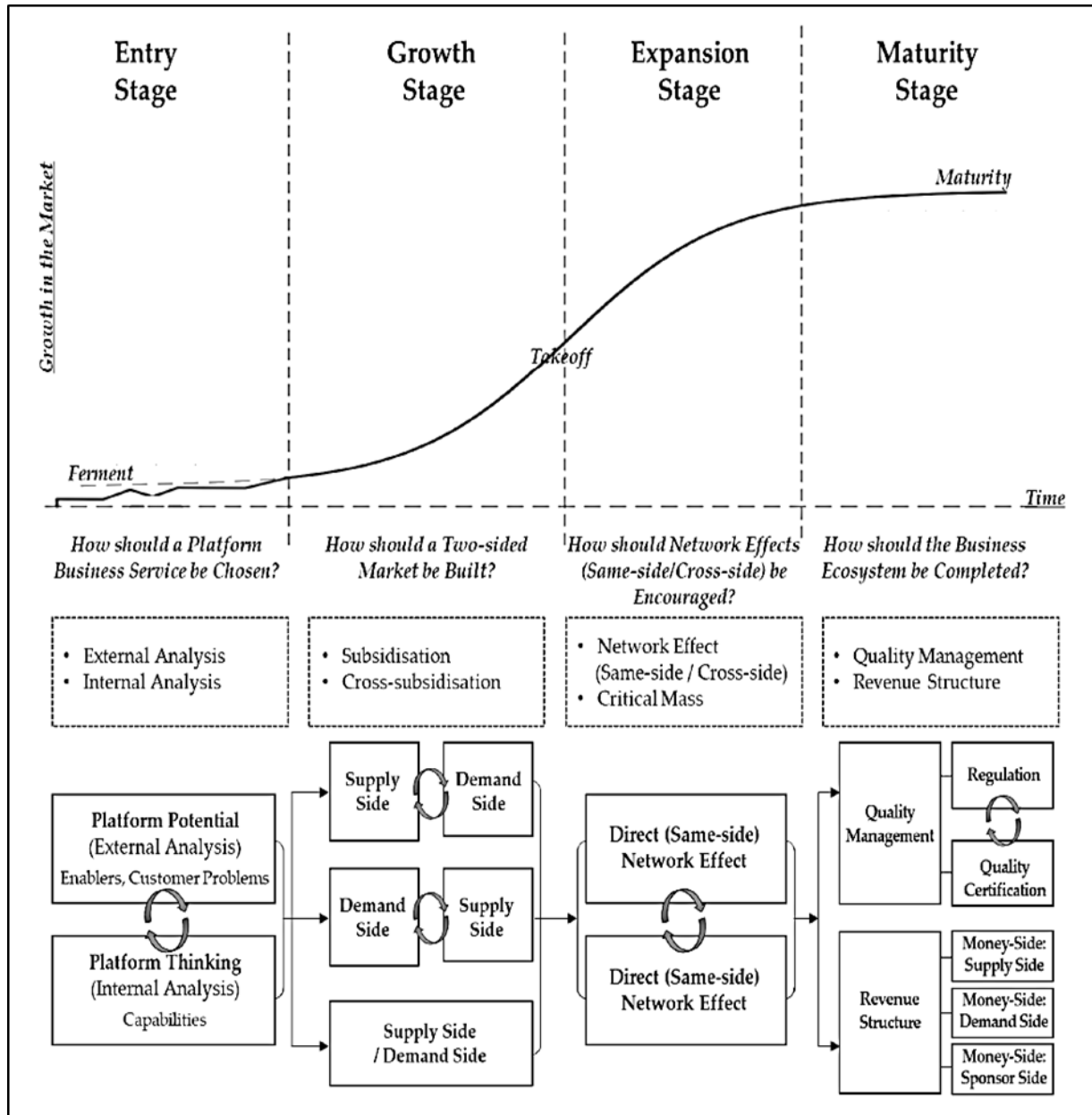


Figure 18. Platform Growth Model. From “Platform Growth Model: The Four Stages of Growth Model,” by J. Kim and J. Yoo, 2019, *Sustainability*, 11(20), p. 11. Copyright 2019 by Junic Kim and Jaewook Yoo.

A “critical issue for managers is to learn to manage the evolution of their industry platforms and accompanying ecosystems and make interrelated technological and business decisions” (Gawer & Cusumano, 2014, p. 429). Figure 19 portrays effective platform management strategies as portrayed by Gawer and Cusumano (2014). These strategies coincide with the basic functions of each evolutionary phase depicted within this research endeavor.

-
1. Develop a vision of how a product, technology, or service could become an essential part of a larger business ecosystem
 - a. Identify or design an element with platform potential (i.e., performing an essential function and easy for others to connect to)
 - b. Identify third-party firms that could become complementors to your platform (think broadly, possibly in different markets and for different uses)
 2. Build the right technical architecture and “connectors”
 - a. Adopt a modular technical architecture, and in particular add connectors or interfaces so that other companies can build on the platform
 - b. Share the intellectual property of these connectors to reduce complementors’ costs to connect to the platform. This should incentivize and facilitate complementary innovation.
 3. Build a coalition around the platform: Share the vision and rally complementors into cocreating a vibrant ecosystem together
 - a. Articulate a set of mutually enhancing business models for different actors in the ecosystem
 - b. Evangelize the merits and potentialities of the technical architecture
 - c. Share risks with complementors
 - d. Work (and keep working) on firm’s legitimacy within the ecosystem. Gradually build up one’s reputation as a neutral industry broker
 - e. Work to develop a collective identity for ecosystem members
 4. Evolve the platform while maintaining a central position and improving the ecosystem’s vibrancy
 - a. Keep innovating on the core, ensuring that it continues to provide an essential (and difficult to replace) function to the overall system, making it worthwhile for others to keep connecting to your platform
 - b. Make long-term investments in industry coordination activities, whose fruits will create value for the whole ecosystem
-

*Figure 19. Effective Platform Management Strategies. From “Industry Platforms and Ecosystem Innovation,” by A. Gawer and M. A. Cusumano, 2014, *Journal of Product Innovation Management*, 31(3), p. 429. Copyright 2013 by the Product Development & Management Association.*

Entry stage of platforms. The entry (i.e., initial) stage was defined by Kim and Yoo (2019) as being facilitated by external and internal analyses. These analyses serve as the core elements of this growth cycle and define the attributes at the heart of the strategic question driving this evolutionary phase. The following question is central in portraying the strategic considerations within the entry growth stage: “How should a platform business service be chosen?” (Kim & Yoo, 2019, p. 10). This question was “answered with the ways to cultivate new platforms” (Kim & Yoo, 2019, p. 10).

Choosing a platform business service. Saarikko, Jonsson, and Burström (2019) described “four types of entrepreneurial awareness present in the establishment of a platform: market, resource, technology and context awareness [...that] should be pursued, and deployed, in unison” (p. 598). In regards to cultivating new platforms, Saarikko et al. (2019) depicted two activity patterns (i.e., exploration and exploitation) and two cognitive patterns (i.e., foresight and insight) that portray the actions and “describe the types of knowledge and experience that are

leveraged for entrepreneurial action” (p. 584). The commingling of the activity and cognition patterns form the necessary types of entrepreneurial awareness. Exploitation “includes processes related to refinement, production, and efficiency, whereas exploration relates to searching, experimentation, and discovery” (Saarikko et al., 2019, p. 583). Exploitative activities relate to “established knowledge areas, performance metrics[,] and entrepreneurial profit” (Saarikko et al., 2019, p. 583-584). Explorative activities refer to search, experimentation, and “represent potential areas of future exploitative activities” (Saarikko et al., 2019, p. 584). Strategic foresight “refers to a business-oriented sensitivity to opportunities for improvement [... and] insight captures the ability to anticipate technological trends, understand their practical significance, and link them to business priorities” (Saarikko et al., 2019, p. 584). Figure 20 portrays the activity and cognitive patterns along with the distinct and necessary types of awareness needed for the well-executed establishment of platforms.

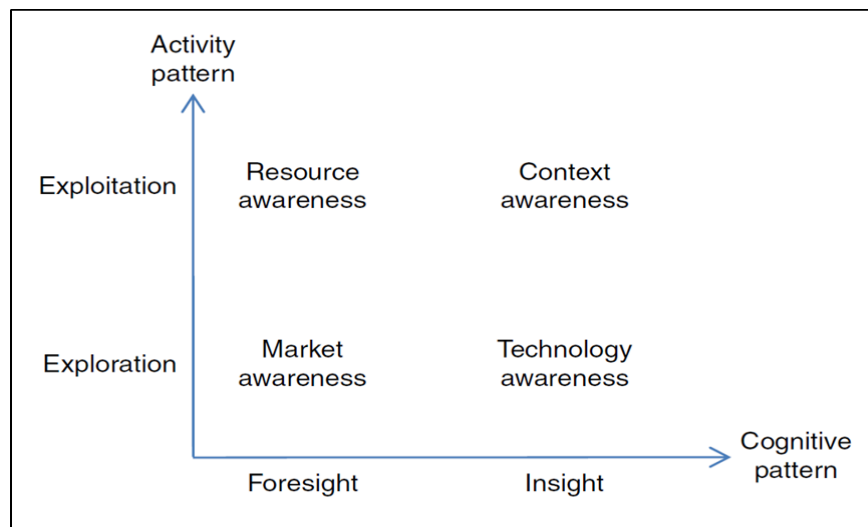


Figure 20. Activity Patterns, Cognitive Patterns, and Types of Awareness. From “Software Platform Establishment: Effectuation and Entrepreneurial Awareness,” by T. Saarikko, K. Jonsson, and T. Burström, 2019, *Information Technology & People*, 32(3), p. 584. Copyright 2019 by Emerald Publishing Limited.

Market and technology awareness serve to guide and influence explorative activities (i.e. positioning, analysis[,] and innovation) whereas resource and context awareness inform

exploitative activities (i.e. performance, maximization of efficiency[,] and execution). [... The term] awareness denote[s] that effectuation is always guided by a clear pattern of cognition (areas of knowledge or expertise) and activity (purpose or intention). Failure to position oneself correctly on either axis leads to activities that are uninformed, or cognition without action-oriented focus. (Saarikko et al., 2019, p. 584)

The portrayals of Saarikko et al. (2019) are in line with the viewpoints of the Kim and Yoo (2019) study and their depictions of internal and external analyses. Sawhney (1998) described how the “roots of a firm's platform should lie in a thoughtful internal assessment of its distinctive capabilities and resources, as well as an external assessment of the drivers of perceived differentiation” (p. 56). Teece, Pisano, and Shuen (1997) stressed the importance of “exploiting internal and external firm-specific competencies to address changing environments” (p. 510). It is “crucial to find the intersection of enablers, customer problems and capabilities to identify a platform business through external and internal analysis” (Kim & Yoo, 2019, p. 10). This approach calls for the development and implementation of management aptitudes and difficult-to-imitate functional, organizational, and technological abilities (Teece et al., 1997). It “integrates and draws upon [...] R&D [efforts], product and process development, technology transfer[s], intellectual property, manufacturing, human resources, and organizational” leadership to help firms gain and maintain “competitive advantage in increasingly demanding environments” (Teece et al., 1997, p. 510).

External analysis. External analysis was described as the initial step organizations should take when considering the approaches to cultivating new platforms. Robertson and Ulrich (1998) described how platform firms need to first “address the problems of which market segments to enter, what the customers in each segment want, and what product attributes will appeal to those

customers” (p. 20). External analysis was also depicted by Kim and Yoo (2019) as identifying new technologies, deregulations and the corresponding business opportunities, and market needs.

Internal analysis. Internal analysis (i.e., platform thinking), as depicted by Kim and Yoo (2019), was central to the initial (i.e., entry) stage of the growth model. Platform thinking was described as the process of “identifying and exploiting the shared logic and structure in a firm's activities and offerings to achieve leveraged growth and variety” (Sawhney, 1998, p. 54). Platform thinking can be implemented to the firm's products (i.e., components, processes, and design proficiencies), business processes, geographical/targeted markets, brands, and relationships (i.e., relationships amongst team members, amongst the team and the firm, and with suppliers; Robertson & Ulrich, 1998; Sawhney, 1998). Robertson and Ulrich (1998) described how platform thinking concepts foster the ability to tailor products and reduce “the incremental cost of addressing the specific needs of a market segment or of an individual customer, enabling market needs to be more closely met.” (p. 20). Table 6 depicts the many benefits derived from platform thinking.

Table 6

Benefits of Platform Thinking (i.e., Internal Analysis)

Benefits	Explanations of Benefits
Speed	Reducing the timeframe for derivative products to be developed stems from utilizing a shared common platform (i.e., shared suppliers, distribution channels, manufacturing processes, technological platforms, and component designs).
Cost	<p>Shared designs and components reduce marketing, product design, manufacturing, and operating costs.</p> <p>High-fixed cost industries (i.e., hotels, travel, and automobiles) can share infrastructure and manufacturing processes to reduce labor, product development, and manufacturing costs.</p> <p>Shared brands and common consumer bases increase consumer loyalty, reduce consumer acquisition costs, and reduce brand building costs.</p>
Design Quality	<p>An established platform has theoretically been vetted and should be debugged. Using underlying technologies, components, and design that has been well vetted yields improved product/design quality. New products/designs are derived from a tested and proven place of success.</p> <p>Performance improvement efforts to the underlying platform consequentially enhance all the derivative products stemmed from the originating platform.</p>
Coherence	Platform offerings can be logically extended to related products/services and/or geographical/targeted markets.
Brand Improvement	Marketing new derivative products/services to an essential consumer base or to a set of consumers that are rationally related to the essential consumer base enhances the brand.
Option Value	Investments in essential technologies, adaptable manufacturing processes, and country-specific platforms serve as knowledge about a given market and can later be called upon and pragmatically exercised.

Note. Adapted from “Leveraged High-Variety Strategies: From Portfolio Thinking to Platform Thinking,” by M. S. Sawhney, 1998, *Journal of the Academy of Marketing Science*, 26(1), p. 55-56. Copyright 1998 by the Academy of Marketing Science.

Robertson and Ulrich (1998) also described how sharing “components and production processes across a platform [... allows organizations to] develop differentiated products efficiently, increase the flexibility and responsiveness of their manufacturing processes, and take market share away from competitors that develop only one product at a time” (p. 20). Platform firms can

reduce costs, time, risks, and can improve customer services through shared components and processes (Robertson & Ulrich, 1998). Gawer and Cusumano (2014) described how, “in practice, companies have successfully used product platforms to increase product variety, control high production and inventory costs, and reduce time to market” (p. 419). Platform thinking and implementing a methodical platform with a targeted purpose is one crucial step towards establishing a platform that lasts beyond entry and initial growth. Platform thinking requires an accurate and insightful definition of the elements of the core platform. To arrive at this definition, the firm needs to carefully assess what is "core" and what is "derivative" in the values that it stands for, the offerings that it creates, the technologies that it employs, the customer franchises that it controls, and the customer segments that it targets. (Sawhney, 1998, p. 56)

Not only is it important to assess the shared logic (i.e., the vision), structure, and offerings, platform owners need to also consider multiple stakeholders’ perspectives. A well-written vision statement is pertinent to conveying these aspects and guides platform thinking by clarifying the corporate values and brand identity to employees, customers, and stakeholders; by providing a context for decisions on new business opportunities; by imposing structure and cadence in the firm's product families; and by providing the basis for prioritizing the firm's technology development efforts. (Sawhney, 1998, p. 56)

Although it is important to prioritize and plan a firm’s development efforts, it is also important to be stay agile and respond quickly to change (Woodall, 2017). Winners “in the global marketplace have been firms that can demonstrate timely responsiveness and rapid and flexible product innovation, coupled with the management capability to effectively coordinate and

redeploy internal and external competences” (Teece et al., 1997, p. 515). As opportunities arise, platform owners need to be able to respond to change with

powerful strategic urgency - and not just in a general sense but centered around a Big Opportunity [*sic*]. And [*sic*] after starting to deal with a strategic challenge, these processes never stop. They become permanent accelerators, creating and maintaining a culture of agility and speed within an organization. (Kotter, 2014, p. 14)

Platform thinking “is difficult because of the many ways in which it can fail” (Robertson & Ulrich, 1998, p. 21). It is important to go beyond platform thinking and platform planning serves as the steps taken by organizations to bring platform thinking from a concept into the realm of reality. Platform planning allows for teams to address the following problems: teams achieving high commonality amongst products/services but failing to sufficiently differentiate their products/services, teams differentiating products/services with excessive costs, and teams creating platform plans utilizing firm assets that are never brought into fruition (Robertson & Ulrich, 1998). Top “management’s participation is needed because making good platform decisions requires making complex trade-offs in different areas” (Robertson & Ulrich, 1998, p. 29). Table 7 serves as the steps top management should take to effectively organize a platform planning endeavor.

Table 7

Steps Top Management Should Take to Effectively Organize a Platform Planning Project

Key Steps	Explanations of the Key Steps
Team Building	<p>High performing teams are necessary as many different functions within new multidisciplinary teams must learn to work together.</p> <p>Top management must be clear with objectives, building consensus, and creating teamwork. Teamwork improves the platform by including various perspectives.</p>
Differentiation and Commonality Leadership	<p>Everyone involved needs to understand that there are trade-offs pertaining to commonalities and variety.</p> <p>Top management should place someone to oversee a team that evaluates the value of differentiation and the costs associated with a lack thereof, someone to oversee a team that evaluates the value and need for commonalities and the associated costs, and someone to lead the entire process.</p> <p>A well-thought out platform business service's architecture effectively balances the need for commonalities and distinctiveness.</p>
Fast, Creative, and Viable Problem Solving	<p>Platform analyses requires fast and creative problem solving and not deep and detailed scrutinizations. Efforts should be focused on evaluating many different potential architectures quickly based on the ability to achieve commonalities and distinctiveness.</p> <p>Focus should be on viable (i.e., not with total agreement or perfect resolutions) design solutions that are good enough relative to the critical competitive dimensional aspects.</p>
Set Targets	<p>Top management should budget for the total costs associated with the platform centered on past performances or benchmarks to prevent too little commonalities.</p>
Fact Driven Efforts	<p>Top management should utilize the best possible data regarding consumer needs, the sizes of targeted segments, and costs associated with differentiation to make strategic decisions.</p>
Planning is a Living, Iterative, and Cohesive Process	<p>Top management should continue to evaluate and improve the planning process itself.</p> <p>Top management should start at the top level of planning and iteratively refine the plan with greater detail adding detailed aspects with the iterations.</p> <p>As planning is completed and progresses from one stage to another, involve as many members of the next phase as possible. This helps to ensure understanding, agreement, and cohesiveness with the decisions made and the ensuing plans.</p>
Planning Drives Platforms' Improvement Efforts	<p>Top management should consider where additional improvements are needed (i.e., research efforts, product and/or service improvements based on consumer needs/wants, additional consumer segments, and robust platform aspects) to foster easy expansion efforts.</p>

Note. Adapted from "Planning for Product Platforms," by D. Robertson and K. Ulrich, 1998, *MIT Sloan Management Review*, 39(4), p. 29-30. Copyright 1998 by the Massachusetts Institute of Technology.

Growth stage of platforms. Kim and Yoo (2019) described how the biggest challenge for platforms in the growth stage is solving the chicken or the egg problem. This is also expressed as the following question: “How should a two-sided market be built?” (Kim & Yoo, 2019, p. 10). Platforms seeking to overcome this problem are faced with effectively developing and growing into a two-sided or multi-sided marketplace (Kim & Yoo, 2019).

Building a two-sided market. Platform owners are faced with initially and strategically deciding upon which of two or more differing user sets should be the initial group and how to drive multiple user sets to utilize the platform simultaneously (Caillaud & Jullien, 2003; Kim & Yoo, 2019). Muzellec, Ronteau, and Lambkin (2015) described how emerging platforms are cultivated through business-to-consumer value oriented actions. This occurs through marketing strategies to initially secure an audience (Muzellec et al., 2015). According to Adner and Levinthal (2001), development actions in this evolutionary phase “are focused on achieving a balance between price and performance relative to the demands of the market” (p. 620). Kim and Yoo (2019) portrayed how solving the problem entails platform providers strategically subsidizing and cross-subsidizing user sets consistent with their platform business model. Caillaud and Jullien (2003) described these as “divide-and-conquer strategies, where one side of the market is subsidized and profits are made on the other side” (p. 324).

Subsidization. Subsidization is offered for initial platform user recruitment (Caillaud & Jullien, 2003; Kim & Yoo, 2019). This initial recruitment is crucial for platforms to succeed. The initial user sets in a platform play

the most critical role in operating a corresponding platform. Further, none of the early participants knows [*sic*] whether the platform used will become a major platform, so their participation comes with a high degree of risk. On that account, platform users are

reluctant to use the initial platform before it has enough users. Thus, to overcome this situation, platform providers must provide subsidisation [*sic*] to gather enough users initially. (Kim & Yoo, 2019, p. 7)

Those researchers also portrayed subsidization as a grant for early platform users.

Cross-subsidization. Cross-subsidization is the process of “distributing the costs associated with the production of goods or services arbitrarily for a specific purpose, rather than spreading them in accordance with the incurred expenses” (Kim & Yoo, 2019, p. 7). Regarding platforms, cross-subsidization is a means of enticing users from one side of the market by using another (Caillaud & Jullien, 2003; Kim & Yoo, 2019). This is accomplished by initially enabling and promoting one side of the market (i.e., one user set) to be subsidized to lure the other or differing side of the market (Kim & Yoo, 2019). The purpose is to result with a broadly utilized platform (i.e., to create a two-sided or multi-sided marketplace; Kim & Yoo, 2019).

Expansion stage of platforms. Kim and Yoo (2019) described how platform “providers must secure enough participants on both sides to provide sufficient value and allow for sustainable growth” (p. 8). This drives at the heart of the following strategic question the expansion stage strives to meet: “How should network effects be encouraged?” (Kim & Yoo, 2019, p. 10). The answer centers on expanding the number of platform participants (Kim & Yoo, 2019).

Promoting network effects. Kim and Yoo (2019) described how strategies need to focus on maximizing network effects to establish a dominant industry-specific platform by increasing the quantity of platform participants on both sides of the market. One such strategy was discussed by Muzellec et al. (2015), who described how this stage needs to focus on the business-to-business value proposition to increase the utility of the platform and revenues.

Muzellec et al. (2015) found that as platform firms expand beyond initially securing an audience, the initial efforts of platform firms merely “triggered an interest from potential business partners; in order to capitalize on this limited interest, [...] companies are forced to realign their value proposition and marketing strategy and start to target business partners in order to generate [additional] revenue” (p. 146). This is an ongoing process. Methods should be “consistently applied to improve the network effect [and] to promote the platform. [...] As the number of platform participants and users increases, the position of the platform strengthens in the industry, especially if the relevant platform is difficult to replace” (Kim & Yoo, 2019, p. 10).

The expansion stage has development activities geared towards enlarging market penetration and Adner and Levinthal (2001) described product and process innovations as the dominant approach. Innovative platforms “tend to facilitate and increase the degree of innovation on complementary products and services” (Gawer & Cusumano, 2014, p. 421). Innovation and the ability to derive differentiated or complementary products or services has been described as advantageous for platform firms. In “order to increase sales, it seems useful for firms not only to develop new designs but, at the same time, to leverage these new designs quickly in overlapping projects that produce other new [derivative] products” (Nobeoka & Cusumano, 1997, p. 183).

The

more innovation there is on complements, the more value it creates for the platform and its users via network effects, creating a cumulative advantage for existing platforms: As they grow in adoption, they become harder to dislodge by rivals or new entrants, with the growing number of complements acting like a barrier to entry. (Gawer & Cusumano, 2014, p. 421).

Same-sided/cross-sided network effects. The review of the literature also conveyed how platforms entering the expansion stage utilize pricing as a leading strategy to enhance network effects (Eisenmann et al., 2006; Kim & Yoo, 2019). Subsidization yields same-sided and cross-sided network effects. Because the

number of subsidy-side users is crucial to developing strong network effects, the platform provider sets prices for that side below the level it would charge if it viewed the subsidy side as an independent market. Conversely, the money side pays more than it would if it were viewed as an independent market. The goal is to generate “cross-side” network effects: If [*sic*] the platform provider can attract enough subsidy-side users, money-side users will pay handsomely to reach them. Cross-side network effects also work in the reverse direction. The presence of money-side users makes the platform more attractive to subsidy-side users, so they will sign up in greater numbers. [...Same-sided network effects are created] when drawing users to one side helps attract even more users to that [same] side. (Eisenmann et al., 2006, p. 3-4)

Platform providers are challenged by various pricing considerations and the longer-term impacts of subsidization. As mentioned earlier within this study, the

challenge for the platform provider with pricing power on both sides is to determine the degree to which one group should be encouraged to swell through subsidization and how much of a premium the other side will pay for the privilege of gaining access to it.

(Eisenmann et al., 2006, p. 4)

Critical mass. Increasing the number of participants fosters achieving critical mass. Once this point is achieved, the

network in which participants prefer to maintain a closer relationship with is formed either directly or indirectly, as a driving force of growth. Therefore, it is imperative to reach a critical mass for the network effect. Platform providers must secure enough participants on both sides to provide sufficient value and allow for sustainable growth.

(Kim & Yoo, 2019, p. 8)

Woodall (2017) described how expanding and promoting a platform encompasses analyzing the platform's data to attain key insights and to make corresponding, measured, and strategic ongoing changes to the platform and its marketing efforts. At this stage, the firm's "value proposition is evolving and is increasingly influenced by the need" to expand its efforts to not only increase participants but to specifically appeal to business partners (Muzellec et al., 2015, p. 146). To enhance network effects and promote attaining critical mass, changes to the platform (i.e., products and/or processes) and marketing efforts should be influenced by the data and simultaneously by the need to appeal to potential strategic business partners (Adner & Levinthal, 2001; Kim & Yoo, 2019; Muzellec et al., 2015; Woodall, 2017).

Maturity stage of platforms. Kim and Yoo (2019) described how a platform "will fail if its participants do not continuously support it, even if it has already been established in the market" (p. 8). A mature business ecosystem is driven by the value continuously achieved by all participants utilizing a platform business model (Kim, 2016). The enduring utility of an established platform is what is desired by platform owners and the following strategic question drives the aspects of the maturity stage: "How should the business ecosystem be completed?"

(Kim & Yoo, 2019, p. 10). This was answered by describing the methods to facilitate platforms' continual growth (i.e., how to advance the platform business; Kim & Yoo, 2019).

Completing the business ecosystem. The maturity stage of platforms requires firms to “reconsider the services underlying their value proposition in a way that embraces both the business partners and the consumer audience” (Muzellec, 2015, p. 146). Adner and Levinthal (2001) described the importance of innovation activities being centered on balancing product and process innovations. This is done “so that price remains relatively stable as product functionality increases” (Adner & Levinthal, 2001, p. 620). The methods to facilitate long-term platform success were depicted by Kim and Yoo (2019) as quality management and revenue structure. This “can be achieved by building profit models and undertaking continuous quality management - these are core elements of the platform business model that have distinct groups of users on both sides” (Kim, 2016, p. 2114).

Quality management. Platform “quality management is critical to prevent quality degradation, a reduction in participation or trading[,] and deterioration in competitiveness. For this, platform regulation and platform quality certification were suggested.” (Kim & Yoo, 2019, p. 10-11). Platform quality management

is needed to increase the number of participants so that network effects can be improved and a powerful platform can be created. The issue is that merely increasing the number of participants might cause an increase in the number of unwanted participants or in opportunistic behaviours [*sic*] from the participants, potentially degrading the quality of the platform and causing desirable participants to leave. (Kim, 2016, p. 2121-2122) Woodall (2017) portrayed how a realignment of the platform business goals with the ever-changing trends of customers, keeping current with new market technologies, and channeling

strategies towards these ends is what is needed to reinvigorate growth. Steering these strategies will require research and analyses to optimize platform processes (Woodall, 2017). This is in line with platform regulation and platform quality certification efforts suggested by Kim and Yoo (2019). However, Kim and Yoo (2019) briefly conveyed quality management efforts as improving participants' loyalty. Kim (2016) expanded on this notion through its conveyances of quality management strategies. Pertaining to an online platform, gaining

the reliability of participants is a necessary strategy for managing the quality of the platform and securing its continued growth. Two quality management strategies are 'platform regulation' (Boudreau & Hagi, 2009), which determines whether to review the platform either 'ex ante' or 'ex post', and 'platform quality certification' (Hagi, 2009), which decides whether to limit participation or to rely on consumers to regulate the platform quality themselves. (Kim, 2016, p. 2123)

Woodall (2017) detailed this further and emphasized customer trends, customer experience improvements, and the needed corresponding research and analyses to optimize processes as key to renewed growth efforts. Nobeoka and Cusumano (1997) also discussed how rapid design transfers may

help companies improve product quality and customer satisfaction by diffusing good new designs quickly across multiple products. Newer designs usually imply more up-to-date and sophisticated features than old designs. In addition, the standards of a 'good' design can change quickly in sophisticated markets such as the United States, Japan, and Europe. Because changes are fast in customer tastes and needs, competitive conditions, and current fashion trends, only products based on relatively new designs and technologies may consistently meet contemporary definitions of good design quality. (p. 183)

Platform owners also need to be aware of what research and analyses may divulge. The preferred path for continuous growth leverages a company's technological capabilities and market segment competencies simultaneously into new markets (Yang & Jiang, 2006). Research and analyses should be done to guide new business processes and formulate new strategies regarding competencies, positioning, and acquisitions (Yang & Jiang, 2006). Such analyses may reveal how continuous growth can occur strategically by leveraging current market and/or platform technology proficiencies into different markets (Yang & Jiang, 2006). Table 8 depicts various strategies for leveraging current market and/or platform technology proficiencies.

Table 8

Strategies for Leveraging Current Market and/or Platform Technology Proficiencies

Strategies	Explanations of Strategies
Focus	<p>This strategy focuses on exploiting a platform in an existing business because the platform firm is currently selling to the consumer base. Leveraging an understanding of the market, combined with the utilization of a proven platform, results in a successful new venture. This is provided that the opportunity is sizeable enough and that the platform can be shared by multiple products/services.</p> <p>Benefits: product quality and a deep understanding of the consumer base</p> <p>Risks: possible lack of growth</p>
Extension	<p>This strategy focuses on stretching market applications (i.e., maximizing the financial value of a platform by developing a broad range of market applications). Small or large enhancements and/or alterations to a platform can offer opportunities to serve unique consumer needs and even potentially grow the consumer base.</p> <p>Benefits: new products/services can be efficiently developed and reduces the costs to enter multiple markets (i.e., reduced costs stem from the utilization of a common platform applied to numerous new markets)</p> <p>Risks: firm may be unfamiliar with the needs of the new customer base</p>
Renewal	<p>This strategy focuses on leveraging market insights into developing new platform designs. This strategic approach should focus on a unique position the firm is striving to achieve (i.e., better market penetration and/or increased profits).</p> <p>Benefits: leveraging knowledge of a current market segment with a new platform development is cheaper than developing a new platform for a new market segment</p> <p>Risks: rapidly changing markets may necessitate platform firms to either grow into new markets or confront extinction</p>
Diversification	<p>This strategy focuses on creating new markets through new platform/s.</p> <p>Benefits: growing into new markets may offer new business opportunities compared to the current marketplaces</p> <p>Risks: rapidly changing markets may necessitate platform firms to either adapt, grow into new markets, or confront extinction</p>

Note. Adapted from “Strategies for Technology Platforms,” by C. Yang and S. Jiang, 2006, *Research Technology Management*, 49(3), p. 51-55. Copyright 2006 by the Industrial Research Institute, Inc.

Revenue structure. The revenue structure of a given platform can be described simply as the “method for acquiring the profit models of the platform” (Kim & Yoo, 2019, p. 11).

Subsidization and cross-subsidization have been discussed from the perspective of establishing critical mass. Regarding the maturity stage of platforms, the profit models refer to the long-term determination of the profit and subsidized side of the market. Kim and Yoo (2019) portrayed this aspect in discussing each user set's price sensitivity. The

money side refers to those platform participants who pay for the service, and this group [...] has relatively low price elasticity. On the other hand, the subsidy side refers to those users who benefit from the platform, and this group has relatively high price elasticity. Identifying the money and subsidy sides is important because they create different indirect network effects, particularly cross-side network effects. Regarding revenue structure, therefore, platform companies design what is imposed on members, making the entire business ecosystem continuously grow while producing their own profits. (Kim & Yoo, 2019, p. 9)

Kim (2016) also described how determining the money and subsidy sides can be determined by each group's price sensitivity; the researcher defined the money side as being the supply side, demand side, or sponsor-based business models. This "model is appropriate when the price competition is fierce or when both the supply and demand sides have high price elasticity, which often occurs in competitive markets or when both sides mostly comprise individuals" (Kim, 2016, p. 2125). Platform leaders must "establish a set of business relationships that are mutually beneficial for ecosystem participants and be able to articulate a set of mutually enhancing business models" (Gawer & Cusumano, 2014, p. 423). Regarding two-sided or multi-sided "networks, in the end, it is not so much the end user but rather business partners that influence the value proposition by forcing the intermediary to propose services that are both appealing to businesses as well as end-users" (Muzellec et al., 2015, p. 147).

Coding Tree for Platform Structure and Functions

A coding tree was conceptually constructed for the unified concept of platform structure and functions. The dimensional aspects of platform structure and functions were depicted as interaction interface and network formulation. The literature review portrayed these aspects and their important strategic implementation considerations regarding the structural and conceptual aspects of platforms and their functions within a platform paradigm. The indicators of interaction interface as a dimensional aspect of platform structure and functions were coded as technological requirements and organizational aspects. The indicators of network formulation as a dimensional aspect of platform structure and functions were coded as types of platforms and formulating relationships. The indicators from the dimensional aspects conveyed applicable measures, degrees, and/or strategic tactics. Figure 21 serves as a visual representation of the data and illustrates the coding tree amalgamated from the literature for platform structure and functions.

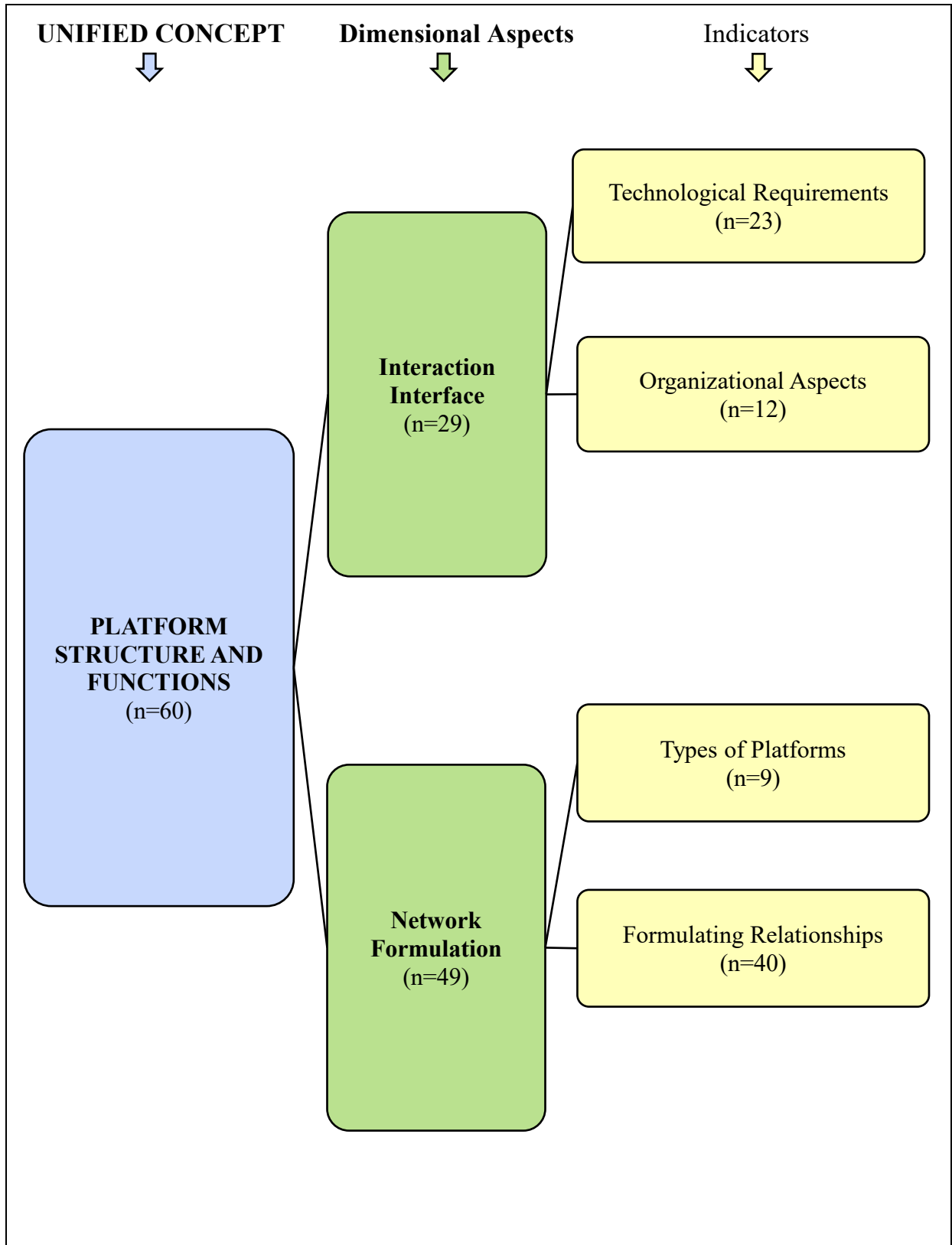


Figure 21. Coding Tree Illustrating Platform Structure and Functions as a Unified Concept, its Dimensions, and Indicators.

Platform Structure and Functions

After searching the Scopus, ProQuest, EBSCOhost, and other databases (i.e., the preliminary research efforts that utilized Google and Google Scholar) and after narrowing the search by applying the search terms as well as inclusion and exclusion criteria, 56 sources were included for platform structure and functions. After the review of the literature and references for the included sources were explored, four additional sources fostering potential added insights into platform structure and functions were included within the study. The remaining unrelated articles or pertinent articles failed to meet the research focus on depth, applicability, and relevance. Those 687 articles were excluded from the review of the literature. Appendices P, Q, R, and S respectively show the excluded and included articles considered within this study originating from the concepts of platform theory, platform business model, platform economy, and types of platforms. Appendix T shows the included articles that were utilized to construct the coding tree for the unified concept of platform structure and functions. The content utilized for the review of the literature served to broaden the understanding of platform structure and functions with the desired research aims taken into account.

This study initially identified platform theory, platform business model, platform economy, and types of platforms as key concepts to be explored. After review of the literature, these key concepts were deemed to be interconnected (i.e., similar structures and purposes as related to the potential strategic platform implementations). This study considered these concepts as different perspectives under one broad notion akin to the general idea of different theories under one school of thought. These different perspectives were amalgamated into one unified school of thought: platform structure and functions. This unified concept encompasses the structures of platforms (i.e., the components that frame platforms and the impact within the

online marketplace), the varying types of platforms within the online economy, the purpose of these aspects, how to effectively and strategically wield these aspects into an applicable paradigm, and serves as a cohesive depiction from the review of the literature. A multifaceted explorative viewpoint revealed applicable insights from a wide range of perspectives. These notions guided the explorations of platform structure and functions and yielded varying considerations within the broad platform research endeavor. Platform theory, platform business model, platform economy, and types of platforms, initially considered as individual key concepts to be explored, were amalgamated as one unified concept, served as the ideologies that make up platform structure and functions, and guided the search terms and concepts explored.

Suarez and Kirtley (2012) defined a platform as a “good or system providing a technological architecture that allows different types of users and complimentary business partners [...] to connect and benefit from the platform’s base functionality” (p. 36). Establishing the technologies and employing the methods in which to effectively make connections are vital for “pioneering platforms and challengers to existing markets” (Suarez & Kirtley, 2012, p. 36). The goal from the differing viewpoints (i.e., platform theory, platform business model, platform economy, and types of platforms) was to convey the structural essential elements that encompass successful platforms and unearth tactics applicable to establishing a platform ecosystem.

Suarez and Kirtley (2012) conveyed how platforms, at the most basic level and for them to succeed, must attract users, complementors, and must overcome the chicken-or-the-egg dilemma. Ding, Ye, and Wu (2019) described how a “platform is regarded as the interaction interface of an ecosystem in the business field” (p. 1565). Rong, Lin, Shi, and Yu (2013) also described platforms as interaction interfaces, but their depictions enhanced this notion and portrayed interaction interface as one of the central functions of platforms. The

concept of 'platform' in the business ecosystem includes three main functions: namely interaction interface, value creation, and network formulation. Interaction interface means ecosystem members could leverage the interface as a kind of toolkit to build their own products. Value creation means the platform enables ecosystem partners to work together to co-create the value. Network formulation means that since the platform makes the partners work together to co-create value, they will formulate specific network patterns to compete against their competitors' ecosystems. (Rong et al., 2013, p. 78)

These functional elements come together and collectively constitute a successful platform paradigm. A platform

"is available to the members of the ecosystem through a set of access points or interfaces" (Iansiti and Levien, 2004, p.148). The platform facilitates the interaction of partners by shaping the manners of such interactions (Li, 2009). As a result, the platform could be regarded as the starting point of the value creation process in an ecosystem. The platform is able to shift value from the enterprise to the network (Li, 2009). The category of platform contains services, tools, and/or technologies shared by other members of the ecosystem to co-create and deliver value. (Ding et al., 2019, p. 1565)

Value stems from the interaction interface and extends into the shared platform ecosystem. Value is the underlying theme regarding platform strategies. It underpins the need to create value for all users and the platform itself. In a producer-oriented platform business "model, the producers (supply side) deliver certain products and services to the consumers (demand side) through the platform. A producer-centered approach in which the producers supply products or services using the platform is thus required" (Kim & Min, 2019, p. 7). This is the type of platform

business model potentially applicable to the anesthesia CE industry, and Kim and Min (2019) described how these types of platform business models need to focus

on interconnecting organizational processes as a competitive strategy by making various third parties participate in two-sided markets. For existing value streams, [...] supply stream management is a critical component of an organization[.] However, it [...] is impossible to gain a competitive advantage by only expanding networks and intensifying competition, implying that it is [...] necessary for organizations to leverage inter-organizational value streams that cover not only suppliers but also end users. (Kim & Min, 2019, p. 10-11)

Value begins with the interface and is enhanced as the relationships within the ecosystem develop. By “developing a core platform and attracting complementors to build on and extend it, platform firms harness external innovation to create value for the entire ecosystem” (Pon, Seppälä, Kenney, 2014, p. 22). Although Rong et al. (2013) depicted interaction interface, value creation, and network formulation as the functional elements of platforms, this endeavor conveyed interaction interface and network formulation as the essential functional elements of platforms. This endeavor did not include value creation as its own dimensional aspect because this study considered the interaction interface and network formulation to be intrinsically engulfed by the necessity of value. This study assumed the perspective that without value from an interaction interface or from the formed network, platform as the desired strategy, is primed to fail.

Interaction interface. The review of the literature depicted the technologies, applications, and organizational aspects that bring the interaction interface to market (Rong et al., 2013). When “imitation is easy, markets don't work well, and the profits from innovation may

accrue to the owners of certain complementary assets, rather than to the developers of the intellectual property” (Teece, 1986, p. 285). The purpose of strategically developing an interaction interface (i.e., the technological aspects and the organizational tactics) is to be competitive within the online economy. Teece (1986) depicted the regimes of appropriability as the “environmental factors, excluding firm and market structure, that govern an innovator’s ability to capture profits generated by an innovation” (p. 287). This depiction portrayed the efficacy of legal instruments and the nature of the technology as the important regimes of appropriability (Teece, 1986). Legal mechanisms have been described as ineffective (Teece, 1986) and easy to “invent around” (Lieberman & Montgomery, 1988, p. 43). The pace of technological changes (Lieberman & Montgomery, 1988), the “tremendous scope of differentiation” within the online economy (Rangan & Adner, 2001, p. 45), the need to have technologies centered around strategically segmented markets, “user-centered design” needs, vetted markets and revenue models (Meyer et al., 2008, p. 42), product and consumer fit, and reduced times to market (Schilling & Hill, 1998) are all driving forces for tactful technological strategies. Teece (1986) depicted how the effective nature of technologies requires firms to focus on the products, processes, tacit knowledge (i.e., knowledge that is difficult to express and convey), and codified knowledge (i.e., knowledge that is systemized and collected). This study drew from the Teece (1986) study and depicted the strategies for an interaction interface centered on technological aspects, processes (i.e., organizational aspects) that impact technologies, and derived at the technologies required to enhance customer relations and strategic business partnerships.

Technological requirements. The technological requirements for an effective interaction interface were portrayed as applied technological know-how employed throughout an array of

products, services, or applications and as a core technology sufficiently open for complementors to furnish their product or service (Rong et al., 2013). Kiesling (2018) described the following three essential elements regarding the technological aspects of platforms: “algorithms, modularity, and interoperability” (p. 49). These elements shape the architecture of successful platforms (Kiesling, 2018). Table 9 depicts the impacts of the essential elements of platforms.

Table 9

How the Essential Technological Elements Shape the Architecture of Successful Platforms

Essential elements	Explanations of how they shape the technological architecture
Algorithms	<p>Refer to the rules followed in the problem-solving, calculating, and actions that embed relationships</p> <p>Allow for automation based on the rules/relationships</p> <p>Fulfill new actions based on the previous interactions from a user’s choices and reduce transaction costs</p> <p>Foster economies of scope</p>
Modularity	<p>Standardized elements come together to form a larger system (i.e., the elements break down complex technological interdependencies into separate components that themselves interact in a distinct and different fashion)</p> <p>Often referred as a plug-and-play function and encompass rules for interconnecting (i.e., interoperability)</p>
Interoperability	<p>Connects components, utilizes agreed-upon standards/format of data to be shared (i.e., syntax), and maintains a standardized meaning of the data (i.e., semantic interoperability)</p> <p>Most useful when standards are recognized by the parties involved or when the standards are open</p>

Note. Adapted from “Toward a Market Epistemology of the Platform Economy,” by L. Kiesling, in S. Horwitz (Ed.), *Austrian Economics: The Next Generation (Advances in Austrian Economics, Vol. 23)* (pp. 49-50), Bingley, UK: Emerald Publishing Limited. Copyright 2019 by Emerald Publishing Limited

Suarez and Kirtley (2012) described the importance of developing a technologically superior product to out-compete competitors. This entails establishing “a better technology than the competitors to provide features or functionality that does not yet exist [or is insufficient] in rival platforms” (Suarez & Kirtley, 2012, p. 36). Lee et al. (2010) described how the Web 2.0

“involves web development and design to facilitate interactive sharing, user-based design, and collaboration on the World Wide Web. Web 2.0 companies allow users to do much more than just retrieve information on the platform” (p. 90). Table 10 depicts the technological features, functionalities, and tactics from the review of the literature that facilitates customer relations, strategic business partnerships, and the position of a platform within the marketplace.

Table 10

Technological Features, Functionalities, and Tactics that Enhance Customer Relations, Strategic Business Partnerships, and the Position of a Platform Within the Marketplace

Aspects	Explanations	Reference
Innovation	At the most basic level, innovation is the ability of a platform firm “to solve current problems in an industry [...] and] to create new value” for all stakeholders.	(Lee et al., 2010, p. 102)
Customer Experience	Firms need to provide “compelling, instant, intimate, frictionless, [and] low-risk and high reward experiences” for customers personalized to appeal to all user sets.	(Ikeda & Marshall, 2019, p. 31; Wang & Lobato, 2019)
	Firms need to pursue integrated customer experiences with technological aspects encompassing “clear platform governance, rules[,] and partner responsibilities.”	(Ikeda & Marshall, 2019, p. 35)
	Firms need to entice complementors with ongoing technical support, by working in conjunction to enhance the platform, and by fostering sustainable profits through new business models.	(Suarez & Kirtley, 2012)
Differentiation/ Specialization/ Complementaries	A wide range of offerings and functionalities extends customers’ experiences. Customers often “find a variety of offerings attractive, so maintain ease of search and offer a broadening range of services to complement and expand customer experiences.”	(Ikeda & Marshall, 2019, p. 35; Pon, Seppälä, & Kenney, 2015)
	Technology-based differentiation (i.e., focus on “attributes highly valued by target customers while de-emphasizing other attributes less crucial to them”) increases a targeted and “growing group of customers and [...] cannot be easily imitated.”	(Suarez & Kirtley, 2012, p. 38)
	Specialization among participants increases “value and functionality as more participants join in (Hagel et al. 2008).”	(Lee et al., 2010, p. 92)
	Complementaries are “an interaction between goods that provide more value together than each of the products could separately (Amit and Zott 2001)[... and are intertwined with] openness, connection, conversation, and collective intelligence” strategies.	(Lee et al., 2010, p. 95)

(continued)

(continued)

Aspects	Explanations	Reference
Scalability	Scalability retains “its desired effectiveness while being expanded from a small scale, limited variety[, ... and] under controlled condition[s] towards a scenario that calls for a) working with a broader and bigger target population, b) providing more varied and complex [...] services[, and] c) complying with stringent real-life commercial conditions.”	(Mukhopadhyay, Bouwman, & Jaiswal, 2019, p. 439)
	Platforms “match supply and demand [...] and serve additional users at almost zero marginal cost (Täuscher & Kietzmann, 2017).”	(Bivona & Cosenz, 2019, p. 3)
	Knowledge “sharing [needs] to be standardized in a way that is scalable and efficiently distributable[.]”	(Foerderer, Schuetz, & Kude, 2014, p. 3)
Integration	If platforms “struggle in attracting third parties, they generally direct to this strategy. In this strategy, owners produce subsidiary product and services by themselves (Hagiu & Spulber, 2013). [...] Platforms that have] properly built their ecosystems, sometimes use this strategy to also increase their growth and income (Zhu & Liu, 2015).”	(Zehir, Zehir, Zehir, 2019, p. 114)
Modularity	Modularity is “critical in achieving scalability[;]” has the core “managed by the platform leader, while the periphery contains the contribution of a number of complementors[;]” promotes reusing resources; “improves the cost-effectiveness of the supported services[;]”and fosters adaptability to market trends.	(Mukhopadhyay et al., 2019, p. 439)
	Modularity entails a “stable technical core and periphery components, which can be innovated by independent, external developers (Chesbrough & Van Alstyne, 2015; Gawer & Cusumano, 2014; Gawer, 2014; Thomas et al., 2015).”	(Moser & Gassmann, 2016, p. 3)
Technological Openness	Technological “openness [...] affects the entry of the partners into the ecosystems based on their complementarity and capability (Boudreau & Hagiu, 2009; de Reuver & Bouwman, 2012; Thomas et al., 2014).”	(Mukhopadhyay et al., 2019, p. 439)
	As platforms consider their technological openness strategies, the implications for alliances (i.e., as a response to competition faced by incumbents), competencies, and tactical business/revenue models (i.e., considering what can be subsidized, cross-subsidized, and aspects yielding profits) should enhance the platform firm and possibly constrain growth and entry by other market entrants.	(Kenney & Pon, 2011)
	Platform firms also need to consider that, under platform theoretical concepts, the “platform sponsor typically treats the platform as a source of direct value generation and/or capture. [It is possible to utilize differing technological openness strategies and strategic alliances to use platforms] as auxiliaries to different value-capture strategies than has been understood in the platform literature.”	(Kenney & Pon, 2011, p. 260)

(continued)

(continued)

Aspects	Explanations	Reference
	A “collaborative infrastructure enables non-hierarchical collaboration practices based on high degrees of standardization, automation[,] and adaptability.”	(Fehrer, Woratschek, & Brodie, 2018, p. 561)
Network User Stickiness	Network user stickiness refers to the “ability to keep the consumer on the platform (Paul, 1999), keep them coming back (Hallowell, 1996; Maciag, 2000; Zott et al., 2000), and on a frequent basis (Li et al., 2006).”	(Rong, Xiao, Zhang, & Wang, 2019, p. 251)
	Corporate “reputation for quality and perceived value will significantly influence online loyalty (Caruana and Ewing, 2010). Moreover, price (Valvi and West, 2013), relationship quality - consisting of relationship satisfaction[, ...] and trust (Rafiq et al., 2013) - as well as coupon proneness and value consciousness (Zheng et al., 2017) will generate a similar effect.”	(Rong et al., 2019, p. 249)
	Regimes of appropriability are essential to increase user stickiness.	(Rong et al., 2019; Teece, 1986)
Strive to Serve New and Underserved Segments	By focusing on an underserved segment, a customized and tailored platform may be able to harness network effects, gain footing, and grow within a new market segment.	(Suarez & Kirtley, 2012)
	Personalization can be used to “tap into new market segments which they cannot serve with their existing mass-produced goods[.]”	(Drewel, Gausemeier, Koldewey, & Özcan, 2018, p. 15)
	Firms need to expand the use of the platform to allow “new and even unintended end-users (Cusumano and Gawer 2002).”	(Lee et al., 2010, p. 92)
Data	Predictive analytics “can seamlessly anticipate and deliver on customer desires, aspirations[,] and needs.”	(Ikeda & Marshall, 2019, p. 31)
	Demographics, “preferences, buying habits, and geographic location of individuals is valuable because it allows companies to contextually personalize their marketing messages and thereby increase sales.”	(Farrelly & Chew, 2019, p. 2)
	Data allows “organizations to identify and develop niche markets (Dalgic & Leeuw, 1994, p. 40) and to personalize products and services (Searby, 2003). Companies use detailed aggregated data to create targeted offers, innovate coupon offers[,] and improve loyalty (Acquisti, 2010).”	(Farrelly & Chew, 2019, p. 3)
	Data makes it “possible to measure the exact reach of real users, visibility of banners, clicks[,] or any other engagement.”	(Kuchta & Miklošik, 2016, p. 181)
	Large “amount of data generates [a] huge number of metrics. It needs to be determined what is effective to measure and how to identify and integrate individual data outputs. In general, there are three main points of view in measured metrics: <ul style="list-style-type: none"> • Amount of something expressed in integers, • CT (click through) something expressed in percentage, • CP (cost per) something expressed financially.” 	(Kuchta & Miklošik, 2016, p. 181)

(continued)

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Aspects	Explanations	Reference
Connectivity/ Accessibility	Platforms “should have the capability to update the information that is demanded by users. It should be able to reconstruct the information generated through the participation of users and create new meaningful data.”	(Lee et al., 2010, p. 94)
Service Platform	Platform “operations can be determined by who owns or orchestrates the platform [... and] successful platforms with many customers and merchants participating typically result in massive amounts of data - a major asset and advantage.”	(Ikeda & Marshall, 2019, p. 31)
	Firms need to develop business strategies to optimally position the platform (i.e., enhance “your organization’s value proposition with new partners [... but] protect and continue to be a thoughtful gatekeeper of your proprietary customer data and insights”).	(Ikeda & Marshall, 2019, p. 35)
	It is important to structure a platform such that a platform firm maintains “ownership and control over [all of] the critical elements that deliver value.”	(Pon et al., 2014, p. 980)
	A “platform should fulfill an essential role in improving services or contribute to solving fundamental technological problems in an industry.”	(Lee et al., 2010, p. 92)
Platform Envelopment	Firms need to consider bundling “the functionality of another, typically smaller and financially weaker, platform, thus making the latter virtually irrelevant to the market.”	(Suarez & Kirtley, 2012, p. 36)
Platform Leverage	Platform owners with multiple platforms can “carefully design the interfaces and functionality of the new platform in order to take advantage of their existing installed base and boost demand and attractiveness for both platforms.”	(Suarez & Kirtley, 2012, p. 37)
	Interoperability and industrialization allow compatible systems to expand market share, grow into new markets, and is a way for platform firms to leverage their technological proficiencies.	(Baron & Mathieu, 2013)

The “collaborative innovation process is based on essential prerogatives: the development of channels and communication filters between actors and the instantiation of the four dimensions of heterogeneous actors of architectural knowledge” (Attour & Peruta, 2016, p. 29). These dimensions were portrayed as vital to organizations wishing to successfully design an inter-organizational platform. Beyond technological features and functionalities, they serve as the broad tactics that bring a business ecosystem into fruition. These dimensions are

indispensable to creating exchange places where heterogeneous actors meet each other and negotiate the matching of their technologies (Kellogg et al, 2006). The first three dimensions are a subset of architectural knowledge:

- *Technology capability awareness*, [sic] which is the actors' awareness of the components' technology capability. This awareness is made possible by previous experiences related to these components.
- *Use context sensitivity*, [sic] which is the understanding of the context in which a specific component is deployed. The sensitivity is the understanding that many innovation contexts exist and can be mobilised. [sic]
- *Business model understanding*, [sic] which is the evaluation of market opportunities related to the applications of a component.

The fourth dimension - boundary-spanning competence (relational competence) - is the ability to develop the first three dimensions (Anderson et al, 2008, p. 35). This fourth dimension represents the resources and competences used and engaged in a collective process where heterogeneous firms redefine their knowledge of components in order to associate them with other components (other firms' components) and to co-develop architectural knowledge. (Attour & Peruta, 2016, p. 29)

An “integrated understanding of technology, business and social practices and the anticipation of not only customers' needs, but the needs of all network actors [...are] essential to the success of” platforms (Fehrer et al., 2018, p. 561). Technology enables the success of platforms. Business “model innovation allows firms to innovate how they create, deliver, capture, and communicate value in new ways - often enabled by new technologies” (Andreassen et al., 2018, p. 886).

Organizational aspects. The “architecture of a common core technology [...] makes diffuse private and contextual knowledge accessible and actionable, enabling coordination and [...] benefit[s]” to be had by all stakeholders (Kiesling, 2018, p. 57). The “rare assets that [...] differentiate the platform's offer from competitors [...] mainly result [...] from] the crowd's activities such as, for instance, the community of users and the resources (know-how, goods, and services) offered, co-created, or enriched by the users' interaction[s]” (Bivona & Cosenz, 2019, p. 4). Platforms “have three epistemic dimensions: access to and aggregation of diffuse private knowledge, actionable contextual knowledge where it was not actionable before, and creating knowledge within the platform interaction itself” (Kiesling, 2018, p. 54). Yablonsky (2018) described how in order to “be competitive in the era of digital economy, firms need intimate knowledge of their enterprises, not just an understanding of technology” (p. 485). The “rules, behavioural [*sic*] expectations, quality control, tone, work and customer service ethic, as well as the overall identity of the organisation [*sic*] (Rubenstein, 2005)” are organizational aspects that drive the effectiveness of the interactions on the platform (Rong et al., 2013, p. 79). A platform’s architecture (i.e., the users and the interactions between the users) is designed with a set of rules allowing participants to access its services” (Baron & Mathieu, 2013, p. 120). MacDonald (2019) also depicted the need to have clarity regarding the “rules and procedures that limit and control the [...] activities that take] place on the platform” and termed this aspect as platform governance (p. 4). A “platform business must counteract the effects of quality uncertainty” (Kim, 2016, p. 2122). Figure 22 portrays the common quality management tactics platform firms can employ.

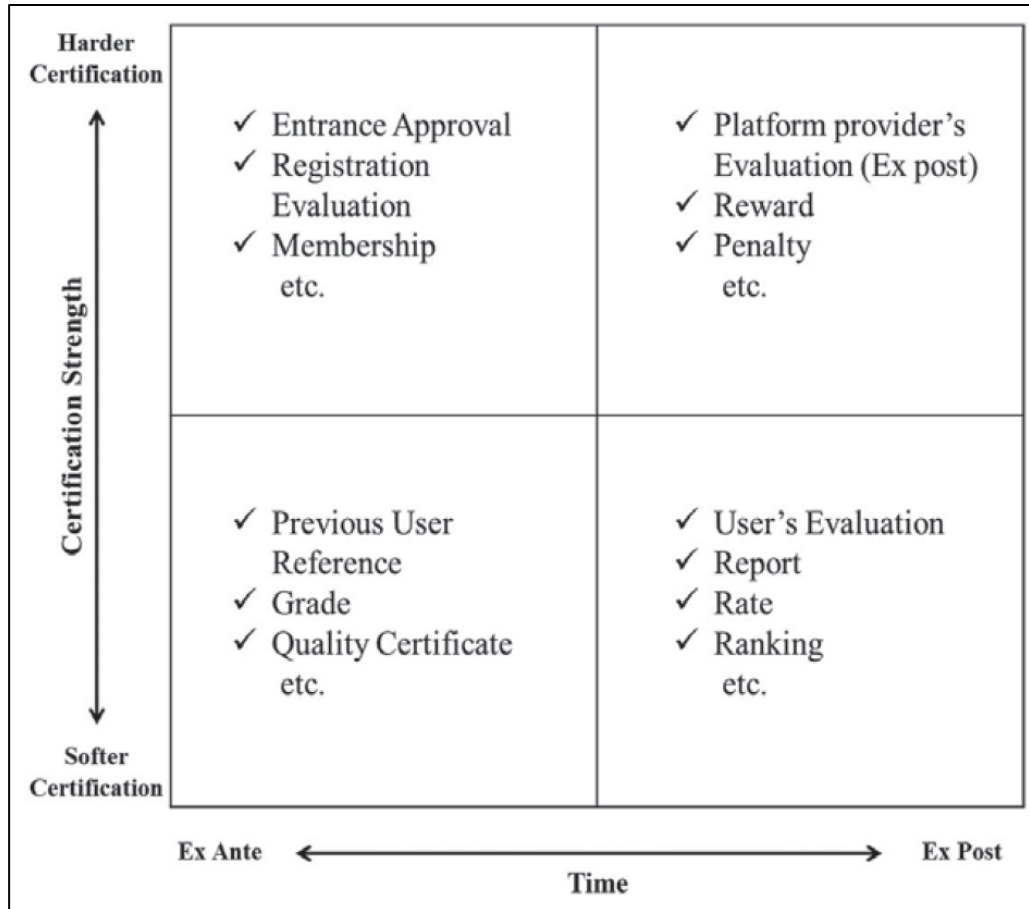


Figure 22. Common Quality Management Strategies. From “The Platform Business Model and Business Ecosystem: Quality Management and Revenue Structures,” by J. Kim, 2016, *European Planning Studies*, 24(12), p. 2124. Copyright 2016 by Informa UK Limited, trading as Taylor & Francis Group.

A platform’s organizational architecture should reduce participant’s risks with defined standards and practices, establish rules to nurture selective and appropriate usage, establish regulations to discourage misuse or abuse, and should implement strategic pricing policies that adapt to the evolving tactical aspirations of the platform firm (Baron & Mathieu, 2013; Lee et al., 2010; Mirza & Beltrán, 2013). Sampler (2018) described how

no one expects a platform provider to anticipate every form of risk, but as a market develops, a company must identify and mitigate the new forms of risk as they emerge. It must also act as a regulator, establishing rules of engagement, and an arbitrator, resolving

disputes. All three tasks - matchmaking, regulating, and arbitrating - are key to opening new markets. (p. 4)

The concept of governance also extends to platform firms' own efforts. Self-regulation was portrayed as a means to enhance the effectiveness of platform interactions. In one example from the literature, Amazon made the decision to

start paying state taxes to all states. Legally, they were not obliged to do so. Platform businesses need to recognize the possibility that regulatory change is going to happen, and that it is going to be painful when it does. If you can find ways to preempt regulation, you're likely in a better position to gain an advantage. (MacDonald, 2019, p. 4)

Regulatory changes were described as a hinderance for new market entrants desiring to gain traction in the marketplace, they anticipate the upcoming and needed interactions and platform changes, and serve as a barrier against competitors (MacDonald, 2019). Regulations come in many forms. Platforms themselves typically establish and adapt a platform to accommodate the best interests of their users. Regulation was described as action "that happens *to [sic]* platforms after the fact; that platforms and users do to themselves; or, in the most sophisticated models, that evolves as an interactive process between platforms, governments, users, and communities (Gillespie, 2017; Heiberger, Pierson & Poell, 2018)" (Wang & Lobato, 2019, p. 364).

Developing an effective interaction interface also involves establishing relationships not directly seen within the platform. People "and relationships are critical to the platform strategy, including the teams, relationships among team members, relationships between the team and the larger organisation, *[sic]* and also relations with the supplier network" (Rong et al., 2013, p. 79-80).

Organizations that surpass "competitors in both revenue and profitability" establish "organizational cultures that excel at empowering employees, creating fluid cross-functional

work teams and promoting the open sharing of ideas between the organizations' leaders, employees, partners and customers" (Berman, Davidson, Ikeda, & Marshall, 2018, p. 27, 28).

These internal organizational aspects bring value to the market through a credible, trustworthy, reliable, and profitable interaction interface.

Network formulation. The literature reviewed for platform theory, platform business model, platform economy, and types of platforms consistently portrayed the necessity of network effects, critical mass, and subsidization tactics. Although necessary, the amalgamation for platform structure and functions looked outside of these portrayals. This study depicted network effects as its own key concept and the conveyances of platform structure and functions strove to portray important impressions from the literature beyond notions already conveyed. The portrayals from the review of the literature for platform theory, platform business model, platform economy, and types of platforms enhance the understanding of network effects, critical mass, and subsidization tactics.

Types of platforms. The aim for the exploration of the types of platforms was to convey strategic and applicable insights from the literature. The review of the literature aids in formulating successful online networks driven by the insights from various platform taxonomies. In depicting the types of platforms, this endeavor funneled the synthesis from broad to detailed depictions noting the fundamental classification aspects of platforms. Platforms have been described as

regional entities, and it behooves us to pay attention to how platforms construct regions and, indeed, often presume regions. This includes attending to how platforms mobilize their quasi-monopoly power and seemingly unlimited reserves of venture capital to insinuate themselves into (and thereby also construct) a given 'target' country or region.

Platforms are inherently regional, somewhere between local, national, supranational, and global, depending on the platform in question. As noted below, the term ‘regional’ designates two things at once: (1) the subnational or local context, designating a region of a country (such as Basque region of Spain); and (2) the grouping of multiple countries into geocultural regions (such as ‘Asia’). Every platform defines and delimits a region, whether subcultural or geographical or an amalgam of the two. (Steinberg & Li, 2017, p. 174-175).

Understanding *where* platforms aggregate conveys “how platforms often mobilize their transactional and mediatory functions within designated geocultural and geopolitical contexts of specific regions” (Steinberg & Li, 2017, p. 178).

In providing a more tapered view regarding the classification aspects of platforms, the review of the literature portrayed multiple perspectives on categorization. Many categorizations of platforms were conveyed throughout the literature, but the renderings from MacDonald (2019) served as an uncomplicated approach. MacDonald (2019) portrayed how “platforms fall into two basic categories: innovation platforms and transaction platforms. The first type facilitates outside innovation, and the second facilitates the exchange of information, goods, or services” (p. 2). Steinberg and Li (2017) portrayed “product-technology type platforms” and designated these platforms as the “hardware basis for computational activities” (p. 176). These types of “platforms serve as a foundation upon which manifold firms develop complementary add-ons to address heterogeneous customer needs[,]” and this type of platform necessitates “a symbiotic relationship between vendor and partner [and] heavily relies on knowledge sharing” (Foerderer et al., 2014, p. 1, 9). Steinberg and Li (2017) portrayed content platforms as “websites or app variants of what is called social media: sites, or ‘platforms’ [...where users can] post, contribute,

share, and so on to a particular web-based and then app-based media interface” (p. 177). Heine, Kuper, and Neururer (2018) portrayed types of content platforms as either chronological (e.g., Facebook), topic-centered (i.e., discussion forums structured by topic threads), or location-centered (i.e., social maps) platforms. The importance of a content platform’s structure is “based on the use of the forum” (Heine et al. 2018, p. 400). In other words, the “type and design of social media platforms [...] influence the user experience” within specific contexts (i.e., its intended use; Heine et al. 2018, p. 400). Online information platforms, as depicted by Belleflamme and Neysen (2009), were described as focusing “specifically on the informational exchange without playing a role in the transaction” (p. 217). Online informational platforms were also described as

any system whose objective is to collect the information available on particular products and services in order to present it in a comprehensive, organized, synthetic[,] and easily accessible form, to the attention of the buyer. Consequently, it represents an information tool and not a transaction tool. (Belleflamme & Neysen, 2009, p. 220)

Steinberg and Li (2017) portrayed transaction platforms

or mediation-type platforms [... as] a paradigm in which the platform signifies something akin to the mediation-structure or intermediary that makes certain kinds of transactions possible. This is arguably the dominant cultural form of platforms today, and one of its moments of genesis can be traced back to Japanese rethinking of management theory in the 1990s. Here the term ‘platform’ designates anything that mediates between users or parties to a transaction. The usefulness [...] from this depiction] is that, while it grows out of a set of concerns with the possibilities and transformations of internet-mediated commerce, it is not limited to ‘high tech’ or technological platforms. (p. 177)

Although both broad categories of platforms exist, the literature conveyed the dominance of transaction platforms within the online economy. Of

the digital platforms that do exist, the majority are transactional platforms. Part of the reason is that creating an innovation platform is more difficult. This entails entrepreneurs introducing a technology that other firms adopt as core to their business and then build products and services around. Take operating systems for instance. We have one dominant software platform for PCs and only two for smartphones because powerful network effects between users and applications make these winner-takes-all or winner-takes-most markets. (MacDonald, 2019, p. 2-3)

Belleflamme and Neysen (2009) defined an electronic marketplace as an “interorganizational [...] system that allows and facilitates Internet-based [*sic*] commercial relationships among multiple buyers and sellers (Akoka and Lang 2002)” (p. 220). These “virtual shopping malls” serve as “a transaction tool” and “provide a complete service from the beginning to the finalization of the transaction, so that both sides never enter directly in contact. For providing this service, [...electronic marketplaces] generally charge a commission, which represents transaction costs and a profit margin” (Belleflamme & Neysen, 2009, p. 220). The literature also described platforms that combine the aspects of innovation platforms and transaction platforms into one business model. Some “firms create both types and use them to reinforce each other[.]” and this has been referred to in the literature as hybrid platforms (MacDonald, 2019, p. 2). Hybrid platforms, or hybrid multi-sided platforms as referred by Olleros and Zhegu (2014), are designed to “bring together communities and markets” and promotes a “mix of communitarian and market logics into the core of its business model” (p. 3). One notable difference in the hybrid

model is the lack of necessity for remuneration. MacDonald (2019) depicted this notion and described how this type of a platform

accepts freeloaders and finds a way of turning their self-interested behavior into a valuable asset [... by embracing] the whole spectrum of users (from ‘freeloaders’ to ‘superfans’ and ‘power users’) [and] by deploying and leveraging a broader spectrum of rewards: monetary, learning, reputational, social, civic, etc. (p. 4)

The ability of hybrid platforms being able to support freeloaders was also described in the literature. In

an Internet-based [*sic*] economy, ‘freeloaders’ (or ‘passive users’) can be turned into a source of collective value for at least four reasons: i) because their freeloading doesn’t usually cost much, ii) because they might eventually become paying users or attract other paying users, iii) because in large numbers they may attract advertisers, and iv) because in large numbers they may attract top contributors eager to accumulate reputational, social[,] or civic capital. (MacDonald, 2019, p. 5)

One additional view of classifying platforms was depicted by Oxera (2015). Their depictions focused on classifying platforms based on the perspectives of the demand and supply sides of the market. These perspectives provide clarity on the functions of platforms and their accompanying formulated structures. The consumers’ perspectives focus on the following: “What do consumers do on online platforms?”, and “What are the services delivered to consumers by online platforms?” (Oxera, 2015, p. 17). It is important to keep in mind the perspectives of both sides of the market as platforms are tasked with providing value to all stakeholders. The firms’ perspectives focus on the following: “Where are online platforms used in the value chain?”, and “What business model is the platform based on?” (Oxera, 2015, p. 17).

Figure 23 shows the common types of platforms, as classified by Oxera (2015), and the associated consumer functions. This aids in understanding why consumers use online platforms (i.e., for what functions).



Figure 23. Classification of Platforms Based on Consumer Functions. From “Benefits of Online Platforms,” by Oxera, 2015 (<https://www.oxera.com/wp-content/uploads/2018/07/The-benefits-of-online-platforms-main-findings-October-2015.pdf>). In the public domain.

Oxera (2015) portrayed consumers’ perceptions of benefits from online platforms as increased or improved convenience, choice, transparency, engagement, monetary gains, and relationships.

Figure 24 shows the common types of platforms, as classified by Oxera (2015), and the associated business functions. This aids in understanding why firms, as suppliers, use online platforms (i.e., for what functions).



Figure 24. Classification of Platforms Based on Firm Functions. From “Benefits of Online Platforms,” by Oxera, 2015 (<https://www.oxera.com/wp-content/uploads/2018/07/The-benefits-of-online-platforms-main-findings-October-2015.pdf>). In the public domain.

Oxera (2015) described platforms’ benefits for businesses (i.e., suppliers) as reduced effects of geographical barriers, increased access to investors to support novel types of businesses, and the changed cost structures of partner firms.

Understanding the essential components of platforms serves a platform firm in identifying where potential changes in the business model logic may be needed (Gatautis, 2017). It helps to identify where value can be enhanced within the platform business model.

Osterwalder and Pigneur (2009) portrayed the following essential components that comprise a platform business model:

- Segment - the group of customers[... a] company is approaching;
- Value proposition - usually associated with company products and/or services and helping customers to solve their problems;
- Delivery channels - [the] means the company is using to deliver value to segments. Companies might use physical or digital channels;
- Relationship - describes what type of relations[hip a] company is seeking to establish with the customers;

- Key resources - what kind of physical, virtual, financial, human[,] or other [resources] are required for value creation;
- Key activities - what kind of activities [... utilize resources] to create value;
- Key partnership[s] - [... strategic partnerships that] create and transfer value;
- Revenues - how [... a platform strategically earns] revenues;
- Cost - [...] the main cost[s] related to value creation and delivery. (as cited in Gatautis, 2017, p. 587)

A platform firm also needs to comprehend the sequence of events regarding platform development. Drewel et al. (2018) framed the sequence of platform development as follows:

The starting point of the development process is the key interaction as the platform[']s central promise of value. The key interaction is based on an exchange of value units between producers and customers [...]. Besides the value unit[s] and the platform participants[,] the anatomy of transaction[s] is part of the key interaction. To determine a suitable anatomy of transaction[s], the exchange of information, value units[,] and payments [... are] worked out. After designing the key interaction, a developing company devotes itself to the mechanisms that enable key interactions between producers and customers. Corresponding functions are grouped together in the platform infrastructure. Subsequently, the design of the monetarization of the platform is carried out with the objective of ensuring the long-term viability of the platform. For this purpose, parts of the created values must be retained by the owner of the platform. The process ends with the decision as to how openly the platform owner will position the platform for further ecosystem participants. (p. 16-17)

Figure 25 serves as a visual depiction of the sequence of events for platform development.

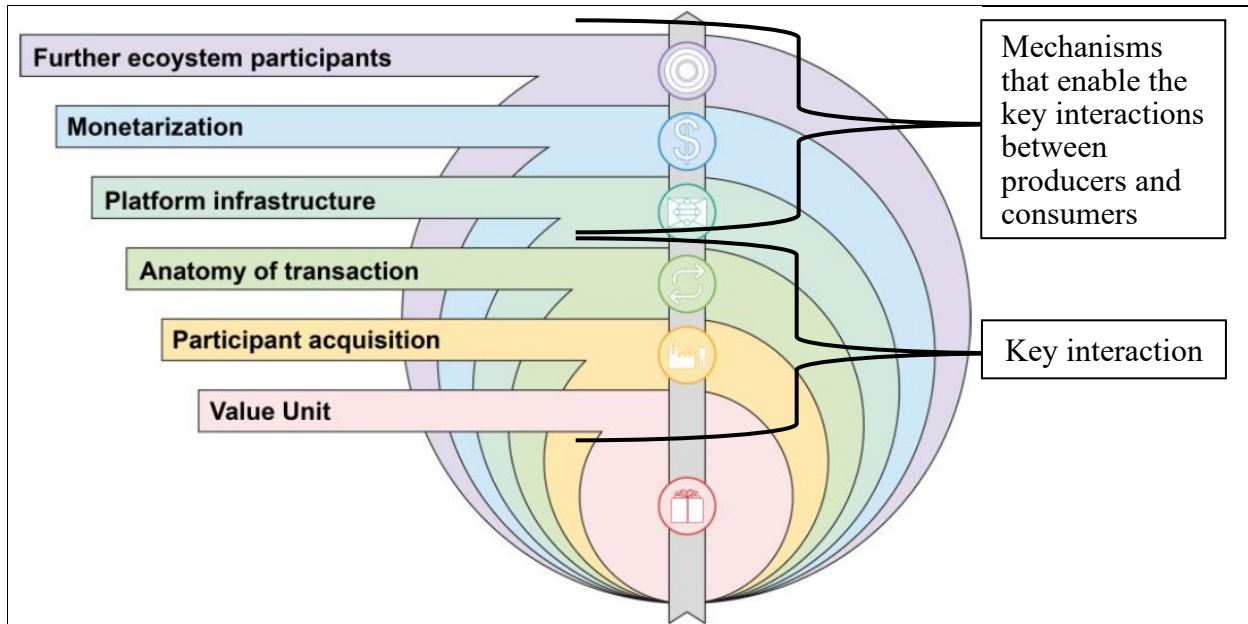


Figure 25. Sequence of Platform Development Efforts. Adapted from “*Pattern Based Development of Digital Platforms*,” by M. Drewel, J. Gausemeier, C. Koldewey, and L. Özcan, 2018, paper presented at the International Society for Professional Innovation Management *Connects Fukuoka - Building on Innovation*, Fukuoka, Japan, p. 17. Copyright 2018 by the International Society for Professional Innovation Management Ltd.

Formulating relationships. Establishing a successful platform involves aspects beyond the role of technology (Brown, 2016). Creating and owning a network serves value to the platform firm and its users. Scholars “and management consultants have identified platform control as a key feature for business success” (Kenney & Pon, 2011, p. 240). Ownership of the core asset utilized by complementors within the marketplace is an architectural advantage, serves as a high barrier to entry, and stems from the creation of a virtuous network (Pon et al., 2015). Suarez and Kirtley (2012) described attracting users and attracting complementors as necessary to creating a network. It is key for platforms to grow and generate profits (Rong et al., 2019). Leadership was described as being tasked with effectively attracting and creating the network. Platform “ecosystem leadership includes a) attracting the best complementors to the ecosystem, b) facilitating and providing adequate incentive for rapid innovations (Kim, Kim, & Lee, 2016; McIntyre & Srinivasan, 2017), and c) keeping complementors on board in the longer term”

(Mukhopadhyay et al., 2019, p. 440). The installed base size (i.e., the quantity of users) was described as the “key factor in the demand for a product or service, often more important than price or quality” (Suarez & Kirtley, 2012, p. 36). In order to attract users from both sides of the market and generate network effects, “platform companies can use subsidies to incentivize users to join, differentiate through technology features[,] or enter the industry early enough to draw in users before competition increases” (Suarez & Kirtley, 2012, p. 36). In order to enhance the utility of a platform, complementors, as the supplier side of the market, must be strategically enticed (Suarez & Kirtley, 2012). Most

companies still create and evaluate business models in isolation, and often do not realize that its success or failure depends largely on how it interacts with models of other players in the industry and on whether it can be designed to generate self-reinforcing virtuous cycles (Casadesus-Masanell and Ricart, 2011). (Casey & Töyli, 2012, p. 704)

A “successful platform usually creates a network of the relationships among economic entities (producers, stakeholders, distributors, consumers, government agencies[,] etc.) that, through competition and/or cooperation, facilitate the creation and distribution of a platform product or service” (Yablonsky, 2018, p. 490). Hänninen, Smedlund, and Mitronen (2018) described consumers as the primary asset of a platform, and they described consumers’ greatest benefits from the platform as convenience and selection. Understanding the role of the demand side of the market and the necessary relationships that need to be strategically implemented aid firms considering a platform business model. Hänninen et al. (2018) also described how

the most important activities and resources are coordinated together with suppliers and managed through open data solutions. In multi-sided digital platforms, the suppliers are

an asset for the platform owner, as the value of the platform depends on the value generated by the suppliers. (p. 159)

Hänninen and Smedlund (2019) further described the importance of suppliers as follows:

When platforms act as an intermediary - a trusted go-between acting in the best interests of buyer and seller - the supplier's role must undergo a fundamental change. The supplier can no longer succeed with a strategy aimed [...] only at delivering the most competitive combination of product quality, cost[,] and speed to a retailer. When customers and suppliers can interact and collaborate over a digital platform[,] the supplier must also compete to deliver instant, intimate, frictionless, mass-customized, [and] low-risk value on a large scale. In order to ensure end-customer satisfaction in such a dynamic marketplace[,] suppliers have to become responsive customer service organizations. The platform owner and the supplier share a strategic goal: delivering a valued customer experience. (p. 37)

Table 11 depicts supplier engagement processes depicted as delivering valued customer experiences.

Table 11

Supplier Engagement Processes

Processes	How supplier engagement processes shape value for customers
Operating Engagement	Entails a platform's core strategies and control mechanisms (e.g., governance, subsidization, quality measures, and revenue models)
	Establishes suppliers' abilities to sell their products or services, how suppliers can leverage the platform, and how interactions will be conducted with customers
	Enables suppliers to earn revenues through co-creation of perceived value during customer-to-firm and/or customer-to-customer communications
Instrumental Engagement	Entails a platform's interface (i.e., the technological infrastructure)
	Enables suppliers to integrate information systems and manage inventory, order fulfillment, and logistics with the platform
Enabling Engagement	Entails marketing, advertising, and analytic tools
	Enables suppliers to increase sales and differentiate from competitors (e.g., educational opportunities for suppliers to increase sales, display ads, and/or varying product/service placements to increase visibility)
Supplying Engagement	Serves as an additional channel (i.e., transactional interface) to bring traffic to suppliers (i.e., provides a touch-point for customer-firm and customer-to-customer communications that shape customers' experiences)
	Enables direct interactions between customers and suppliers through potential customization and/or communication processes

Note. Adapted from “On Retail Digital Platforms Suppliers Have to Become Responsive Customer Service Organizations,” by M. Hänninen, and A. Smedlund, 2019, *Strategy and Leadership*, 47(1), p. 39-41. Copyright 2019 by Emerald Publishing Limited, and from “Beyond Virtuality: From Engagement Platforms to Engagement Ecosystems,” by C. F. Breidbach, R. Brodie, and L. Hollebeek, 2014, *Managing Service Quality*, 24(6), p. 603-606. Copyright 2014 by Emerald Group Publishing Limited.

Symbiosis was described as the nature of enriched business relationships. Organizations who “outperform competitors in both revenue growth and profitability” utilize strategic “partnership relationships” to “not just create the types of experiences now demanded by customers, but [do so] to bridge gaps in expertise, assets[,] and other resources” (Berman et al., 2018, p. 27).

Davidson, Giesen, Harmer, and Marshall (2018) described the following three goals organizations seek regarding engaging in strategic relationships: grow “the strategic impact of

ecosystem engagement on their business[,]” gain “access to [new] skills[,]” and increase “the scope of strategic business opportunities and initiatives” (p. 28). A “common goal and shared vision becomes critical in managing partners involved towards a desired outcome”

(Mukhopadhyay et al., 2019, p. 439). Ding et al. (2019) described mutualism symbiosis as

positive interactions between organizations, in which each organization may benefit from working with others, and they depend on each other in this mutually beneficial relationship. In contrast, [... predation] symbiosis refers to the approximate zero-sum game that is often observed in a biological food chain. The players may compete with each other, absorb nutrition from the others, and eventually benefit itself by damaging the others. (p. 1566)

Strategically structuring relationships. As platforms grow within their lifecycle and cultivate their relationships with complementors and other outside organizations, the nature of the symbiotic relationship must be considered from strategic platform business perspectives. Simply put, averting “collaborative innovation will often lose big time. The decision thus will often be to which degree, what[,] and how” (Uenlue, 2017, Design section, para. 3). Platform firms are tasked with “continuously learning to co-create value with customers, suppliers, and stakeholders” (Lusch, Liu, & Chen, 2010, p. 74). Ikeda and Marshall (2019) also portrayed the importance of strategic symbiosis as they described how platform firms need to recognize the “value inherent in the customer relationships [...] built over time and work to avoid other organization’s attempts to implement a disintermediation strategy.” (p. 34). The review of the literature depicted the concept of a bottleneck as vital to maintaining value within the online ecosystem.

Jacobides et al. (2006) suggest that a platform firm can intentionally construct the value network in such a way as to create barriers of entry for its own position, while increasing competition in other nodes around its network location, thereby positioning itself as the bottleneck. [... This entails focusing] on one or more core competencies while actively facilitating competition among firms providing complementary assets adjacent to the bottleneck. (Pon et al., 2014, p. 981)

The concept of a bottleneck fosters funneling relationships and business transactions through the platform as the intermediary. This is not to say that value should not be generated to all stakeholders but stresses the importance of strategically structuring relationships and tactics. The aim of formulating a network is to serve value to all stakeholders while simultaneously enforcing and growing the intermediary (i.e., cultivate strategic relationships that enhances value to users, as well as the value proposition of the platform as the intermediary; Pon et al., 2014). It is about value co-creation (Lusch et al. 2010). Lusch et al. (2010) posed the following questions for platform firms to consider as they develop and contextualize their co-creation metrics:

- When actors use an organization's product(s), what other resources are integrated with it? How can we model this resource network?
- When actors use an organization's product(s), what goals are they trying to reach?
- What is the level of value cocreation [*sic*] that occurs outside of markets (as in home [*sic*] production or social exchange)?
- What are the cocreation [*sic*] benefits to the firm? What resources or expertise does the firm need to engage in successful cocreation [*sic*] activities with customers, suppliers, employees, and other stakeholders? (p. 74)

Ding et al. (2019) portrayed how “competitive advantages [...] derive from the mutualism symbiosis (++) among organizations in the process of co-evolution process with the involvement of external upstream suppliers, downstream customers[,] and complementors (Adner and Kapoor, 2010)” (p. 1566). An ecosystem provides the interface for relationships and strategies to take form. The ecosystem perspective proposes “that exchanges within a network allow actors to acquire knowledge about their partners, including their resources, needs, capabilities, strategies[, and establish strategic...] relationships” (Guo & Bouwman, 2016, p. 59). The connections made within the platform as a network aim to reduce market uncertainties and frame firms’ dependency relationships (Guo & Bouwman, 2016). Platform firms can also use the concept of dependent relationships to increase its market utility and decrease their own uncertainties within the marketplace. Guo & Bouwman (2016) described how the Alipay case

may serve as an example that other providers follow, taking similar actions to increase the dependency of others and reduce their own dependency on others. It is helpful to take a keystone strategy to create value within the ecosystem and share this value with other participants. Moreover, Alipay acts as the platform provider, in addition to managing value creation within the ecosystem and sharing that value with the other participants. Alipay focuses on the business and strategic needs of the core actors, without threatening their main business, for example, Alipay focuses on micro-payments, which do not pose a direct competition to banks, who mainly rely on macro-payments to generate profit. Micro-payments are often related to high transaction costs for banks. In addition, although it is difficult to define the boundaries of actors in the ecosystem, the core business of every actor is the key competitive or even survival condition. This notion should be taken into consideration by actors whose actions affect the business of other

ecosystem partners. For instance, Alipay will not aim to become a bank, as they know that if they do so, they cannot connect any other bank to their platform. In other words, the scope and boundary of the actors are clearly identified so that the core business will not be threatened. (Guo & Bouwman, 2016, p. 72)

Kenney and Pon (2011) also conveyed the importance of interdependent relationships and the value that is generated for complementors, as well as the platform firm. A

platform is not solely a technology, but also the outcome of a set of business behaviors and relationships between actors in an ecosystem. This ecosystem for modern high-technology [*sic*] platforms is characterized as having high levels of interdependence between actors, as well as high potential for innovation by each actor (Gawer and Cusumano 2002; Gawer and Henderson 2007; Gawer 2009). As a result, even those firms with clear market dominance in one area [...] are dependent on the innovation of complementary firms to maintain their leadership position. [...] Even Apple and its relatively closed iOS depends upon thousands of application developers to continue to create desirable apps for end-users[.] (Kenney & Pon, 2011, p. 241)

Brown (2016) posed the following question for platform firms to consider in establishing long-term business success:

Which relationships enable business success? All too often, blunt answers include employees or customer personas, but leadership must push beyond these expected labels. In a network, individual roles become more fluid and a company's engagement plan must mature beyond offering only paychecks or products. (Brown, 2016, p 3).

Brown (2016) portrayed how Microsoft and their newly envisioned relationships with marquee users served as an augmentation to their development and marketing efforts, and how

Microsoft's openness decision, regarding their Windows Insider Program, allowed the utility of the program to swell to over five million users. A platform ecosystem "is characterized by open, flexible, demand-driven, interactive networked architecture[,] and collaborative environments (Boley and Chang, 2007; Gawer and Cusumano, 2013)" (Yablonsky, 2018, p. 490).

In seeking to provide value to the platform itself, to complementors, and to reduce uncertainties in the marketplace, the decision and extent of openness must be considered. Besides technological considerations, the relationships potentially created and applicable market strategies differ in the decision and extent of openness. Viewing platform

business models as open networks suggest that their activity systems are continuously developing. Central, for operating in open networks are: collaborative infrastructures, which enable access to resources and capabilities of other actors (i.e. business partners, customers, freelancers, start-ups[,] and other service providers); relinquishing control; and continuously evaluating collaboration potential to expand the network. (Fehrer et al., 2018, p. 560-561)

Kenney and Pon (2011) described the different alliance strategies utilized by Apple, Google, and Microsoft within the smartphone marketplace. Apple was described as having a vertically integrated and closed system (Kenney & Pon, 2011). While this strategy "does, as Apple claims, provide a more effective and cohesive user experience, it also limits the external innovation and scale that can come from [a] more open platform licensing strategy" (Kenney & Pon, 2011, p. 252). This was strategically implemented by Apple. In contrast, Google's openness strategies were depicted as quite different. As a

relative latecomer to the smartphone market, Google faced entrenched opposition from Nokia/Symbian as well as from quickly rising Apple/iOS. Its open, free licensing

approach with Android is intended to build market share as quickly as possible, with the goal of taking advantage of "network effects" -whereby for each additional user of a platform, the value of the platform to all users increases (Cusumano and Suarez 2009). (Kenney & Pon, 2011, p. 252).

Kenney and Pon (2011) also portrayed Microsoft's efforts within the smartphone industry. Microsoft is "following its legacy strategy from the PC industry, and is [...] somewhere in the middle between Apple and Google [...] regarding their strategic alliances]. It is charging device manufacturers to license the WP7 OS, but it is encouraging widespread development and integration with its platform" (Kenney & Pon, 2011, p. 253). Although these aspects depict the different technological aspects that have been in play within the smartphone industry, they also depict the relationships that are established and navigated to decrease market uncertainties and enhance growth. Openness tactics were described as able to

expedite innovation and lead to more value (Chesbrough and Appleyard 2007). [...] A] platform should be developed in an innovative way and should be able to solve essential problems currently existing in an industry by using the open characteristics of the Internet [sic] (Meyer and Mugge 2001). (Lee et al., 2010, p. 94)

Google was able to successfully grow in terms of speed and in terms of the quantity of units shipped (Campbell-Kelly, Garcia-Schwartz, Lam, & Yang, 2014). Google utilized a

multi-sided model characterized by considerably more openness. It created an open source operating system and gave its partners - handset makers and even network operators - the ability to modify it to achieve product differentiation. It engaged as many handset makers and network carriers as it could from the beginning, and it made it

extremely easy for third-party developers to create apps for the platform. (Campbell-Kelly et al., 2014, p. 732).

The “ecosystem of open platforms consist[s] of different main stakeholder groups” (Moser, Wecht, & Gassmann, 2017, p. 3). Stakeholders’ efforts are directed by the platform firm. Enticement “and control mechanisms required to align the behavior of different parties in transaction [... act] as the main coordination mechanism in open platform ecosystems (Adner & Kapoor, 2010; Demil & Lecocq, 2006; Wareham et al., 2014)” (Moser et al., 2017, p. 3).

Platform leverage was also described in the literature as an important aspect to formulating an efficient network. Development leverage refers to the technological aspects of platform leveraging and “reduces the investment in products or services” (Lee et al., 2010, p. 95). Platforms can also generate interaction leverage. Interaction leverage permits a large quantity “of participants to make transactions. Accordingly, the revenue of the platform leader increases with the large number of transactions and proportional decrease in transaction costs. Therefore, the greater transaction efficiency enables the greater value (Amit and Zott 2001)” (Lee et al., 2010, p. 95).

Deriving at value from relationships. Uenlue (2017) described how value from formulated relationships on platforms (i.e., between customers and strategic business partnerships) “make transactions cheaper and simpler” (Transaction Costs section, para. 1).

Platforms

emerge and thrive because of the potential profit in taking advantage of transactions cost reductions to connect people for mutual benefit. They do so in a particular way, not by offering a specific product at a take it or leave it price, but rather by acting as a connector,

a search cost reducer, [and] enabling people to find each other and agree to terms.

(Kiesling, 2018, p. 46)

Figure 26 depicts search costs, transactions costs, and the potential impact on future transactions (i.e., dependent upon the value derived from the interactions with the intermediary).

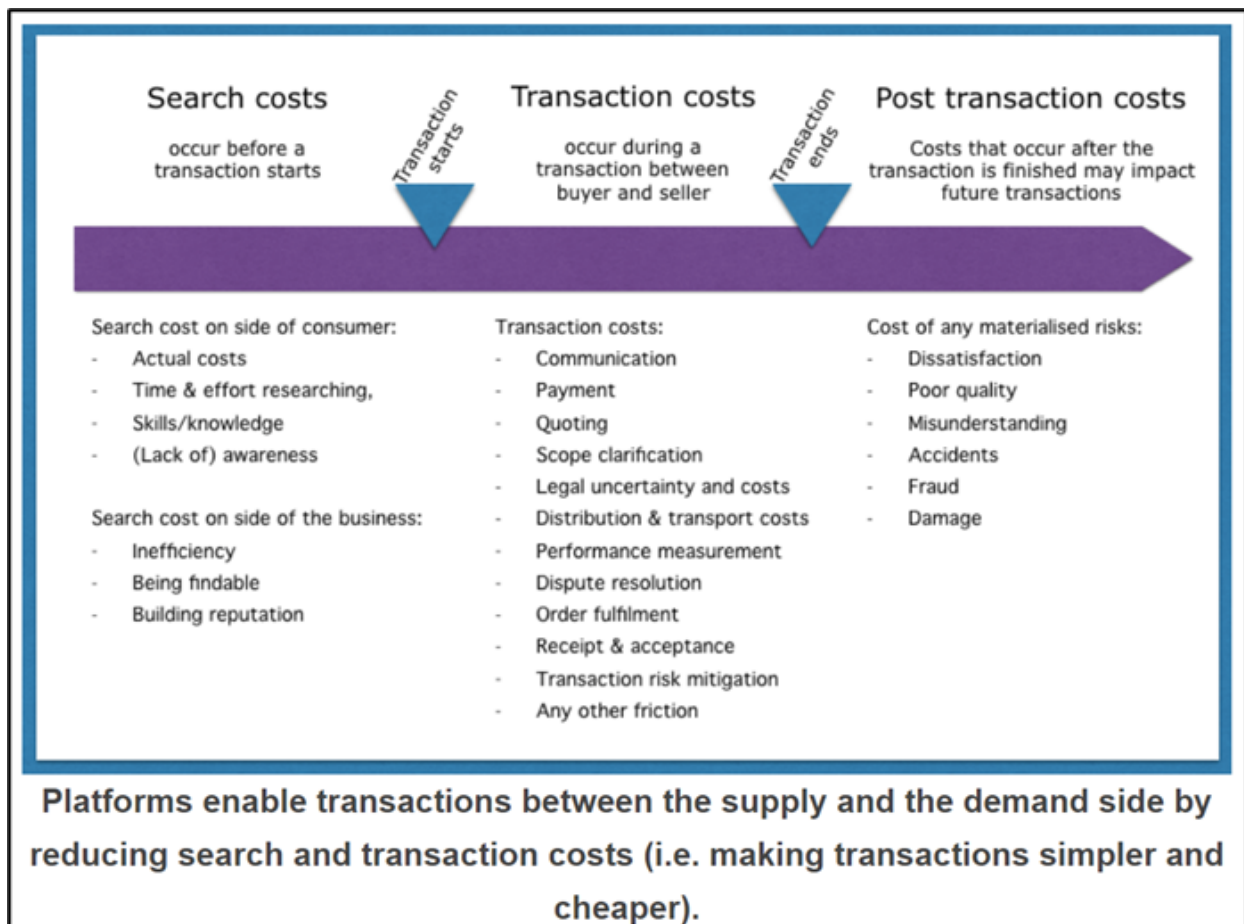


Figure 26. Search Costs, Transaction Costs, and the Potential Post Transaction Costs. From “The Complete Guide to the Revolutionary Platform Business Model,” by M. Uenlue, 2017 (<https://www.innovationtactics.com/platform-business-model-complete-guide/>). In the public domain.

Platforms “need to add additional value to the overall exchange - and still be able to extract value - in order to be relevant” (Uenlue, 2017, Value Creation and Value Capture section, para. 2).

As platform firms seek various strategies, they must understand that “interactions between the demands on the various sides of the platform [...] are interconnected[...] and] small changes on one side of the market may have important repercussions on other sides” (Campbell-

Kelly et al., 2014, p. 722). Platform firms “bring together [the] demand and supply side. But in most cases, the value creation efforts are more concentrated on one side. This doesn’t mean more value is created for that side, it just denotes where the efforts of developing the platform [predominantly] lie” (Uenlue, 2017, Strategy section, para. 6). Figure 27 shows different market-sided strategies for platforms to consider to initiate value.

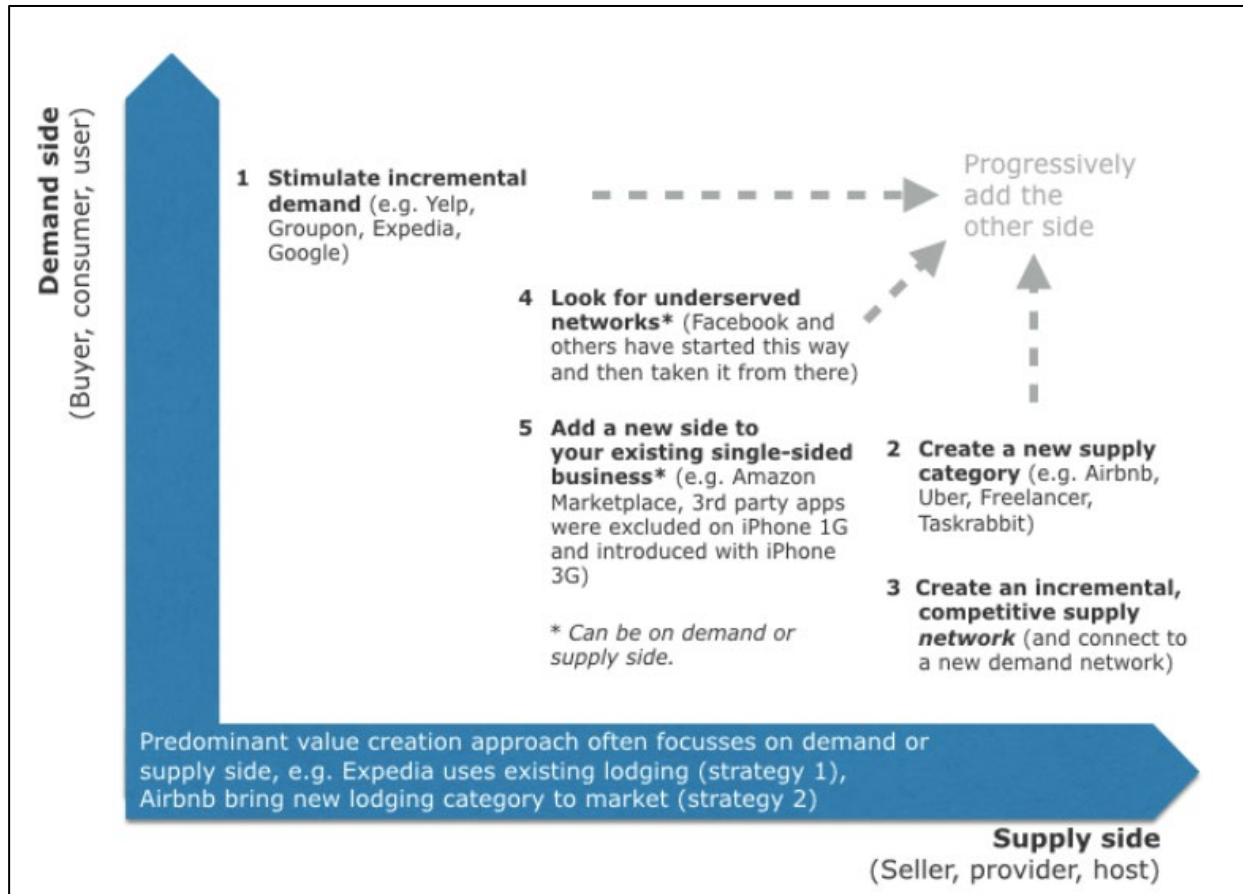


Figure 27. Value Creation Efforts Stemming from One Side of the Market. From “The Complete Guide to the Revolutionary Platform Business Model,” by M. Uenlue, 2017 (<https://www.innovationtactics.com/platform-business-model-complete-guide/>). In the public domain.

Creating value is about more than where (i.e., on which side of the market) to initiate value. It is also about to which degree and what to do to foster value (Uenlue, 2017). Uenlue (2017) portrayed the following eight tactics frequently utilized by firms to successfully establish a platform:

- Tactic 1: Accelerate early supply (with subsidies)
- Tactic 2: Accelerate early demand (with subsidies)
- Tactic 3: Tap/piggy-back onto an existing network
- Tactic 4: Attract high-value users (or celebrities)
- Tactic 5: Start as useful single-sided platform
- Tactic 6: Extend your existing assets
- Tactic 7: start in a niche or micro market, then expand
- Tactic 8: provide certainty through commitment (Getting to Critical Mass section, para. 2)

Figure 28 contextualizes these eight tactics with specific entities and their implementations.

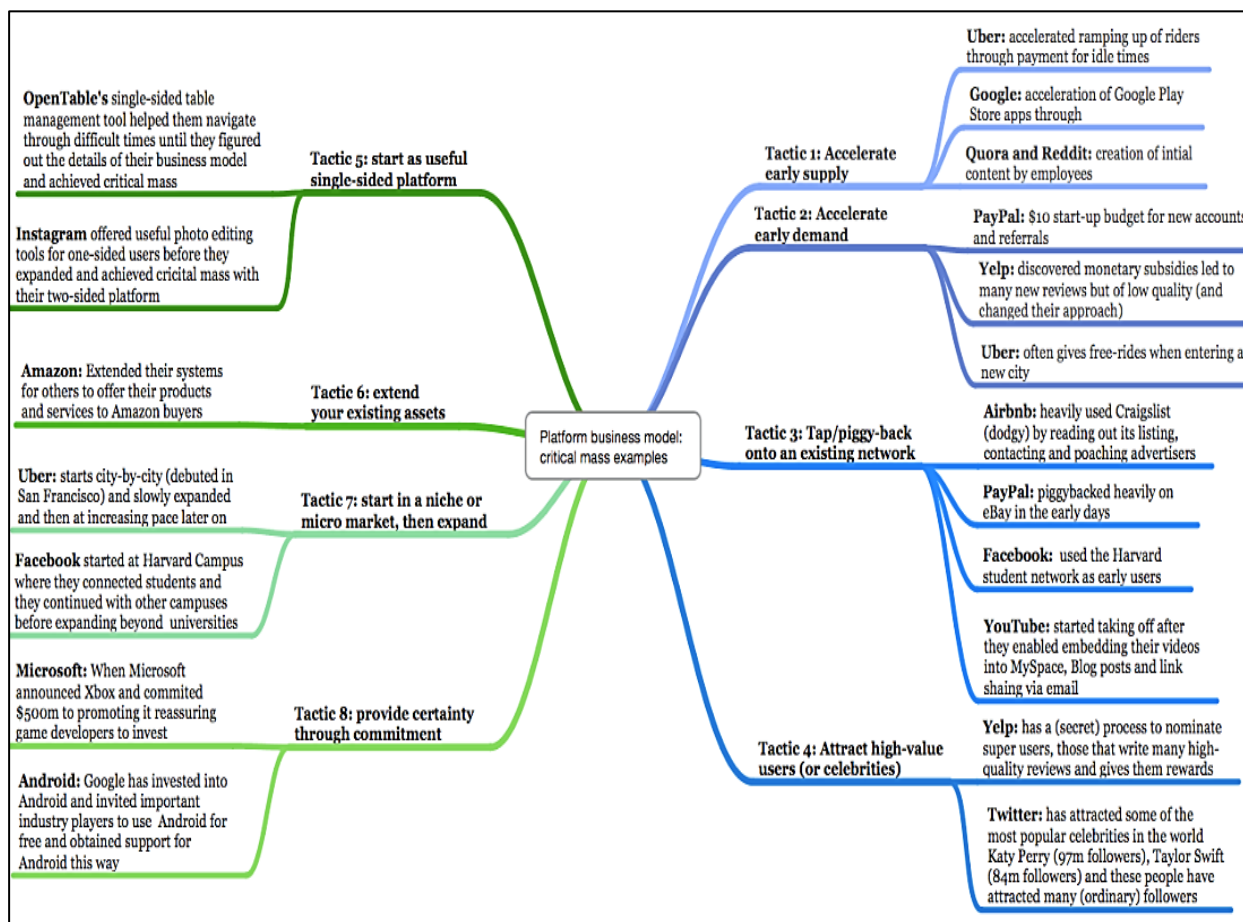


Figure 28. Commonly Employed Platform Tactics by Specified Firms. From “The Complete Guide to the Revolutionary Platform Business Model,” by M. Uenlue, 2017 (<https://www.innovationtactics.com/platform-business-model-complete-guide/>). In the public domain.

Moser and Gassmann (2016) portrayed how successful platforms implement strategies to go beyond emerging and bringing a business ecosystem into fruition. Platform leaders are tasked with developing and enhancing the technological aspects of a platform's core as well as transforming the broad business model of the platform with additional and complementary business strategies (Moser & Gassmann, 2016). Moser and Gassmann (2016) provided the following four value propositions for firms to consider in growing and increasing market scope:

Proposition 1: If a platform emerges, a platform leader not only need to develop the underlying core technology but successively the business model to broaden the scope of the platform[sic]. [...]

Proposition 2: If an incumbent platform has a portfolio of multiple business models, the core business model of the platform gets supported by the other business models and follows stands therefore on top of them, on a higher hierarchy level[sic]. [...]

Proposition 3: If an incumbent platform has a portfolio of multiple business models, they are always strongly interrelated with the platform core business model[sic]. [...]

Proposition 4: Incumbent platform companies innovate their business models through the addition of new business models out of offensive, defensive[,] or opportunistic reasons[sic]. (p. 8-10)

Fu et al. (2017) portrayed tactics to enhance value frequently utilized by platform firms stratified by the evolutionary phases of platforms (i.e., the entry, expansion, and maturity stages as defined by the researchers). Table 12 portrays successful platform strategies stratified by the evolutionary phases of platforms.

Table 12

Tactics Frequently Utilized by Platform Firms to Enhance Value

Evolutionary phase	Tactics to employ
Emergence	<ul style="list-style-type: none"> ▪ VIP member service ▪ Service product customization to increase engagement and avoid multi-homing ▪ Segmented service product to retain old and attract new customers ▪ Standardization to promote the efficiency of suppliers and matching on the platform ▪ Modularization to meet the service needs of multiple customers ▪ A one-stop cohesive service ▪ User growth and reward processes to enhance engagement and ensure critical mass is attained ▪ Customer subsidization <p><i>The goal is to create the platform's infrastructure, entice new users, and initiate network effects.</i></p>
Expansion	<ul style="list-style-type: none"> ▪ A recommendation and network marketing service to attract new users ▪ Supply chain financing and process integration to enhance the relationships with suppliers (i.e., financial, problem-solving efficiencies, and co-evolution) to enhance the entry and retention of users ▪ Openness regarding new product development efforts to drive efforts focused on the customers' needs ▪ Changes in the cost structure <p><i>The goal is to nurture value co-creation activities to have new network effects and expand.</i></p>
Maturity	<ul style="list-style-type: none"> ▪ Entrepreneurial actions to potentially engage new investors, new participants, and/or to attain a new critical mass ▪ Ecosystem tactics to enhance symbiosis and supervisory role compared to purely concentrating on profits ▪ Foster independent interactions to directly enhance connections with different groups of users (i.e., enhance the relationships with cross-sided customers/suppliers) ▪ Consider a stair-stepped revenue-sharing model to increase the quantity of new developers <p><i>The goal is to create an ecosystem environment where participants have power.</i></p>

Note. Adapted from “The Influence of Platform Service Innovation on Value Co-creation Activities and the Network Effect,” by W. Fu, Q. Wang, and X. Zhao, 2017, *Journal of Service Management*, 28(2), p. 365-373. Copyright 2017 by Emerald Publishing Limited.

Singh & Srivastava (2019) described “perceived usefulness [sic] as the most important driver of online purchases” (p. 65). Although their study focused on retail platforms, the necessity for value exists across all types of platforms and for all stakeholders involved. The

“value delivery dimension contains the elements that generate value for a group of defined target customers[,]” whereby customers refers to participants on both sides of the market (Täuscher & Laudien, 2018, p. 321). The

value proposition reflects the bundle of products and services that create value for specific customer segments. It represents the reason why customers turn to one company over another. It includes the product, price, extended product, [...] and is what creates the competitive edge of the company’s offering by solving a customer problem or satisfying a customer need. (Ruggieri, Savasto, Scalingi, Bala, and D’Ascenzo, 2018, p. 1215)

Täuscher and Laudien (2018) portrayed the following as the “types of perceived value: (a) utilitarian value through price, cost, or efficiency advantages, (b) emotional value through superior user experience or the associated image with using the marketplace[,] and (c) social value through the interaction with other marketplace participants” (p. 321). Value capture was also portrayed within the literature. Value capture is the “profit formula (Baden-Fuller & Mangematin, 2013) [and] describes how the firm transforms the value delivered to customers into revenues and profits (Abdelkafi & Täuscher, 2016; Teece, 2010)” (Täuscher & Laudien, 2018, p. 321). Ruggieri et al. (2018) identified revenue stream/s as deriving from sales, rental fees, transaction fees, subscriptions, and/or advertising fees. Zehir et al. (2019) portrayed the elements of pricing strategies as follows:

- Market Price and Price Flexibility of the Demand
- Quality Sensibility
- Fungible or Subsidiary Relations between Applications
- Competition level in sector
- Price sensibility of customers in time

- Industry dynamics
- Lifecycle of platform ecosystem (p. 112-113)

Perceived value and the profit formula are the components that provide co-created value for suppliers, demanders, and for the platform firm (Singh & Srivastava, 2019; Täuscher & Laudien, 2018). Bivona and Cosenz (2019) also portrayed the concepts of value as value creation and value capture. Successful platform

initiatives can be attributed to two main stages of value generation, namely, (a) value creation that is, the process through which the platform gets crowded - and (b) value capture - that is, the process through which the platform delivers value to community users and to the platform itself (Osterwalder & Pigneur, 2013; Zott & Amit, 2010). In particular, although the first stage is associated with the user's registration on the platform (i.e., the so-called network effects), the second one involves a stable interaction among users (i.e., cross-side network effects) aimed at delivering the co-created value through successful transactions/exchanges among them. (Bivona & Cosenz, 2019, p. 2)

Figure 29 depicts the various dimensions of value.

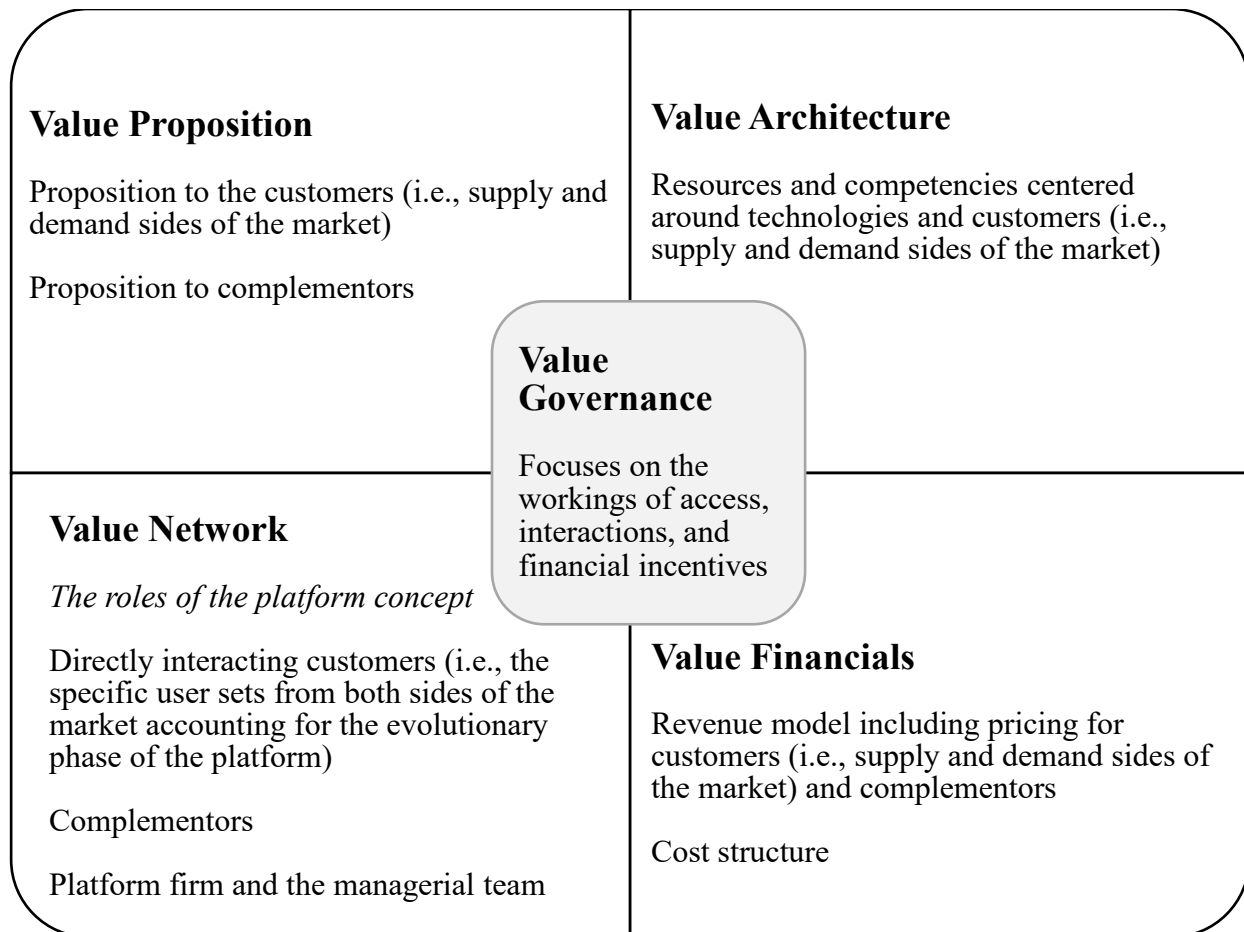


Figure 29. The Five Dimensions of Value. Adapted from “Platform Business Models and Internet of Things as Complementary Concepts for Digital Disruption,” by O. Mack and P. Veil, in A. Khare, B. Stewart, & R. Schatz (Eds.), *Phantom Ex Machina: Digital Disruption's Role in Business Model Transformation* (p. 77-78), 2016, Cham, Switzerland: Springer. Copyright 2017 by Springer International Publishing.

The dimensions of value are important for platform firms to understand as are the processes that foster value creation. Figure 30 shows the processes for value creation for the supply and demand sides of the market, as well as the platform firm itself.

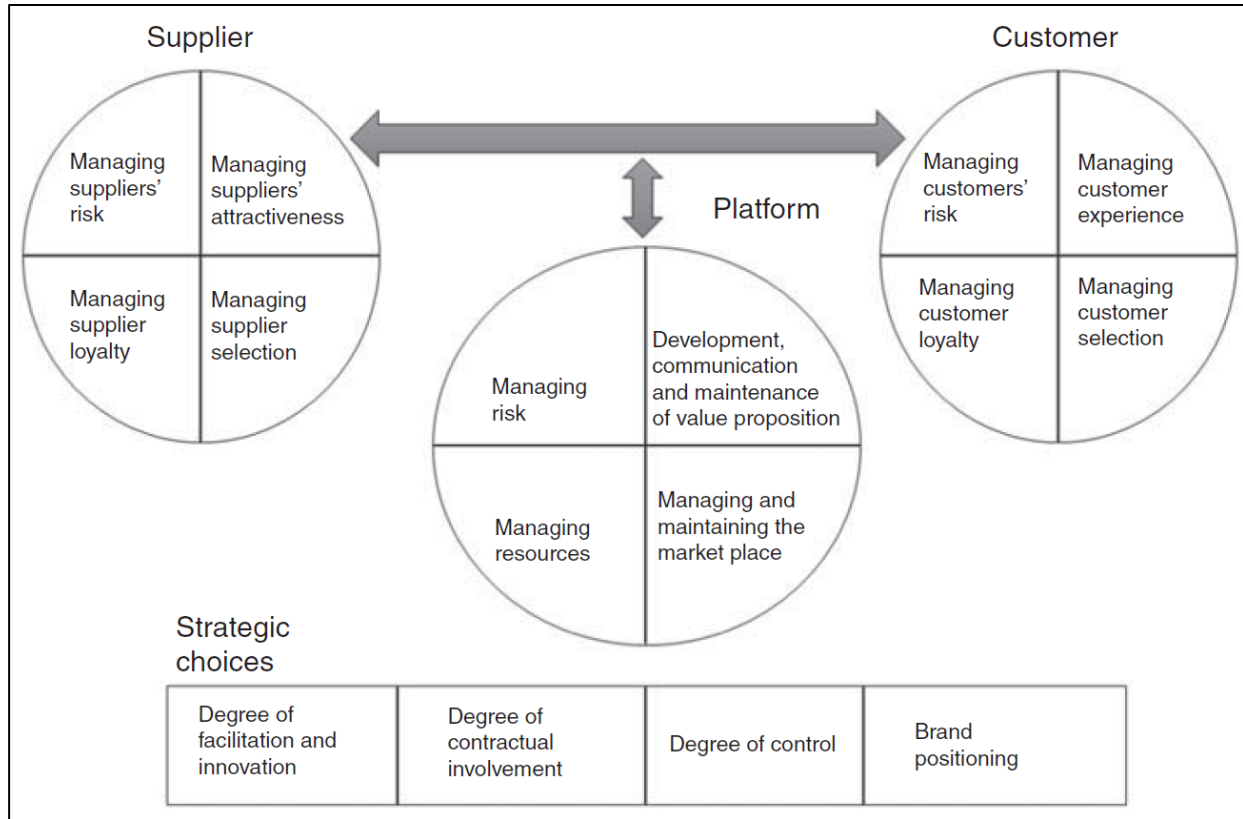


Figure 30. Value Creation Processes for Platforms. From “Business Model Innovation and Value Creation: The Triadic Way,” by T. W. Andreassen, L. Lervik-Olsen, H. Snyder, A. C. R. Van Riel, J. C. Sweeney, and Y. Van Vaerenbergh, 2018, *Journal of Service Management*, 29(5), p. 888. Copyright 2018 by Emerald Publishing Limited.

Hänninen, Mitronen, and Kwan (2019) and Sorescu, Frambach, Singh, Rangaswamy, and

Bridges (2011) described the dimensions of value as value creation and value appropriation.

Table 13 depicts the aspects of value creation and value appropriation as dimensions of value.

Table 13

Dimensions of Value: Value Creation and Value Appropriation

Dimensions	Definitions
Value creation	Customer efficiency - degree in which demander's access to supplier's offering is made easy
	Customer effectiveness - degree in which suppliers facilitate demanders' realization of consumption
	Customer engagement - degree in which suppliers design demanders' experiences to conjure emotional connections that go beyond the purchase
Value appropriation	Operational efficiency- degree in which knowledgeable and proficient utilization of resources enhances speed and simplicity, as well as reduces costs
	Operational effectiveness - degree in which suppliers conduct ethical business practices and reduce inefficiencies
	Customer lock-in - degree in which demanders' proclivity to switch to a competitor is minimalized

Note. Adapted from “Multi-sided Marketplaces and the Transformation of Retail: A Service Systems Perspective,” by M. Hänninen, L. Mitronen, and S. K. Kwan, 2019, *Journal of Retailing and Consumer Services*, 49, p. 384-385. Copyright 2019 by Elsevier Limited, and from “Innovations in Retail Business Models,” by A. Sorescu, R. T. Frambach, J. Singh, A. Rangaswamy, and C. Bridges, 2011, *Journal of Retailing*, 87(SUPPL. 1), p. S7-S11. Copyright 2011 New York University.

Yablonsky (2018) expanded on these value dimensions as conveyed by Mack and Veil (2016),

Hänninen et al. (2019), and Sorescu et al. (2011). A platform business model

is a useful lens for understanding the company's platform underlying logic because it explains what value is provided, how this value is created and delivered[,] and how profits can be generated therefrom. This concept helps to understand the capturing value from technological innovations and platforms (Chesbrough and Rosenbloom, 2002; Osterwalder and Pigneur, 2010; Osterwalder et al., 2014), the boundaries of a firm (Zott et al., 2010), and create a direct connection between business strategy and business processes (Al-Debei and Avison, 2010). (Yablonsky, 2019, p. 491)

Figure 31 depicts a platform business model including the essential business model building blocks, value creation dimensions, and applicable platform business tactics.

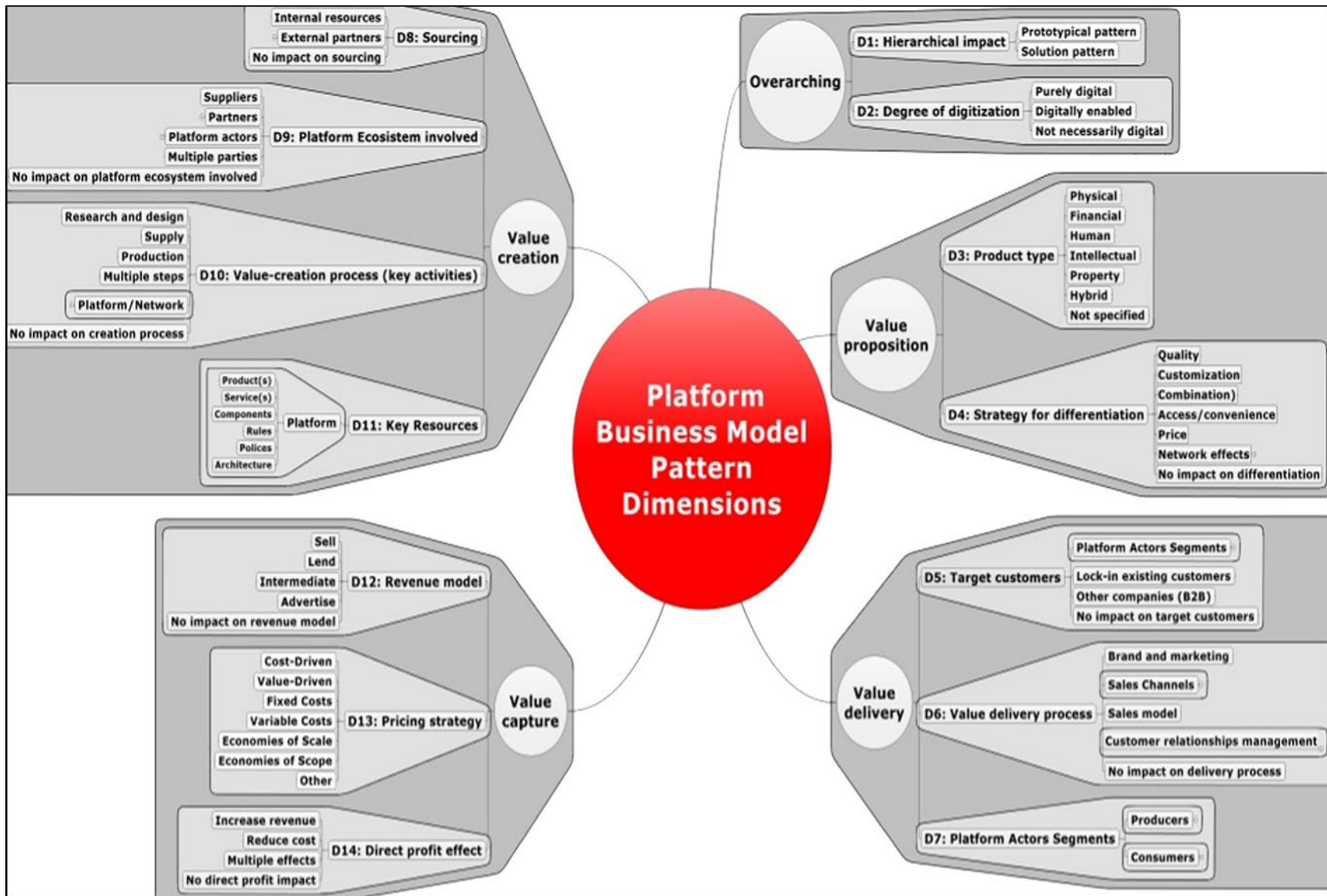


Figure 31. Platform Business Model. From “A Multidimensional Framework for Digital Platform Innovation and Management: From Business to Technological Platforms,” by S. Yablonsky, 2018, *Systems Research and Behavioral Science* 35(4), p. 492. Copyright 2018 by John Wiley & Sons, Ltd.

Sorri, Seppänen, Still, and Valkokari (2019) developed guiding questions that “help companies to innovate and evaluate their platform business models from different perspectives, thus addressing the ecosystemic [*sic*] nature of platforms” (p. 6). Figure 32 portrays these guiding questions that address the core value interactions between both sides of the market.

Characteristics	Questions
Value producers	Who are the value producers and what motivates them to create the value? Through which channels do they produce the value?
Value users	Who are the value users, and what motivates them to consume the value? Through which channels do they consume the value?
Value	What are the different values that are created? How does the platform attract participants? How is the chicken-and-egg problem solved? Which friction does the platform reduce?
Filters	What data are acquired to match producer and user? Which filters does the platform need to serve the relevant content to consumers and connect them to the relevant value producer?
Network effects	Which types of network effects are achieved?
Value capture	What currency does the user provide to the producer in exchange for value? How does the platform capture some portion of this currency?
Governance	What are the tools for lowering the barriers to entering the platform? Which creation/curation/customization/ consumption tools does the platform provide?
Resilience	To what extent are the boundary resources defined?

Figure 32. Guiding Questions to Assess the Value Interactions Between Both Sides of the Market. From “Business Model Innovation with Platform Canvas,” by K. Sorri, M. Seppänen, K. Still, and K. Valkokari, 2019, *Journal of Business Models*, 7(2), p. 7. Copyright 2019 by the Journal of Business Models.

Emerging strategies. The notion of value should be driven by an iterative and ever-emerging learning process (Mancha, Gordon, & Stoddard, 2019). While any digital startup should be responsive to data and market shifts, digital platforms must coordinate the exchange of value between two or more sides, making misadjustments between initial strategy and market reality quite likely. As opposed to following a rigid and pre-defined strategy, a digital platform needs to continuously capture customer and ecosystem data and adapt its strategy to what it is learning - it should follow emergent strategies (Mintzberg and Waters, 1985). (Mancha, Gordon, & Stoddard, 2019, p. 10)

The “aim is to understand what combination of information, presented at which trigger points, increases a customer’s propensity to [... purchase a] product or service” (Rosner, 2019, p. 56).

Posner and Mangelsdorf (2017) also described how “a company’s innovation strategy needn’t be ‘cast in stone.’ As the needs of the business change, the innovation strategy can change as well” (p. 33). Zehir et al. (2019) described how platform “strategies should be changed depending on transforming conditions. A platform strategy that is useful [...] today could lose its significance tomorrow. One of the best strategies is to combine different platform strategies. But, this requires an integral approach” (p. 116). As a platform business develops, platform firms need to consider where they are in the marketplace, where they want to be, what new business innovations are required, how to achieve new business goals, and the role of competitors within the market (Mancha et al., 2019; Sorri et al., 2019; Zehir et al., 2019; Zhao, von Delft, Moran-Thomas, & Buck, 2019). Kiesling (2018) also described how pricing

and market processes provide feedback channels. Feedback loops, learning, adaptation to a changing environment and changing actions and plans of others, interdependence of agents and their actions in a complex system, and how prices and markets serve as feedback loops making a complex system adaptive are all important. (p. 60)

Zhao et al. (2019) described how “innovative actions and imitative reactions are commonplace in crafting a viable multi-sided platform business model” (p. 16). These strategies serve as two differing viewpoints regarding business modeling. Business

model innovation [...] enables] platforms to challenge the dominant logic of value creation and capture in the market, and significantly [...] enhance] their platform's relative competitive position. However, successful business model innovations promote rapid

imitations that may also be used as an effective means of differentiating and enhancing a platform firm's relative competitive position. (Zhao et al., 2019, p. 16)

It is important for firms to consider how their platform will interact with rivals within the platform economy. Successful “platform firms create highly interdependent activity systems with a large number of design elements, and the sheer complexity of an activity system can itself constitute a barrier to imitation” (Zhao et al., 2019, p. 17). As firms seek out imitation or innovation within their platform endeavor, firms need to keep in mind that “complexity can provide a basis for competitive advantage in platform battles, but [... it is] possible that complexity may become a burden at later stages of the evolution[ary] cycle” (Zhao et al., 2019, p. 17). Complexity can be found within emerging or growing platforms, emerging or adjustments to strategies, or regarding strategic relationships within the online economy. The notion of imitation or innovation also extends to these same parameters. Platform firms need to consider the dimensions of value, how to strategically structure relationships, and complexities regarding new or expanding imitation or innovative efforts.

Chapter 5: Discussion

Discussion of Network Effects

To make informed decisions regarding network effects, a potential anesthesia CE platform owner should carefully consider the following: market analyses, strategically navigating how online technologies are utilized and changing, the evolving anesthesia CE environment, the political obstructions that exist within the industry (i.e., barriers to successfully developing relationships with anesthesia CE providers), competing marketing streams in which CE providers reach anesthesia professionals, and their capabilities and resources. The goals of an emerging platform should be centered on analyzing and strategizing on how to cultivate a marketplace. Partnering with the leading anesthesia CE providers may serve a unified anesthesia CE platform well. Collaborating with their platforms or developing a functionality that co-creates value for anesthesia CE providers and anesthesia professionals should be of the utmost importance. Such collaboration accounts for the need to consider openness strategies, generate network effects, and to attain a critical mass of users from both sides of the market.

In the current study, the anesthesia CE industry, the various user sets, and targeting the leading anesthesia CE providers were strategically assessed, within the context of the literature, to better understand who may serve the greatest chance of mass adoption and who may most effectively set off a chain reaction of adoption within the platform. The launch of a potential anesthesia CE platform will have to be strategically focused. In considering the anesthesia CE marketplace and the potential launch of a unified platform, strategies will have to be initially considered to bring in the supply side of the market. From a practical point of view, a potential platform would need to have available anesthesia CE offerings (i.e., supply of anesthesia CE) before the demand side of the market (i.e., anesthesia professionals) can be targeted.

Pragmatically, the opposite does not work towards establishing a critical mass adoption of the potential platform as a viable network (i.e., a significant quantity of anesthesia professionals with minimal anesthesia CE offerings available on a platform would not promote return visits to the platform from anesthesia professionals).

Subsidization was continuously discussed within the literature as one useful approach for platforms entering a marketplace. Applying pricing strategies to the anesthesia CE industry requires thought about the initial and long-term impact to both sides of the market, strategies for attaining mass adoption, and initial and long-term subsidization considerations. It is essential to define the leading providers from the perspectives of size, credibility, and potential impact on the potential platform and the desirable online marketplace. Partnerships with large anesthesia CE provider organizations need to be strategically implemented. Credibility tactics also need to be employed. Professional organizations are stewards of their professions and are bound to the interests, spread, and advancement of their members. Subsidizing the CE offerings from the ASA, AANA, AAAA, and their respective state component societies, associations, and academies may be a viable way to strategically target leading anesthesia CE providers and add to the credibility of the offerings within the potential platform. This also will help establish credibility with anesthesia professionals who are considering utilizing a new online CE platform to explore the CE market, as well as to utilize new CE offerings from other suppliers of anesthesia CE.

Value from a unified platform needs to be considered from the perspective of the platform as well as its users. The implementation of a unified anesthesia CE platform could potentially make homing costs high for anesthesia CE providers. These high homing costs for anesthesia CE providers would serve as a benefit to a potential unified anesthesia CE platform,

especially if it is the first to market. Valuable interactions on the platform also need to be considered from the perspective of the supply and demand side of the market. The platform and its strategic applications should a) offer value to anesthesia CE providers with a stable and substantial installed base users (i.e., anesthesia CE professionals), b) enhance the ability to reach a large audience of anesthesia professionals, c) offer a high quantity of credentialed anesthesia CE offerings, d) utilize focused loyalty programs for both sides of the anesthesia market, e) provide business transactions that foster value regarding registration costs and marketing costs for anesthesia professionals and anesthesia CE providers respectively, and f) provide credibility in each transaction.

In offering value that is feasible, a MVP must be considered. An analysis of a MVP within the anesthesia CE marketplace should focus on comparing available products. Value to anesthesia CE providers and anesthesia professionals should be greater with a unified anesthesia CE platform versus what is currently available within the marketplace. A product that meets the needs of anesthesia CE professionals and anesthesia CE providers should provide quality as a standalone benefit that initially attracts customers. Complementary products or services, above and beyond an established MVP, may be desired at launch; those would have to be considered also by accounting for the additional costs associated with development and implementation. A platform that can afford complementary products to supply the customizable needs of both sides of the market should be strongly considered especially during launch and prior to established network effects. Considering complementary products within an anesthesia CE platform is not only a strategic issue, the additional outlays associated with development and implementation are a business decision that depends on the programming skillset of the developers, the funding available for the endeavor, the anticipated returns on the investment, and the timeframe for the

potential returns. Despite the benefits of complementary products, the business decision must account for the outlays to the platform, the feasibility of enhancing an anesthesia CE platform beyond a MVP, the MEP for each complimentary product considered, and the derived value to the platform's user sets and owner/s. Also, product differentiation may serve a potential anesthesia CE platform well, but only on the supply side of the market. These differentiated products work to facilitate the CE needs of anesthesia professionals. The basic function of the potential platform is unchanged with differentiated products and still serves the demand side of the market in the same capacity: to explore anesthesia CE. Allowing anesthesia CE providers to gain top advertisement placement on a unified platform reflects how many platforms operate and serves as one approach to utilizing a differentiated feature. This strategy a) may prove inexpensive to implement within a potential online platform, with the potential to cultivate marquee anesthesia CE providers as users of the differentiated feature, b) may serve to retain old customers and attract anesthesia CE providers desiring increased visibility within the marketplace, and c) may simultaneously provide a standardized system that would help match anesthesia CE providers with their searchable and specified anesthesia CE criteria.

The literature also discussed pre-announcement as one approach for emerging platforms to consider in entering a marketplace. The goal for a potential anesthesia CE platform is to supplant current approaches to how anesthesia CE is marketed and explored. Providing value to both sides of the market is key. Careful consideration should be given to the marketing efforts of a potential new competitor because the revenues of the ASA, AANA, AAAA, and large anesthesia CE provider organizations are substantial. Regarding the anesthesia CE industry, pre-announcement may serve as an announcement to new competition entering and attempting to strategically disrupt and unify the marketplace. This study does not consider pre-announcement

to be a strategic approach to supplant the current market and the way anesthesia CE is marketed and searched.

Discussion of Segmentation

Regarding the value a unified anesthesia CE platform could potentially provide, the anesthesia CE industry needs to consider the job it is trying to fulfill for its suppliers and demanders. The organization needs to understand why customers behave the way they do. Understanding this *why* serves the anesthesia CE industry in strategically navigating the following: why CE providers currently market the way they do, the problems with their current marketing efforts, the positives of their current marketing streams, what additional CE providers' needs need to be serviced (i.e., during and after the CE explorations and CE course purchases), why anesthesia professionals select specific CE courses (i.e., by what dimensional aspects), the problems with their current CE exploration efforts, the positives of their current CE search efforts, and what additional anesthesia professionals' needs need to be serviced (i.e., during and after the CE explorations and CE course purchases).

Given the geographic variations across the US and the varied CE preferences of anesthesia professionals, geographic segmentation may only be partially applicable to a unified anesthesia platform from the perspective of where anesthesia professionals exploring CE offerings are located. The quantity of anesthesia professionals within a specified geographical location seeking CE may serve a CE provider with a desired and targeted marketing reach (i.e., it may be beneficial for an anesthesia CE provider to spend marketing dollars to reach a geographical area with a large or targeted concentration of anesthesia providers to effectively utilize marketing dollars). This approach is only partially effective because destination-based CE offerings and the availability of reaching large quantities of anesthesia professionals via online

advertisements may lead anesthesia CE providers to consider CE offerings and their advertisements focused on the destination of the CE itself (i.e., instead of focusing on a marketing reach based on where targeted anesthesia professionals are physically located, CE providers may decide to direct their marketing efforts towards promoting the destination of their CE offerings). However, the approach of marketing destination-based CE only serves anesthesia CE offerings that are destination based. Anesthesia CE offerings are presented in a vast array of formats (e.g., online, audio, correspondence, destination based, etc.). Other formats may have to consider targeting desirable geographic attributes from a specified segment of the anesthesia provider community or a geographic location with a high quantity of anesthesia professionals. Given the array of CE delivery formats and the possibilities that exist for destination-based CE offerings, geographic segmentation applies more towards the supply side of the market. Anesthesia CE providers and their CE course offerings and advertisements will have to account for destination-based CE, additional CE offerings offered via differing formats, and the impact of the geographic needs, preferences, and interests of anesthesia professionals. Data analytics would prove a useful tool to implement data-based feedback (i.e., data points that drive applicable and effective marketing strategies) to CE providers regarding their CE offerings and advertisements.

In considering the anesthesia CE industry and the varied user sets, demographic segmentation is arguably necessary, not as a means of optimizing products or advertising, but as a means of basic organizational necessity. Demographics serve as blunt instruments (i.e., they dictate characteristics about an individual but not enough to know a person or provide strategic insightful inferences; Lin, 2002). The differing CE requirements, accrediting bodies, and the corresponding CE offerings alone dictate a need to segment a potential platform based on anesthesia profession-specific CE requirements. This basic necessity is in line with some of the

depictions in the literature. Demographic segmentation has been portrayed as one of the simplest methods of segmenting a market due to the prevalence and utility of demographic factors (Qualtrics, n.d.). Because some CE offerings may only be offered to one or multiple anesthesia professions, a potential anesthesia CE platform must strongly consider being stratified by allowing anesthesia professionals to explore CE offerings based on the end users' selected anesthesia profession. Regarding other potential demographic segmentation considerations, the aspects of education and income are a given due to the profession-specific nature of this type of necessary segmentation within a potential platform. Age, family size, race, gender, and nationality may prove useful if tracked in response to the types of searches, CE bookings, and other segmentation characteristics (i.e., lifestyle characteristics can be utilized to augment segmentation and for targeting. Demographics are crucial to effective segmentation strategies even though they may be insufficient when considered separately; Lin, 2002). The consideration for data analytics and the implementation of data-based feedback may serve a potential platform well in providing data-driven value to anesthesia CE providers in offering and advertising CE course offerings.

Firmographic segmentation considerations are important as a potential platform seeks to navigate the market. In considering the user sets within a potential anesthesia CE platform, the profit status of organizations (i.e., for-profit versus non-profit), the existence and navigation of the political agenda of the national and state professional organizations, and the size and impact of anesthesia CE providers within the anesthesia CE industry are all considerations for this type of segmentation. Successful platform strategies will have to focus on navigating, partnering, and/or optimizing relationships with anesthesia organizations based on targeted organizational elements. This type of segmentation is the basis for the aforementioned subsidization

considerations of CE offerings from the ASA, AANA, AAAA, and their respective state component societies, associations, and academies fostering credibility.

This study endeavors to apply strategic applications of individual and group consumption behaviors within the anesthesia CE industry. Consumer information, behavior, and preferences will need to be considered within the anesthesia CE market. Demographic segmentation in conjunction with and correlating with the spending patterns of anesthesia professionals, the formats of CE courses explored by anesthesia professionals, the destinations booked, and/or when bookings occur may all lead to predicting/anticipating future behaviors and driving the CE offerings and advertising efforts of anesthesia CE providers. Data analytics and the ensuing data-driven value for anesthesia CE providers are at the core of successful segmentation strategic considerations now and as the CE industry evolves. Continual market assessments and strategies derived from market and customer preference changes will need to be tailored to the evolving needs of the industry, the anesthesia CE providers, and anesthesia professionals. In light of the Reimer et al. (2014) study, considerations that a potential anesthesia CE platform should be focused on include individual customers (i.e., anesthesia professionals from the demand side of the market seeking to explore and book CE offerings and anesthesia CE providers from the supply side of the market seeking to promote their anesthesia CE offerings) and their individual and user set level purchasing behaviors. The Reimer et al. (2014) study stressed the importance of consumption, usage, and purchasing patterns and assessed the efficacy of various marketing mediums. Regarding the anesthesia CE industry, demographic and firmographic segmentations contextualized by purchasing behaviors (i.e., behavioral segmentation) may better serve strategic segmentation strategies. Given the narrow size of the anesthesia CE market, the homogeneous aspects of its demand side of the market (i.e., profession-specific entry level educational

mandates, profession-specific salary ranges and average yearly incomes, and the profession-specific anesthesia CE mandates) and heterogeneous aspects of the supply side of the market (i.e., the profit status of organizations, varied political agendas of the national and state professional organizations, the size of organizations, and the impact of anesthesia CE providers on the anesthesia CE industry), behavioral segmentation contextualized by demographic and firmographic variables may provide additional depth and applicable strategic considerations for a potential anesthesia CE platform seeking to target specific customers. Reimer et al. (2014) obtained data from a leading digital media company in a large European country; the data represented over 500,000 customers, captured heterogeneity across all of their customers, mixed aggregation-level data comprised individual consumer behavior and aggregate marketing measures (i.e., weekly information on marketing measures via TV, print, radio, and internet), and included customer-level information (i.e., sales per customer and per week, customers' coupon usage, and the customers' use of newsletters and permission-based emails). Their focus was on behavioral segmentation and the impact to marketing actions across mediums. The anesthesia CE industry, the considerations to the potential impact on successful marketing mediums, and segmentation strategies based on various strategic variables must all be taken into account across differing uniformities (i.e., homogeneous aspects of the demand side of the anesthesia CE market and heterogeneous aspects of the supply side of the anesthesia CE market) regarding targeted customer bases.

Although not expressly examined within the context of this study, this analysis utilizes the assumption that family/personal circumstances, anesthesia professionals' quantity of hours typically worked within a work-week, reimbursement/compensation for anesthesia CE offerings, reimbursement/compensation for CE leave of absence, politically incentivized potential bias

towards certain corporate structures and ownership status of CE provider organizations (i.e., owned by ANs, CRNAs, AAs, or affiliations with conflicting competitive anesthesia political policies/agendas), CE providers' reputation in the marketplace, quantity of CE desired/needed, and/or specific CE topics of interest drive the CE choices of anesthesia professionals.

Psychographic elements contextualize the organizations purchased from, formats preferred, price ranges of CE, desired locations of CE offerings, and shapes the purchasing patterns of the demand side of the anesthesia CE market. The lifestyle and CE interests of anesthesia professionals drive their purchasing patterns and will have to be continuously and strategically considered and tracked to derive a data-driven value. An anesthesia CE platform must consider these aspects as psychographic segmentation strategies are pondered, implemented, and altered.

Discussion of First to Market

No known unified resource exists for anesthesia CE exploration by anesthesia professionals and for anesthesia CE providers to reach these professionals. Thus, a potential unified anesthesia CE platform would be the first of its kind to enter the market. The findings from the literature review serve a potential platform owner in considering strategic implementations and in understanding the misconceptions and disadvantages of being first to market. The review described many advantages of being first to market. One notable point was the notion of having a strategically desirable platform and not simply building one because it is technologically feasible (Porter, 1996; Rangan & Adner, 2001). An anesthesia CE platform should first consider the value proposition for anesthesia professionals and for anesthesia CE providers.

Considering these aspects, how to develop a platform and its offerings, and the capabilities of the potential platform firm are in line with the depictions of platform thinking as

depicted within this endeavor. Platform customers comprise the demand and supply side of the market and the value of the platform's utilization needs to be established, grown, maintained, and advanced as network effects are fostered, critical mass is achieved, the business ecosystem is refined, and as new growth is continuously sought. The literature portrayed three primary means of establishing first mover advantages. As depicted within the literature review, leadership in product or process technologies, preemption of assets, and development of buyer switching costs (Lieberman & Montgomery, 1988) were the primary methods of not just simply establishing first mover advantages, but in establishing strategies for platforms to endure and prosper from their efforts in being first to market. Suarez and Lanzolla (2005) depicted how creating a technological edge over market competitors is the primary method in understanding *how* organizations achieve first mover advantages. Understanding the pace of the technology and the market (Suarez & Lanzolla, 2005) also portrayed important aspects for organizations to understand as they consider their platform efforts. Kim and Mauborgne (1997) described value innovation as the "simultaneous pursuit of radically superior value for buyers and lower cost for companies" (p. 112). A potential anesthesia CE platform and owner need to understand all these aspects. The pace of technological change is fast and ever-changing within the online economy (Tulman, 2015). The pace of the anesthesia CE industry, however, is slow to change and behind other industries. Even with the current technologies available within the digital economy, to date, no unified anesthesia CE resource exists. A unified anesthesia CE platform should consider building radically superior value for anesthesia professionals seeking anesthesia CE education and radically superior value for anesthesia CE providers in reaching these professionals. Moreover, the value should far supersede what is currently available within the marketplace. Kim and Mauborgne (1997) best illustrated this point when they conveyed how competition is

not the benchmark. A unified anesthesia CE platform should seek to make a quantum leap in value for anesthesia professionals and for anesthesia CE providers as the platform seeks to enter and dominate the market (Kim & Mauborgne, 1997).

Some common elements vital to organizations were also depicted throughout the literature and the various key aspects explored. The recurring notions of network effects, critical mass, and pricing strategies are all centered on relationships. Platforms work as intermediaries for relationships. They serve as middlemen who bring suppliers and demanders into unified physical or digital locations to engage. The type of platform, the purpose of the intermediary, and the types of exchanges between users all vary, but the constant viewpoints from the literature stemmed from the importance of initiating, building, maintaining, and advancing relationships. As platforms engage relationships, they need to employ a quality product, be able to adapt and change (i.e., in response to and in anticipating market changes, technological changes, new or differentiated offerings, and efficient business structures and capabilities) as needed, and continuously provide value to the customers. Regarding the anesthesia CE industry and a potential unified anesthesia CE platform, customers refer to anesthesia CE professionals and CE providers. A potential unified anesthesia CE platform should serve the needs of both sides of the market as the customers and end users of the platform. The literature portrayed how first to market does provide some benefits, but the depiction of Yahoo.com in the marketplace summed it up best. Yahoo “is not successful because of being a first mover, but because it is a *best* [sic] mover” (Rangan & Adner, 2001, p. 45).

The depictions from the literature regarding late entrants’ advantages into a marketplace can be applied to a potential anesthesia CE platform when considering the current CE exploration methods within the market. A potential anesthesia CE platform should consider the

competition (i.e., the supply user sets in the market), their efforts in reaching anesthesia CE providers. Also, the platform should consider late entrant tactics to offer value that by far supersedes what is currently available within the marketplace. A potential anesthesia CE platform should consider the shortcomings of current market offerings; navigate the market to achieve penetration, gain market control, and structure the business model to serve value instead of purely pursuing profits; strategically deliver a quality product (i.e., the platform and its offerings to the marketplace); and consider all market forces. The quality product should be minimally considered, from the perspective of anesthesia professionals, based on the specific searchable needs of anesthesia professionals (i.e., cost of anesthesia CE, format of the CE offerings, location of the CE, quantity of CE hours, organizations offering the CE, dates of the CE, and the CE topic/s of interest). The costs to register for the CE also should be considered, as well as the user experience, the branding of the platform, the reputation of trust within the anesthesia community, the quantity of CE offerings available for exploration, and the value proposition of one potential resource to explore the anesthesia CE market. From the perspective of anesthesia CE providers, a quality product should be minimally considered based on meeting the matched needs of anesthesia professionals, the costs to post a CE offering, the user experience, the reputation of trust within the anesthesia community, the quantity of anesthesia professionals utilizing the site, the quantity of anesthesia CE providers utilizing the platform, and the value proposition of one potential resource to market and reach anesthesia professionals. Pricing strategies will help to establish the platform within the market. Further navigation of the market will require business relationships, strategic alliances, and continuously enhancing product offerings that fit and enhance the needs of each user set (i.e., anesthesia professionals, the ASA, the AANA, the AAAA, the state components of the professional organizations,

privatized anesthesia CE organizations, and hospitals and other healthcare delivery organizations that offer anesthesia CE). As the platform grows and matures, complementary products can and should strive to service non-CE related anesthesia organizations (e.g., anesthesia staffing companies, anesthesia product companies, pharmaceutical companies, etc.) and affiliated organizations (e.g. travelling accommodations, cardiopulmonary resuscitation course offerings, etc.) wishing to capitalize on the potential market power of a successful unified anesthesia CE platform, but these products should simultaneously fit with the needs of the cultivated user sets (i.e., anesthesia professionals and anesthesia CE providers). Market forces will have to account for the threats of new entrants and substitutes and the power of buyers (i.e., anesthesia professionals) and sellers (i.e., anesthesia CE providers) within the marketplace. In summary, notions of free-rider effects, resolution of market and design uncertainties, changes in technologies and the ensuing impacts on consumer needs, and incumbent inertia (Lieberman & Montgomery, 1988) were all depicted within the literature as misconceptions of being first to market.

Being adaptable to change was a common theme extracted from the literature regarding the beneficial implementations and the misconceptions and disadvantages of being first to market. It is important to be adaptable to the market, competitors, technologies, and consumer needs. It is also important to be able to shift corporate structure to fit with the changes within the anesthesia CE marketplace.

Discussion of the Evolutionary Phases of Platforms

The purpose of exploring the evolutionary phases of platforms was to understand the wide-ranging strategies for success as platforms enter and grow within the marketplace. The implications from the literature serve a potential anesthesia CE platform in structuring market

entry and long-term business tactics. The four evolutionary phases of platforms portrayed from the review of the literature contextualize *when* specific tactics should be strategically applied.

The review of the literature portrayed the importance of initially conducting an external analysis to address the specific markets a potential anesthesia CE platform should enter and the attributes that will appeal to anesthesia professionals and anesthesia CE providers. The need to consider the aspects of a MVP, how to effectively structure a MEP, and the impact to all stakeholders exists and must be simultaneously navigated. The aspects of corporate abilities, consumers' (i.e., anesthesia CE professionals and anesthesia CE providers) needs, and overall market needs must also be simultaneously assessed. Regarding a potential anesthesia CE platform, the most important job in the anesthesia CE market centers on anesthesia professionals and the lack of ability to effectively search the breadth of available anesthesia CE offerings in the marketplace. Anesthesia CE professionals could potentially benefit from the ability to explore the offerings tailored to their specific needs (i.e., based on the psychographic elements that best fit their current CE needs at the time of exploration).

Platform thinking (i.e., internal analysis) perpetuates value to anesthesia professionals by servicing their tailored CE explorative needs while simultaneously creating a multi-sided network for anesthesia CE providers to market their CE offerings directly to their targeted audience. This in turn generates value to the platform in establishing a multi-sided network, gaining market power, and economically by potentially funneling anesthesia CE registration convenience fees and CE marketing dollars as it grows within the marketplace. Centering the vision of a potential anesthesia CE platform around consumers' needs (i.e., the needs of anesthesia professionals and CE providers) is paramount to a successful potential CE platform. The vision should be perpetually focused on providing the greatest consumer value in the

marketplace. Robertson and Ulrich (1998) depicted the steps to effectively organize a platform planning project and focused on the notions of commonalities and differentiation. The conceptual commonalities for a potential anesthesia CE platform should be based on servicing the catalogue-like aspects current to the marketplace to explore CE and the ability for anesthesia CE providers to reach their audience. A unified anesthesia CE platform should seek to make a quantum leap in value for anesthesia professionals and for anesthesia CE providers as it seeks to enter and dominate the market (Kim & Mauborgne, 1997). The conceptual differentiations, stemming from the existing CE marketplace, should be contemplated and structured to supplant how anesthesia CE is explored and how anesthesia CE offerings are marketed.

The value generation from a potential CE platform and the “ways to cultivate” (Kim & Yoo, 2019) a platform should center on the notions of a quantum leap in value (Kim & Mauborgne, 1997) and differentiation. The user experience, the ease in which to explore the CE offerings, the potential exhaustive options to navigate and explore the CE market, and the ease and unification of how to register for a CE course are leaps above what is currently available to anesthesia professionals. A unified medium for CE advertisements, cost-effective advertising, an interprofessional market reach, and predictive analytics are leaps above what is currently available to anesthesia CE providers. These aspects are different from what is currently available within the anesthesia CE industry and serve as quantum leaps in value (Kim & Mauborgne, 1997). These stances supplant the current anesthesia CE explorative and marketing efforts and should be considered within the context of the attributes that potentially define a MVP.

Caillaud and Jullien (2003) described subsidization and cross-subsidization as “divide-and-conquer strategies, where one side of the market is subsidized and profits are made on the other side” (p. 324). The literature portrayed subsidization and cross-subsidization strategies as

methods for attracting users and growing into a two-sided and multi-sided marketplace. As depicted within this study, initially subsidizing the CE offerings from the ASA, AANA, AAAA, and their respective state component societies, associations, and academies may strategically target (i.e., credibility and initiating network effects) the leading anesthesia CE providers. The need to attract anesthesia CE providers first was also described as a pragmatic necessity within the anesthesia CE marketplace. Cross-subsidization yields cross-sided network effects, which activate by potentially having the registration convenience fees subsidized for anesthesia professionals booking anesthesia CE. Word-of-mouth and advertising efforts increase the utility of the site as additional anesthesia professionals use its services, and thus potentially perpetuates and entices more anesthesia CE providers to utilize the potential platform to advertise their CE offerings. This enticement comes from generating network effects with increased utility. Pricing manipulation tactics should also go beyond merely generating network effects. Ongoing competitive pricing, adding more value than what is currently offered within the marketplace by fostering an interprofessional reach, and doing so at lower rates than what is currently offered through marketing/advertising mediums reaching merely one profession at a time is one approach that could reveal itself to be a potent quantum leap in value (Kim & Mauborgne, 1997; Rysman, 2009). Same-sided network effects can be potentially generated as the quantity of CE providers increases with an increase in utility from the other anesthesia CE providers. These effects are initiated through the potential increase in utility commenced by subsidizing the professional anesthesia organizations. This subsidization could potentially be classified as the MEP of a potential anesthesia CE platform. Sustainable growth is encouraged and stems from subsidization and cross-subsidization tactics encouraging same-sided and cross-sided network effects within the anesthesia CE marketplace. Value to anesthesia CE providers stems from a

potentially cheaper and more effective means of reaching anesthesia professionals. Value to anesthesia professionals is gained from the implementation of a one-stop-solution to their CE explorative and booking needs. Value to the potential platform is generated by gaining market power and potentially serving as *the* resource that links anesthesia CE professionals with anesthesia CE providers.

Complementary and derivative products would need to be considered as the organization grows and should be based on the feasibility of the product itself and the firm's abilities to effectively deliver the product. However, future product development efforts should remain focused on the needs of their consumers. Complementary and derivative products should also be considered by specifically attracting business partners to effectively prosper and grow (Muzellec et al., 2015). The needs of the consumers (i.e., anesthesia professionals and anesthesia CE providers) and data analytics should help guide future business growth opportunities and future business partnerships.

This endeavor depicted the economic benefit of CE registration convenience fees and CE marketing dollars. These fees constitute the potential economic plan for the MVP and will have to evolve as the potential CE platform grows, expands, and matures. Quality within the potential platform stems from accredited anesthesia CE offerings targeted to a specified professional audience and from the platform as a product. It should also account for platform process improvements guided by the future needs of the consumers and by the data analytics potentially harnessed from the platform and its users. As depicted by Yang and Jiang (2006), a potentially mature anesthesia CE platform cultivating new growth opportunities should consider focus, extension, renewal, and/or diversification strategies as a means of leveraging the then acquired anesthesia CE market knowledge and the subsequent anesthesia CE platform technological

proficiencies. These leveraged aptitudes, the evolved needs of the consumers, and data-driven metrics should lead strategic future growth efforts.

Discussion of Platform Structure and Function

The structure and functions of platforms divide the actions a potential anesthesia CE platform firm should take into two broad action plans. The first is establishing an interaction interface. The technological requirements (i.e., the technological functions) and the organizational aspects of platforms (i.e., the governance of how relationships will be conducted within a potential platform) serve as the methods of establishing the interaction interface. Value for all stakeholders needs to be established and embedded within the technological functions and governance tactics. The second and most difficult step involves establishing a network of users. This requires a deep understanding of the supply and demand sides of the market, their necessary interconnectedness, and how to enhance value for all stakeholders.

As depicted within this study, the technological requirements of an interaction interface serve as a rubric for *what* and *why* to establish the technologies and functions of a potential anesthesia CE platform. Although important and necessary, the technological requirements serve as items in a series that must be completed to have a pragmatic technological tool. The tool is important, but the organizational aspects, understanding the taxonomies and implementing the corresponding strategic functions of platforms, and strategically formulating relationships serve as the effective wielding of the tool. Value originates with the technological requirements of the potential anesthesia CE platform and is subsequently enhanced by the relationships within the ecosystem.

Governance is central to the organizational aspects of platforms. The literature depicted the importance and specific tactics to establishing a credible, trustworthy, reliable, and profitable

interaction network. The anesthesia CE industry is currently fragmented in how CE is explored by anesthesia professionals and how CE is marketed by anesthesia CE providers. The interaction interface establishes the groundwork for unification within the anesthesia CE industry. This was described as the *use context sensitivity*. The *use context* of a potential anesthesia CE platform is to match anesthesia professionals with the CE offerings that best meet their needs. A potential anesthesia CE platform should be missioned with the context of use for the platform and should adhere to the governance findings from the literature to help build an enduring reputation within the marketplace.

The formulation of a network is the most important aspect of building an enduring anesthesia CE platform. The taxonomies of platforms (i.e., the types of platforms) were explored not simply to classify platforms or to derive at the fact that a potential anesthesia CE platform is a transaction platform that facilitates the exchange of anesthesia CE, but they were explored to contextualize the following: 1) For what specific functions would anesthesia professionals and anesthesia CE providers utilize an anesthesia CE platform? and 2) What are the potential changes to the current business models within the industry that could be supplanted with a unified platform? The explorations of the types of platforms broadly provided the functions and benefits to be had by suppliers (e.g., reduced effects of geographical barriers, increased access to investors to support novel types of businesses, and the changed cost structures of partner firms) and demanders (e.g., increased or improved convenience, choice, transparency, engagement, monetary gains, and relationships; Oxera, 2015). The exploration efforts also identified the following essential components that need to be considered as a potential anesthesia CE platform seeks to unify and supplant the current anesthesia CE explorative and marketing efforts:

segments, value propositions, delivery channels, relationships, key resources, key activities, key partnerships, revenues, and costs (Osterwalder & Pigneur, 2009, as cited in Gatautis, 2017).

Cooperation and/or competition with stakeholders potentially facilitates the distribution of anesthesia CE and the creation of a potential anesthesia CE platform (Yablonsky, 2018). The openness and leverage tactics employed by a potential platform should be structured to provide value to anesthesia professionals and anesthesia CE providers, as well as the platform. To provide value to the potential platform, openness and leverage strategies should be bottlenecked through the platform. In regards to providing value for demanders and suppliers of anesthesia CE, co-creation and symbiotic tactics should be employed.

Although the literature conveyed the importance of providing value to all stakeholders, it also described how the efforts of developing the platform predominantly lie with one side of the market. As a matter of necessity, the suppliers of anesthesia CE should be targeted to predominantly provide value driven efforts. These efforts facilitate the basic necessity of supplying the potential anesthesia CE platform with CE offerings. Focusing on suppliers' value also mutually benefits the strategic goal of the potential anesthesia CE platform: delivering a valued anesthesia CE customer experience (Hänninen & Smedlund, 2019). As the marketplace evolves and as the potential anesthesia CE platform considers future growth tactics and adjustments, data will be a major driver of future strategies. Emerging supplier and demander trends, new technologies, new CE requirements, and potentially new strategic alliances will need to be guided by the following: data, understanding where the potential anesthesia CE platform is in the marketplace and where it wants to be, required new business innovations, strategies to achieve new business goals, and understanding the role of new anesthesia CE competitors within the marketplace (Mancha et al., 2019; Sorri et al., 2019; Zehir et al., 2019; Zhao et al., 2019).

Limitations and Future Research

Contextualized by the needs of the anesthesia CE marketplace. US industries are multifaceted and range in size, population, and needs. The anesthesia CE industry is one marketplace with specific intricacies. This study focused on applicational insights specific to the anesthesia CE marketplace. Although this endeavor sought to be diverse with its potential insights, the focus was on providing the potential impacts and implications onto the anesthesia CE industry. This focus was consistently considered during the initial review of the literature, the subsequent in-depth review of the literature, and when answering the research questions and analyzing the results. A different focus could have redirected the research and yielded different amalgamations from the literature. The anesthesia CE context could have made an impact on how, what, and why the platform aspects were examined.

Databases and the resultant exclusions. As aforementioned, this endeavor conducted an initial search of the literature utilizing Google and Google Scholar. The Scopus database; ProQuest employing the Healthcare Administration database; and EBSCOhost employing the Academic Search Premier, Business Source Premier, and Computer Source databases were utilized for the systematic review of the literature and were accessed through the MUSC Libraries' database subscriptions. The choice of databases employed for the literature review were made based on ease of use, accessibility, and the overall quantity of results. Numerous databases could have been employed and the utilization of different and/or additional databases could have impacted the study. Also, exclusions from the Scopus, ProQuest, and EBSCOhost databases included some sources that were unavailable or could not be openly and freely obtained through the MUSC Libraries' interlibrary loan program and staff. These exclusions are

partially due to the closings from the Coronavirus outbreak of 2020. These database limitations also could have impacted the content selection.

Search terms utilized. Another considered limitation is the search terms employed to explore the key concepts. The utilization of different or less search terms could have led to a different or more comprehensive scope for each key concept. The specific terms and quantity of terms utilized could have impacted this study.

One researcher. This endeavor was conducted by one sole researcher (i.e., the author). The databases utilized for the initial literature review; the key concepts identified; the databases utilized for the systematic review of the literature; the inclusions and exclusions utilized within the study accounting for depth, applicability, and relevance; and the amalgamations from the literature could all have been impacted with additional researchers. Furthermore, as a solo venture, this undertaking did not allow for member checking or peer review.

Centered on platform successes. This endeavor centered on identifying and exploring the key concepts from platform successes. Although platform failures were also depicted within the study, their portrayals were utilized to enhance and contextualize the conveyances derived from successful platforms. A deeper consideration of platform failures may have served as an additional perspective, may have added additional depth to the study, and may have provided additional concepts key to establishing enduring platforms. Additional potential research considerations should be focused on platform failures to identify and explore any differing insights.

This endeavor also located and analyzed a theoretical model of platform generation and utility based on a Primary Personal Information Market (PPIM; Farrelly & Chew, 2019). The article titled “Transforming the Worldwide Market in Personal Information” considered the

following: “Could a suitably designed digital platform enable individuals to be directly compensated for the data they generate and if so, what form would such a digital platform take?” (Farrelly & Chew, 2019, p. 6). The limitations from their PPIM research stemmed from the evaluation of their theoretical platform paradigm being based on opinion. Farrelly and Chew (2019) described how their study’s

most pressing limitation is that the evaluation is based on surveying practitioners on their opinions regarding the viability of the PPIM rather than observing their participation on a working PPIM. To further refine the design of a PPIM, there is a need to build a minimum viable product and conduct a proof-of-concept project in the real world. (p. 30)

Again, this research focused on platform successes. Theoretical and prototypical platform concepts additionally contextualized the findings. Additional and future potential research considerations should also take into account theoretical and prototypical platform paradigms assembled from the literature to identify and explore any additional applicable insights.

User experience. In establishing an enduring platform, this study evaluated the concept of user experience using a salient example. This study depicted the ASA’s Calendar of Events and described how it is the only known anesthesia CE platform in the market. Although this platform serves only ANs and provides no value for the rest of the anesthesia professional community, an assessment of user experience could be beneficial in evaluating how ANs, as the users, feel when they interact with (i.e., the usability, adoptability, desirability, and value) the website (Raia, 2017). Evaluating the user experience of ANs as they interact with the ASA’s Calendar of Events could provide useful strategic implications that could be applied to a broader potential platform that facilitates utility across the entire anesthesia CE industry. Although useful, the topics of user experience and pertinent user experience evaluation guides were outside

of the scope of this study. Whether by evaluating the ASA's Calendar of Events or considering other investigatory approaches, user experience serves as an area and endeavor for potential future inquiry.

Applied data analytic techniques. This study also conveyed the importance of data analytics and the potential impact onto a unified platform. Although outside of the realm of this study, data analytics could serve as a vital tool to enhance match preferences of anesthesia professionals and enhance the ability of anesthesia CE providers to better market and structure their CE offerings. Data analytics could assist in pinpointing value regarding platform interactions by furnishing detailed information about anesthesia professionals, their purchasing patterns, and could enhance the relationship with anesthesia CE providers, anesthesia related organizations outside of the anesthesia CE industry, and/or affiliated industries (i.e., other organizations outside of the anesthesia industry) desiring to capitalize on the potential market power of a successful unified anesthesia CE platform. While understood as important and a vital aspect to the marketing needs of a potential unified platform, this study did not address "how to link traditional and new sources of customer data and their metrics" (Kumar et al., 2013, p. 338). Future research is to better understand causality, identify triggering events, establish links between actual and online behavior, and model social interactions within the context of the anesthesia CE industry (Kumar et al., 2013). Future research also is needed to understand how to model data analytic capabilities. This understanding of data can aid in strategic business applications that are industry and service-relevant, complementary, forward-looking, and driven by proven correlations specific to business outcomes (Kumar et al., 2013).

Conclusions

Social media, books, travel, and music have been the typical domains for platform developments (Evans & Gawer, 2016). Evans and Gawer (2016) also described how many businesses within transportation, energy, banking, and the healthcare industry have recently flourished with platform business models. Platforms are primarily about enhancing relationships. These relationships are between the platform and its users and between suppliers and demanders. Platforms serve as an interface for beneficial interactions (OECD, 2019) to be initially established and maintained. As discussed in this study, the strategic platform framework consists of openness, pricing, innovation, advertising, and quality (Rysman, 2009). These strategies served to contextualize the many concepts, dimensions, and indicators explored and amalgamated within this study. The strategic platform framework and the depicted platform facets serve to cultivate relationships into a sustainable platform to potentially improve how anesthesia professionals search available CE offerings and to potentially enhance how anesthesia CE providers reach anesthesia professionals.

This study addressed how to successfully deploy a unified potential anesthesia CE platform and advanced its ability to derive value for the demanders and suppliers of anesthesia CE as well as the platform itself. The results of the study were driven by synthesizing platform strategies and attributes into a comprehensive and sustainable platform paradigm. The discussion of the results was driven by immersing the amalgamations from the literature onto the anesthesia CE industry. The discussion centered on depicting the strategic impacts/implications for potential applications within the anesthesia CE industry. The overarching goal of the study was to convey a comprehensive and strategic *how-to-guide* that could be applied to the anesthesia industry and beyond. Although the focus was on the anesthesia CE industry and this enduring emphasis

permeated the entire research endeavor, the amalgamations can be applied to a broad array of industries pursuing a platform business model. The portrayals onto the anesthesia CE industry serve as one applicational approach. Careful assessments of the intricacies of other industries may yield different applicational impacts and implications specific to the industry at hand, yet the findings within this study should serve other industries well as they consider strategic platform applications.

Although this research is applicable to many other industries, it is important to understand that businesses and markets change. OECD (2019) portrayed how as businesses and markets transform, so must the future definition and analyzed attributes of successful online platforms. The definitions, concepts, dimensions, and indicators within this study are applicable within the current online platform economy, but they will need future analyses and applied adjustments as businesses and the online marketplace continues to evolve. As businesses evolve and become more complex, and as the online marketplace continues to transform, new strategies may develop, and they may require new applicational insights from future industries and from future studies.

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Appendix A

Pertinent Anesthesia Billing Modifiers

Table A1

Anesthesiologists' Billing Modifiers Denoting Personally Performed, Medically Directed, or Medically Supervised Payment Distribution Rates

Modifier	Description	Payment
AA	Anesthesia care personally performed by Anesthesiologist	Anesthesiologist receives 100% of the allowed payment
AD	Medical supervision by Anesthesiologist; more than 4 concurrent anesthesia procedures	Medicare Administrative Contractor Part B may allow only three base units per procedure when the Anesthesiologist is involved in furnishing more than four procedures simultaneously or is performing other services while directing the simultaneous procedures (an additional time unit may be recognized if the Anesthesiologist can document their presence at the induction of anesthesia)
QK	Medical direction of two, three, or four simultaneous anesthesia procedures involving nonphysician anesthetists	Evenly split with 50% going towards the nonphysician anesthetists individually in each room and Anesthesiologist receiving simultaneous payments of 50% for each procedure for the medical direction of two, three, or four simultaneous procedures
QY	Medical direction of one qualified nonphysician anesthetist by Anesthesiologist	Evenly split between the Anesthesiologist and the qualified nonphysician anesthetist

Note. Qualified nonphysician anesthetist(s) refers to CRNAs or AAs. Adapted from "Payment and Practice Management Memo: Anesthesiologist Assistants and the QZ Modifier," by American Society of Anesthesiologists, 2013 (<https://www.asahq.org/~media/sites/asahq/files/public/resources/practice%20management/tppm/anesthesiologist%20assistants%20and%20qz%20july%202013.pdf>). In the public domain.

Table A2

Qualified Nonphysician Anesthetists' Billing Modifiers Denoting Payment Distribution Rates

Modifier	Description	Payment
QX	Qualified nonphysician anesthetist service with medical direction by Anesthesiologist	Evenly split between the Anesthesiologist and the qualified nonphysician anesthetist
QZ	CRNA service without medical direction by Anesthesiologist	CRNA receives 100% of the allowed payment

Note. Qualified nonphysician anesthetist(s) refers to CRNAs or AAs. Adapted from “Payment and Practice Management Memo: Anesthesiologist Assistants and the QZ Modifier,” by the American Society of Anesthesiologists, 2013 (<https://www.asahq.org/~media/sites/asahq/files/public/resources/practice%20management/tppm/anesthesiologist%20assistants%20and%20qz%20july%202013.pdf>). In the public domain.

Appendix B

ABA's MOCA 2.0 Quality Improvement Activities

Quality Improvement Activity Categories	Points/ Hour	Max Points In 5 Years
- MOCA simulation course (ASA-endorsed simulation center)	3	- 20
- Course follow-up materials		- 5
Other on-site simulation course	1	15
Online simulation	1	25
Other American Board of Medical Specialties [ABMS] Member Board Part 4 Activities	1	25
Institutional/departmental quality improvement project leader	1	25
Quality improvement plan based on feedback	1	25
Clinical pathway development leader	1	25
Clinical pathway development participant	1	15
ABMS Multi-Specialty Portfolio Program leader	1	25
ABMS Multi-Specialty Portfolio Program participant	1	20
Multicenter Perioperative Outcomes Group: Anesthesiology Performance Improvement and Reporting Exchange Provider Feedback emails	1	25
Case evaluation, case discussion, or practice improvement CME	1	15
Point-of-care learning (Minimum of one hour/case and reported within 31 days of case)	1	15
Anesthesia Quality Institute's National Anesthesia Clinical Outcomes Registry: Measure Review and Quality Improvement Action Plan	1	25

Note. Adapted from "MOCA 2.0® Quality Improvement (QI) Activities," by the American Board of Anesthesiology, n.d. (<http://www.theaba.org/PDFs/MOCA/MOCA-2-0-Part-4-Requirements>). In the public domain.

Appendix C

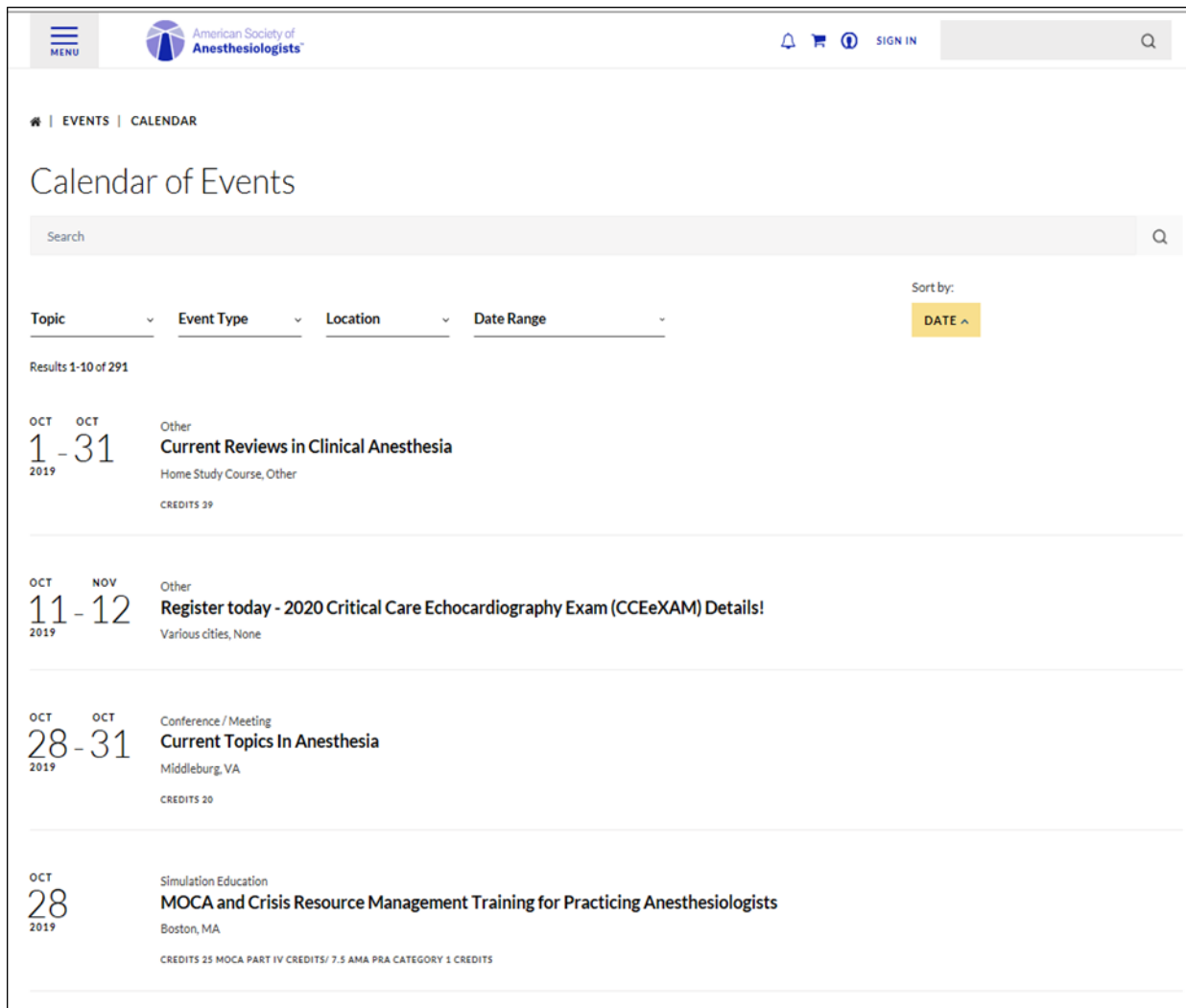
NBCRNA's CPC Program Class B Activities and their Values

Activity Category	Value
Class A Credits (assessed and prior approved by the AANA): Above the 60 minimally required	1 CE = 1 credit
Non-prior approved and/or non-assessed CEs	60 minutes or 1 CE = 1 credit
Subspecialty or austere clinical practice environment	1 year = 5 credits
Integration of a new clinical practice techniques	1 new technique = 3 credits
Academic credits	1 academic credit = 3 credits
Service: Seated or elected activities	1 year = 5 credits
Presentations	1-hour presentation = 3 credits
Service: Mission or diplomacy activities	1 activity = 5 credits
Publication: Books (anesthesia or healthcare-related)	1 book = 10 credits
Service: CRNA advocacy or public relations activities	1 activity = 1 credit
Publication: Chapters (anesthesia or healthcare-related)	1 chapter = 7 credits
Life support courses	60 minutes or 1 CE = 1 credit
Publication: Peer reviewed articles	1 article = 5 credits
Quality Improvement initiatives	1 initiative or 1 year = 5 credits
Publication: Grants	1 grant = 5 credits
Discoveries (positively influence or has potential to positively influence nurse anesthesia or healthcare)	1 product = 10 credits
Teaching in clinical settings	1 day = 1 credit
Research or practice inquiry project (content reviewer or research team member)	1 project = 5 credits
Research or practice inquiry project (principal investigator or individual completion of dissertation)	1 project = 10 credits
Clinical administrative activities	1 year = 5 credits

Note. This is not an all-inclusive list but serves as the anticipated common Class B activities. Adapted from "Continued Professional Certification (CPC) Program Class B Requirements: Professional Development Activities and their Values Approved by the NBCRNA for Use with the CPC Program," by the National Board of Certification and Recertification for Nurse Anesthetists, 2018 (https://www.nbcrna.com/docs/default-source/continued-certification/class-b-reporting/classbtable.pdf?sfvrsn=16a4e221_56). In the public domain.

Appendix D

ASA's and AANA's Calendar of Events



American Society of Anesthesiologists
 MENU SIGN IN

EVENTS | CALENDAR

Calendar of Events

Search

Topic Event Type Location Date Range Sort by: DATE

Results 1-10 of 291

OCT 2019	OCT 1 - 31	Other Current Reviews in Clinical Anesthesia Home Study Course, Other CREDITS 39
OCT 2019	NOV 11 - 12	Other Register today - 2020 Critical Care Echocardiography Exam (CCEeXAM) Details! Various cities, None
OCT 2019	OCT 28 - 31	Conference / Meeting Current Topics In Anesthesia Middleburg, VA CREDITS 20
OCT 2019	OCT 28	Simulation Education MOCA and Crisis Resource Management Training for Practicing Anesthesiologists Boston, MA CREDITS 25 MOCA PART IV CREDITS/ 7.5 AMA PRA CATEGORY 1 CREDITS

Figure D1. ASA's Calendar of Events. From "Calendar of Events," by the American Society of Anesthesiologists, 2019 (<https://www.asahq.org/meetings/calendar#sort=%40fstartz32xdate77238%20ascending>). In the public domain.



CALENDAR OF EVENTS

Advertisers who list their prior-approved CE programs in the Calendar of Events enjoy wider exposure for their approved programs because the \$150 per listing fee includes a duplicate listing on the AANA website as well as a link directly to the online Calendar of Events in the bi-monthly *Anesthesia E-ssential* (the AANA's electronic newsletter). Additionally, the web address provided in the advertisement will be hyperlinked directly to the

websites allowing viewers access to company and program information for more exposure and target-directed traffic.

Go to <http://www.aana.com/ccalendarofevents> for specific deadline dates. The fee can be paid along with the CE Application submission.

For additional information, contact Ann Carlson, Continuing Education Department, at (847) 655-1190.

October 1, 2019 - January 31, 2022, Tennessee; Healthy Visions-MyCEcredit - 20 CEC. "Pain Management With Hypnosis." Healthy Visions-MyCEcredit, Clinton, TN. Ron Eslinger, 351 Market Street, Clinton, TN 37716; (865) 269-4616; fax (865) 269-4613; email, ron@eslinger.net; www.mycecredit.com.

October 1, 2019 - March 14, 2022, Michigan; FOCUS Nurse Anesthesia Review - 25 CEC. "FOCUS: Recap and Refresh." Oakland, MI. (248) 618-3481; email, info@focusnar.com; www.focusnar.com.

October 1, 2019 - May 31, 2022, Florida; Current Reviews for Nurse Anesthetists - 26 CEC. "Current Reviews for Nurse Anesthetists - Volume 42." Current Reviews for Nurse Anesthetists, Fort Lauderdale, FL. Carrie Scott, 1828 SE First Ave, Fort Lauderdale, FL 33316; (954) 763-8003; fax (954) 762-9111; email, info@currentreviews.com; www.currentreviews.com.

October 1, 2019 - June 30, 2022, Illinois; American Association of Nurse Anesthetists - 1 CEC. "Respiratory Compromise: How Will You Know?" (847) 939-3530; email, AANAlearn@aana.com; www.aanalearn.com.

October 1, 2019 - July 25, 2022, Pennsylvania; Perelman School Of Medicine at the University of Pennsylvania - .75 CEC. "NORA Safety and the Human Factor Element." Philadelphia, PA. Ansheai Spence-Jones, 3620 Hamilton Walk, 150 Anatomy/Chemistry Bldg, Philadelphia, PA 19104; (215) 898-6400; fax (215) 898-1888; email, aspencc@upenn.edu; https://upenn.cloud-cme.com.

October 1, 2019 - July 25, 2022, Pennsylvania; Perelman School Of Medicine at the University of Pennsylvania - .75 CEC. "Anesthesia for GI Endoscopic Procedures." Philadelphia, PA. Ansheai Spence-Jones, 3620 Hamilton Walk, 150 Anatomy/Chemistry Bldg, Philadelphia, PA 19104; (215) 898-6400; fax (215) 898-1888; email, aspencc@upenn.edu; https://upenn.cloud-cme.com.

October 1, 2019 - July 25, 2022, Pennsylvania; Perelman School Of Medicine at the University of Pennsylvania - .75 CEC. "Anesthesia for Interventional Pulmonology Procedures." Philadelphia, PA. Ansheai Spence-Jones, 3620 Hamilton Walk, 150 Anatomy/Chemistry Bldg, Philadelphia, PA 19104; (215) 898-6400; fax (215) 898-1888; email, aspencc@upenn.edu; https://upenn.cloud-cme.com.

October 1, 2019 - July 25, 2022, Pennsylvania; Perelman School Of Medicine at the University of Pennsylvania - .75 CEC. "Anesthesia for Electroconvulsive Therapy (ECT)." Philadelphia, PA. Ansheai Spence-Jones, 3620 Hamilton Walk, 150 Anatomy/Chemistry Bldg, Philadelphia, PA 19104; (215) 898-6400; fax (215) 898-1888; email, aspencc@upenn.edu; https://upenn.cloud-cme.com.

October 1, 2019 - July 25, 2022, Pennsylvania; Perelman School Of Medicine at the University of Pennsylvania - .75 CEC. "Anesthesia in the Electrophysiology Lab." Philadelphia, PA. Ansheai Spence-Jones, 3620 Hamilton Walk, 150 Anatomy/Chemistry Bldg, Philadelphia, PA 19104; (215) 898-6400; fax (215) 898-1888; email, aspencc@upenn.edu; https://upenn.cloud-cme.com.

October 4, 2019 - October 6, 2019, New Jersey; New Jersey Association of Nurse Anesthetists (NJANA) - 25.75 CEC. "NJANA Fall 2019 Education Symposium." Delta Hotels by Marriott at Woodbridge, Iselin, NJ. Catherine Morse, 12 Miller Dr. Sewell, NJ 08080; email, cymk8811@gmail.com; www.njana.com.

October 4, 2019 - October 6, 2019, Rhode Island; Rhode Island Association of Nurse Anesthetists - 11 CEC. "NEANA Fall Meeting." Providence Marriott Downtown, Providence, RI. Michelle Hanlon, 11 Pitt Clarke Rd, Norton, MA 02766-2719; (508) 245-2320; email, TMhanlon35@comcast.net; https://www.ricrna.com/.

October 11, 2019 - October 13, 2019, Washington; Washington Association of Nurse Anesthetists - 18 CEC. "2019 Northwest States Anesthesia Conference." The Historic Davenport, Spokane, WA. Scot Pettery; (509) 998-6429; email, wana1@comcast.net; http://wana-crna.org/.

October 12, 2019 - October 12, 2019, Arkansas; Arkansas Association of Nurse Anesthetists - 8 CEC. "ARANA 2019 Fall Meeting." St Vincent's Infirmary (Terrace Room), Little Rock, AR. Rhonda Davis, 9 Shackelford Plaza, Suite 1, Little Rock, AR 72211; (501) 224-4840; fax (501) 224-0988; email, rhonda@bestmanagement.net; www.arkansascrnas.com.

October 12, 2019 - October 13, 2019, Nebraska; Nebraska Association of Nurse Anesthetists - 15 CEC. "2019 NANA Fall Conference." Bryan College of Health Sciences, Lincoln, NE. Emily Wilcox, 1633 Normandy Court, Suite A, Lincoln, NE 68512; (402) 476-3852; email, ewilcox@assocoffice.net; https://neana.org/conferences-events/fall-conference/fall-conference.html.

Figure D2. AANA's Calendar of Events. From "Calendar of Events," by the American Association of Nurse Anesthetists, 2019 (https://www.aana.com/docs/default-source/aana-journal-web-documents-1/calendar-of-events-october-2019.pdf?sfvrsn=c03e01e_4). In the public domain.

Appendix E

Summary of Reviewed Articles: Network Effects

	Source	Year	Author/s	Title/Topic	Results
1	Scopus	2011	Molina-Castillo, Munuera-Alemán, & Calantone	Product quality and product performance: The role of network externalities and switching costs	Included
2	Scopus	2006	Beck	The network(ed) economy: The nature, adoption and diffusion of communication standards	Included
3	ProQuest	2017	Fu, Wang, & Zhao	The influence of platform service innovation on value co-creation activities and the network effect	Included
4	ProQuest	2000	Sobrero	Structural constraints, strategic interactions and innovative processes: Measuring network effects in new product development projects	Excluded
5	ProQuest	2010	Lee, Kim, Noh, & Lee	Success factors of platform leadership in web 2.0 service business	Included
6	ProQuest	2018	Xiao, Fu, & Liu	Understanding consumer repurchase intention on O2O platforms: An integrated model of network externalities and trust transfer theory	Included
7	ProQuest	2011	Manne & Wright	Google and the limits of antitrust: The case against the case against Google	Included
8	ProQuest	2010	Weyl	A price theory of multi-sided platforms	Excluded
9	ProQuest	2012	Niculescu & Whang	Codiffusion of wireless voice and data services: An empirical analysis of the Japanese mobile telecommunications market	Excluded
10	ProQuest	2013	Peng & Dey	A dynamic view of the impact of network structure on technology adoption: The case of OSS development	Excluded
11	ProQuest	2012	Boudreau	Let a thousand flowers bloom? An early look at large numbers of software app developers and patterns of innovation	Excluded
12	ProQuest	2016	Hu	The adoption of electronic medical records by U.S. hospitals: An exploration of network methods and models	Excluded
13	ProQuest	2019	Fontana & Egels-Zandén	Non Sibi, Sed Omnibus: Influence of supplier collective behaviour on corporate social responsibility in the Bangladeshi apparel supply chain	Excluded

14	ProQuest	2003	Moody & White	Structural cohesion and embeddedness: A hierarchical concept of social groups	Excluded
15	ProQuest	2000	Speta	Handicapping the race for the last mile?: A critique of open access rules for broadband platforms	Excluded
16	ProQuest	2017	Surowiecki	Why Tesla is worth more than GM	Included
17	ProQuest	2004	Barr	Banking the poor	Excluded
18	ProQuest	2017	Mashaw & Harfst	From command and control to collaboration and deference: The transformation of auto safety regulation	Excluded
19	ProQuest	2001	Amit & Zott	Value creation in e-Business	Included
20	ProQuest	2012	Sytch, Tatarynowicz, & Gulati	Toward a theory of extended contact: The incentives and opportunities for bridging across network communities	Excluded
21	ProQuest	2018	Boni	Bridging theory and practice for commercialization and innovation - A market-centered perspective for cross-industry applications	Included
22	ProQuest	2009	Sheehan & Vaidyanathan	Using a value creation compass to discover "blue oceans"	Excluded
23	ProQuest	1999	McKelvey	Avoiding complexity catastrophe in coevolutionary pockets: Strategies for rugged landscapes	Excluded
24	ProQuest	2010	Stocker	Technology acceptance of electronic medical records by nurses	Excluded
25	ProQuest	2014	Khamseh & Jolly	Knowledge transfer in alliances: The moderating role of the alliance type	Excluded
26	ProQuest	2011	Adobor	Alliances as collaborative regimes	Excluded
27	ProQuest	2006	Fonkyeh	Accelerating adoption of clinical IT among the healthcare providers in United States: Strategies and policies	Excluded
28	ProQuest	2015	Journal of Economic Literature	Annotated listing of new books	Excluded
29	Google	n.d.	Currier & NFX	The network effects bible	Included
30	Google	2018	Schadler	Platform economy myth #3: Platform economies are always winner-takes-all	Included
31	Google Scholar	2006	Eisenmann, Parker, & Van Alstyne	Strategies for two-sided markets	Included
32	Google Scholar	2015	Voigt & Hinz	Network effects in two-sided markets: Why a 50/50 user split is not necessarily revenue optimal	Included

33	Google Scholar	2008	Bakos & Katsamakos	Design and ownership of two-sided networks: Implications for internet platforms	Included
34	Google Scholar	2018	Stummer, Kundisch, & Decker	Platform launch strategies	Included
35	Google Scholar	2014	Bhargava	Platform technologies and network goods: Insights on product	Included
36	Google Scholar	2009	McIntyre & Subramaniam	Strategy in network industries: A review and research agenda	Included
37	Google Scholar	2017	Van Alstyne & Parker	Platform business: From resources to relationships	Included
38	Google Scholar	2010	Arroyo-Barrigüete , Ernst, López-Sánchez, & Orero-Giménez	On the identification of critical mass in internet-based services subject to network effects	Included
39	From References	2004	Sheremata	Competing through innovation in network markets: Strategies for challengers	Included
40	From References	1987	Klemperer	Markets with consumer switching costs	Included
41	From References	1987	Farrell	Rigidity vs. license.	Included
42	From References	1988	Farrell & Shapiro	Dynamic competition with switching costs	Included
43	From References	1989	Farrell & Shapiro	Optimal contracts with lock-in	Included

Appendix F

Summary of Utilized Articles for Coding Tree: Network Effects

NETWORK EFFECT (n=24)

- Amit & Zott (2001)
- Arroyo-Barrigüete, Ernst, López-Sánchez, & Orero-Giménez (2010)
- Bakos & Katsamakas (2008)
- Beck (2006)
- Bhargava (2014)
- Boni (2018)
- Currier & NFX (n.d.)
- Eisenmann, Parker, & Van Alstyne (2006)
- Farrell (1987)
- Farrell & Shapiro (1988)
- Farrell & Shapiro (1989)
- Fu, Wang, & Zhao (2017)
- Klemperer (1987)
- Lee, Kim, Noh, & Lee (2010)
- Manne & Wright (2011)
- McIntyre & Subramaniam (2009)
- Molina-Castillo, Munuera-Alemán, & Calantone (2011)
- Schadler (2018)
- Sheremata (2004)
- Stummer, Kundisch, & Decker (2018)
- Surowiecki (2017)
- Van Alstyne & Parker (2017)
- Voigt & Hinz (2015)
- Xiao, Fu, & Liu (2018)

Relationships (n=14)

- Amit & Zott (2001)
- Bakos & Katsamakas (2008)
- Bhargava (2014)
- Currier & NFX (n.d.)
- Eisenmann, Parker, & Van Alstyne (2006)
- Fu, Wang, & Zhao (2017)
- Manne & Wright (2011)
- McIntyre & Subramaniam (2009)
- Molina-Castillo, Munuera-Alemán, & Calantone (2011)
- Schadler (2018)
- Stummer, Kundisch, & Decker (2018)
- Van Alstyne & Parker (2017)
- Voigt & Hinz (2015)
- Xiao, Fu, & Liu (2018)

Openness (n=5)

- Eisenmann, Parker, & Van Alstyne (2006)
- Molina-Castillo, Munuera-Alemán, & Calantone (2011)
- Schadler (2018)
- Stummer, Kundisch, & Decker (2018)
- Van Alstyne & Parker (2017)

Focused Launch (n=2)

- Stummer, Kundisch, & Decker (2018)
- Van Alstyne & Parker (2017)

Valued Interactions (n=9)

- Amit & Zott (2001)
- Currier & NFX (n.d.)
- Eisenmann, Parker, & Van Alstyne (2006)
- Fu, Wang, & Zhao (2017)
- Manne & Wright (2011)
- McIntyre & Subramaniam (2009)
- Van Alstyne & Parker (2017)
- Voigt & Hinz (2015)
- Xiao, Fu, & Liu (2018)

Pricing (n=4)

- Bakos & Katsamakas (2008)
- Bhargava (2014)
- Eisenmann, Parker, & Van Alstyne (2006)
- Stummer, Kundisch, & Decker (2018)

Platforms as Products (n=12)

- Amit & Zott (2001)
- Beck (2006)
- Bhargava (2014)
- Boni (2018)
- Farrell (1987)
- Farrell & Shapiro (1988)
- Farrell & Shapiro (1989)
- Fu, Wang, & Zhao (2017)
- Klemperer (1987)
- Lee, Kim, Noh, & Lee (2010)
- Molina-Castillo, Munuera-Alemán, & Calantone (2011)
- Sheremata (2004)

Quality (n=11)

- Amit & Zott (2001)
- Beck (2006)
- Bhargava (2014)
- Boni (2018)
- Farrell (1987)
- Farrell & Shapiro (1988)
- Farrell & Shapiro (1989)
- Klemperer (1987)
- Lee, Kim, Noh, & Lee (2010)
- Molina-Castillo, Munuera-Alemán, & Calantone (2011)
- Sheremata (2004)

Pre-announcement (n=1)

- Bhargava (2014)

Product Differentiation (n=2)

- Bhargava (2014)
- Fu, Wang, & Zhao (2017)

Complementary products (n=3)

- Amit & Zott (2001)
- Fu, Wang, & Zhao (2017)
- Lee, Kim, Noh, & Lee (2010)

DATA ANALYTICS (n=2)

- Amit & Zott (2001)
- Surowiecki (2017)

Appendix G

Summary of Reviewed Articles: Segmentation

	Source	Year	Author/s	Title/Topic	Results
1	Scopus	2018	Risius & Aydingül	Facebook user segmentation to enable targeted social advertisement	Included
2	ProQuest	2015	Tella & Abdulmumin	Predictors of users' satisfaction with e-Payment system: A case study of staff at the University of Ilorin, Nigeria	Excluded
3	ProQuest	2011	Shaw	Market segmentation and the impact of online media	Included
4	ProQuest	2014	Weijters, Goedertir, & Verstreken	Online music consumption in today's technological context: Putting the influence of ethics in perspective	Excluded
5	ProQuest	2017	Iskoujina, Ciesielska, Roberts, & Li	Grasping the business value of online communities	Excluded
6	ProQuest	2016	Sahoo & Ghosh	Healthscape role towards customer satisfaction in private healthcare	Excluded
7	ProQuest	2004	Preston & White	Commodifying kids: Branded identities and the selling of Adspace on kids' networks	Excluded
8	ProQuest	2018	Chou & Chuang	A predictive investigation of first-time customer retention in online reservation services	Excluded
9	ProQuest	2006	Boehler & Hansel	Innovative strategies for self-pay segmentation	Excluded
10	ProQuest	2001	O'Neill, Wright, & Fitz	Quality evaluation in on-line service environments: An application of the importance-performance measurement technique	Excluded
11	ProQuest	2012	Baird	Extending adoption of innovation theory with consumer influence the case of personal health records (PHRs) and patient portals	Excluded
12	ProQuest	2018	Basco	Digital fundraising strategies for nonprofit marketing leaders in international markets	Excluded
13	ProQuest	2018	Ghosh	Measuring electronic service quality in India using E-S-QUAL	Excluded
14	ProQuest	2014	Kang, Kang, Yoon, & Kim	A consumer value analysis of mobile internet protocol television based on a means-end chain theory	Excluded
15	ProQuest	2018	Smith-Ditizio, Smith, & Kendall	Integrating search engine capacity and gender preference within a social media captured authority locus of control	Excluded

16	ProQuest	2008	Will, Cobb, & Cheney	Florida's changing rainbow: Identifying emerging markets through the examination of racial composition and demographic change in Florida	Excluded
17	ProQuest	2013	Kumar, Chattaraman, Neghina, Skiera, Aksoy, Buoye, & Henseler	Data-driven services marketing in a connected world	Excluded
18	ProQuest	2017	Pedeliento, Andreini, Bergamaschi, & Klobas	Trust, information asymmetry and professional service online referral agents	Excluded
19	ProQuest	2016	Lord, Bolton, Fleming, & Anderson	Researching a segmented market: Reflections on telephone interviewing	Excluded
20	ProQuest	2014	Yaraghi	Essays on health information exchange: Adoption, usage and patient privacy	Excluded
21	ProQuest	2003	Leonard	Marketing literature review	Excluded
22	ProQuest	2016	Acquisti, Taylor, & Wagman	The economics of privacy	Excluded
23	ProQuest	2007	Christensen, Anthony, Berstell, & Nitterhouse	Finding the right job for your product	Included
24	ProQuest	2013	Sawng, Motohashi, & Kim	Comparative analysis of innovative diffusion in the high-tech markets of Japan and South Korea: A use-diffusion model approach	Excluded
25	ProQuest	2013	Chakravarty, Grewal, & Sambamurthy	Information technology competencies, organizational agility, and firm performance: Enabling and facilitating roles	Excluded
26	ProQuest	2000	Medical Marketing and Media	2000 direct marketing review	Excluded
27	ProQuest	2018	Fisk, Dean, Alkire, Joubert, Previte, Robertson, & Rosenbaum	Design for service inclusion: Creating inclusive service systems by 2050	Excluded
28	ProQuest	2006	Hong, & Tam	Understanding the adoption of multipurpose information appliances: The case of mobile data services	Excluded
29	ProQuest	2007	Powell, Tapp, & Sparks	Social marketing in action-geodemographics, alcoholic liver disease and heavy episodic drinking in Great Britain	Excluded
30	ProQuest	2017	Journal of Economic Literature	Annotated listing of new books	Excluded
31	ProQuest	2016	Journal of Economic Literature	Annotated listing of new books	Excluded

32	ProQuest	2013	Iglesias-Rios & Parascandola	A historical review of R. J. Reynolds' strategies for marketing tobacco to Hispanics in the United States	Excluded
33	ProQuest	2015	Prince & Graf	Geisinger's retail innovation journey	Excluded
34	ProQuest	2010	Ko & Lu	Measuring innovation competencies for integrated services in the communications industry	Excluded
35	ProQuest	2008	Journal of Economic Literature	Annotated listing of new books	Excluded
36	ProQuest	2001	Sidak	An antitrust rule for software integration	Excluded
37	ProQuest	2016	Tsiotsou	The social aspects of consumption as predictors of consumer loyalty: Online vs offline services	Included
38	ProQuest	2016	Aker & Mbiti	Mobile phones and economic development in Africa	Excluded
39	ProQuest	2015	Medical Buyer	Product guide devices and utilities	Excluded
40	ProQuest	2012	Rusetski	The whole new world: Nintendo's targeting choice	Included
41	ProQuest	2010	Journal of Economic Literature	Annotated listing of new books	Excluded
42	ProQuest	2012	Journal of Economic Literature	Annotated listing of new books	Excluded
43	ProQuest	2011	Journal of Economic Literature	Annotated listing of new books	Excluded
44	ProQuest	2015	Ponsignon, Klaus, & Maull	Experience co-creation in financial services: An empirical exploration	Excluded
45	ProQuest	2013	Boone	Addressing informatics barriers to conducting observational comparative effectiveness research: A comparative case analysis	Excluded
46	ProQuest	2012	Journal of Economic Literature	Annotated listing of new books	Excluded
47	ProQuest	2014	Journal of Economic Literature	Annotated listing of new books	Excluded
48	ProQuest	2014	Journal of Economic Literature	Annotated listing of new books	Excluded
49	ProQuest	2010	Coltman, Gattorna, & Whiting	Realigning service operations strategy at DHL Express	Included
50	ProQuest	2019	Medhekar, Wong, & Hall	Factors influencing inbound medical travel to India	Excluded
51	ProQuest	2013	Journal of Economic Literature	Annotated listing of new books	Excluded
52	ProQuest	2015	Journal of Economic Literature	Annotated listing of new books	Excluded

53	ProQuest	2011	Journal of Economic Literature	Annotated listing of new books	Excluded
54	ProQuest	2012	McPhee	Employers and migration in low-skilled services in Dublin	Excluded
55	ProQuest	2007	Journal of Economic Literature	Annotated listing of new books	Excluded
56	ProQuest	2014	Journal of Economic Literature	Annotated listing of new books	Excluded
57	ProQuest	2018	Chavarria	Perceived transformational leadership, Latino cultural values, and leadership outcomes among medical imaging professionals	Excluded
58	ProQuest	2007	Journal of Economic Literature	Annotated listing of new books	Excluded
59	ProQuest	2010	Journal of Economic Literature	Annotated listing of new books	Excluded
60	ProQuest	2000	Hsieh	Comparative analysis of state capitation rate setting methods	Excluded
61	ProQuest	2014	Henderson	Uncertainty avoidance and trust: Strategic networking in medical tourism industry	Excluded
62	ProQuest	2013	Byus & Deis	Listening to the voice of the customer: Four shades of the green consumer	Excluded
63	ProQuest	2011	Journal of Economic Literature	Annotated listing of new books	Excluded
64	ProQuest	1996	Leonard	Marketing literature review	Excluded
65	ProQuest	2019	Byrne & Pecchenino	Heigh ho, heigh ho: Flexible labor contracts with real option characteristics	Excluded
66	ProQuest	2010	Security	The perfect partner	Excluded
67	ProQuest	1998	Arnold & Quelch	New strategies in emerging markets	Excluded
68	ProQuest	2017	Payne	Immersive cultural plunge: How mental health trainees can exercise cultural competence with African American descendants of Chattel slaves A qualitative study	Excluded
69	ProQuest	2018	Rahimi	Developing a mixed-methods method to model elderly health technology adoption with fuzzy cognitive map, and its application in adoption of remote health monitoring technologies by elderly women	Excluded
70	ProQuest	2014	Fisher & Vaidyanathan	A demand estimation procedure for retail assortment optimization with results from implementations	Excluded

71	ProQuest	2017	Fan	Statistical learning with applications in high dimensional data and health care analytics	Excluded
72	ProQuest	2006	Journal of Economic Literature	Annotated listing of new books: Editor's note	Excluded
73	ProQuest	2010	Stocker	Technology acceptance of electronic medical records by nurses	Excluded
74	ProQuest	2015	Sindakis, Depeige, & Anoyrkati	Customer-centered knowledge management: Challenges and implications for knowledge-based innovation in the public transport sector	Excluded
75	ProQuest	2010	Piercey	A qualitative study of hospital health care availability in rural Kentucky	Excluded
76	ProQuest	2010	Canadian HR Reporter	The time is now 2010-2011 management & executive education seminars	Excluded
77	ProQuest	2006	Journal of General Internal Medicine	Society of general internal medicine 29th annual meeting Los Angeles, California April 26-29, 2006	Excluded
78	ProQuest	2018	Hudson	Strategies for increasing volunteer engagement in nonprofit healthcare organizations	Excluded
79	ProQuest	1998	Walton	Linking strategy, diversity, and competitive advantage in managerial processes: Perspectives of health care system executives	Excluded
80	ProQuest	2015	Enyia	Effects of health information technology implementation on clinical outcomes and quality of care	Excluded
81	ProQuest	2007	Patel	A qualitative study examining the implementation of outcomes management systems in child and adolescent out-of-home placement settings	Excluded
82	ProQuest	2007	Bohrer	Discriminant analysis of Aaker's brand equity model on top-of-mind awareness /brand preference congruence in prospective hospital patients	Excluded
83	ProQuest	2016	Gaikwad	Easy care home health agency - Business plan	Excluded
84	ProQuest	2016	Biswas & Suar	Antecedents and consequences of employer branding	Excluded
85	ProQuest	2002	Eisler	Health care technology management (HCTM): An assessment of its application in Canadian teaching hospitals	Excluded
86	ProQuest	2015	Business Monitor International	Argentina pharmaceuticals & healthcare report - Q3 2015	Excluded

87	ProQuest	2015	Business Monitor International	Argentina pharmaceuticals & healthcare report - Q2 2015. (2015)	Excluded
88	ProQuest	2006	Myers	A critical case study of program fidelity in TennCare	Excluded
89	ProQuest	2014	Obi	An ethical justification for post-trial access to antiretroviral drugs for participants and host populations in developing countries: A global justice perspective	Excluded
90	ProQuest	2010	Esmail	The politics of Canada's access to medicines regime: The dogs that didn't bark	Excluded
91	ProQuest	2014	Jamieson	Strategic flexibility in not-for-profit acute care hospitals	Excluded
92	ProQuest	2006	Pozniak	An examination of organizational change and structure in the healthcare industry	Excluded
93	EBSCOhost	2018	Gal-Or, Gal-Or, & Penmetsa	The role of user privacy concerns in shaping competition among platforms	Excluded
94	EBSCOhost	2017	Despotakis, Hafalir, Ravi, & Sayedi	Expertise in online markets	Excluded
95	EBSCOhost	2017	Kim, Lee, & Park	A security generic service interface of internet of things (IoT) platforms	Excluded
96	EBSCOhost	2016	Baumgartner	Ellation will ride SVOD's next wave	Excluded
97	EBSCOhost	2015	Overby	Big gulp of customer data	Included
98	EBSCOhost	2015	Khwaja	A retailer's guide to choosing an email service provider	Included
99	EBSCOhost	2015	McMahon	Swiss re picks cloud platform for marketing	Excluded
100	EBSCOhost	2014	Reimer, Rutz, & Pauwels	How online consumer segments differ in long-term marketing effectiveness	Included
101	EBSCOhost	2014	Birkner	Six tips for six-second success	Excluded
102	EBSCOhost	2013	Bannan	Email analytics: 3 best practices to live by	Excluded
103	EBSCOhost	2013	Lin	Convergence and regulation of multi-screen television: The Singapore experience	Excluded
104	EBSCOhost	2013	Raphael	Lucky mag grows online community with eye on sponsorship ops	Included
105	EBSCOhost	2011	Schultz	Boston Proper builds customer database and sales with summer catalog initiative	Included
106	EBSCOhost	2011	Yao & Mela	A dynamic model of sponsored search advertising	Excluded

107	EBSCOhost	2011	Palmer	Marketers strike a balance between skeptical teens and their cautious parents	Excluded
108	EBSCOhost	2010	Williams	The PatientsLikeMe® Multiple Sclerosis community: Using online marketing to shift the health data privacy paradigm	Excluded
109	EBSCOhost	2008	Bloom	Some at NATPE see digital as future rather than threat	Excluded
110	EBSCOhost	2007	The Magazine for Magazine Management	“Narrow-cast” your e-mail newsletters	Excluded
111	EBSCOhost	2007	Mansley	Creative print business	Excluded
112	EBSCOhost	2007	The Magazine for Magazine Management	Building an online job board	Excluded
113	EBSCOhost	2006	American Banker	Scottrade office targets Chinese speakers	Excluded
114	EBSCOhost	2006	Rogers	Bull’s eye!	Included
115	EBSCOhost	2005	Yeates	Cadence divides incisive platform for three different types of user	Excluded
116	EBSCOhost	2004	Drennan & Cornwell	Emerging strategies for sponsorship on the internet	Excluded
117	EBSCOhost	2004	Gulliksen	Market trends upward for merchant DSP boards	Excluded
118	Google	n.d.	Qualtrics	What is market segmentation? Different types explained	Included
119	Google Scholar	2016	Harmon-Kizer	Identity distancing and targeted advertisements: The black sheep effect	Included
120	From References	2002	Lin	Segmenting customer brand preference: Demographic or psychographic	Included
121	From References	1987	Tynan & Drayton	Market Segmentation	Included
122	From References	1978	Young, Ott, & Feigin	Some practical considerations in market segmentation	Included

Appendix H

Summary of Utilized Articles for Coding Tree: Segmentation

SEGMENTATION (n=17)

- Christensen, Anthony, Berstell, & Nitterhouse (2007)
- Coltman, Gattorna, & Whiting (2010)
- Harmon-Kizer (2016)
- Khwaja (2015)
- Lin (2002)
- Overby (2015)
- Qualtrics (n.d.)
- Raphael (2013)
- Reimer, Rutz, & Pauwels (2014)
- Risius & Aydingül (2018)
- Rogers (2006)
- Rusetski (2012)
- Schultz (2011)
- Shaw (2011)
- Tsiotsou (2016)
- Tynan & Drayton (1987)
- Young, Ott, & Feigin (1978)

Identified Segmentations (n=10)

- Christensen, Anthony, Berstell, & Nitterhouse (2007)
- Coltman, Gattorna, & Whiting (2010)
- Lin (2002)
- Qualtrics (n.d.)
- Reimer, Rutz, & Pauwels (2014)
- Risius & Aydingül (2018)
- Rogers (2006)
- Shaw (2011)
- Tsiotsou (2016)
- Tynan & Drayton (1987)

Geographic Segmentation (n=2)

- Qualtrics (n.d.)
- Tynan & Drayton (1987)

Demographic Segmentation (n=3)

- Lin (2002)
- Qualtrics (n.d.)
- Tynan & Drayton (1987)

Firmographic Segmentation (n=2)

- Qualtrics (n.d.)
- Tynan & Drayton (1987)

Behavioral Segmentation (n=7)

- Coltman, Gattorna, & Whiting (2010)
- Qualtrics (n.d.)
- Reimer, Rutz, & Pauwels (2014)
- Risius & Aydingül (2018)
- Rogers (2006)
- Tsiotsou (2016)
- Tynan & Drayton (1987)

Psychographic Segmentation (n=3)

- Lin (2002)
- Qualtrics (n.d.)
- Tynan & Drayton (1987)

Product Positions (n=7)

- Coltman, Gattorna, & Whiting (2010)
- Qualtrics (n.d.)
- Reimer, Rutz, & Pauwels (2014)
- Rusetski (2012)
- Shaw (2011)
- Tynan & Drayton (1987)
- Young, Ott, & Feigin (1978)

Segmentation Process (n=5)

- Coltman, Gattorna, & Whiting (2010)
- Qualtrics (n.d.)
- Reimer, Rutz, & Pauwels (2014)
- Rusetski (2012)
- Tynan & Drayton (1987)

Ensuring Effective Segmentation (n=7)

- Coltman, Gattorna, & Whiting (2010)
- Qualtrics (n.d.)
- Reimer, Rutz, & Pauwels (2014)
- Rusetski (2012)
- Shaw (2011)
- Tynan & Drayton (1987)
- Young, Ott, & Feigin (1978)

Appendix I

Summary of Reviewed Articles: First to Market

	Source	Year	Author/s	Title/Topic	Results
1	ProQuest	2019	Yun, Lee, & Aoshima	An analysis of the trilemma phenomenon for Apple iPhone and Samsung Galaxy	Included
2	ProQuest	2001	Rangan & Adner	Profits and the internet: Seven misconceptions	Included
3	ProQuest	2016	Mooney	Strategies technology development marketing leaders used to commercialize a new product innovation	Included
4	ProQuest	2017	Dike & Rose	Internationalization of mobile telecommunications: A systematic literature review	Included
5	ProQuest	1998	Schilling & Hill	Managing the new product development process: Strategic imperatives	Included
6	ProQuest	2012	Ye, Priem, & Alshwer	Achieving demand-side synergy from strategic diversification: How combining mundane assets can leverage consumer diversification	Excluded
7	ProQuest	1997	Chakravarthy	A new strategy framework for coping with turbulence	Excluded
8	ProQuest	2018	Banda, Tait, & Mitra	Evolution of business models in regenerative medicine: Effects of a disruptive innovation on the innovation ecosystem	Excluded
9	ProQuest	2019	Santoso, Prijadi, & Balqiah	Synergizing multi-sided platform firms and crowds: A typology of an open innovation mechanism in a digital ecosystem	Excluded
10	ProQuest	2000	Eisenmann & Bower	The entrepreneurial M-form: Strategic integration in global media firms	Excluded
11	ProQuest	2002	Burke	Information technology strategy-environmental fit and hospital finance performance	Included
12	ProQuest	2007	Lin, Jang, & Chen	Assessing the market valuation of e-Service initiatives	Excluded
13	ProQuest	2003	Kalling	ERP systems and the strategic management processes that lead to competitive advantage	Excluded

14	ProQuest	2007	Stephenson & Sage	Information and knowledge perspectives in systems engineering and management for innovation and productivity through enterprise resource planning	Excluded
15	ProQuest	2003	Evans	The antitrust economics of multi-sided platform markets	Excluded
16	ProQuest	2004	Constantinides	Strategies for surviving the internet meltdown: The case of two internet incumbents	Included
17	ProQuest	2018	Fehrer, Benoit, Aksoy, Baker, Bell, Brodie, & Marimuthu	Future scenarios of the collaborative economy	Excluded
18	ProQuest	2003	Oliva, Sterman, & Giese	Limits to growth in the new economy: Exploring the 'get big fast' strategy in e-Commerce	Excluded
19	ProQuest	2010	Gnyawali, Fan, & Penner	Competitive actions and dynamics in the digital age: An empirical investigation of social networking firms	Included
20	ProQuest	2001	Roberts & Liu	Ally or acquire?	Excluded
21	ProQuest	2010	Ahn, York, & Rizova	Pathways to biomedical tipping points: Vertical, horizontal or other?	Excluded
22	ProQuest	2010	Vannoy & Salam	Managerial interpretations of the role of information systems in competitive actions and firm performance: A grounded theory investigation	Excluded
23	ProQuest	1998	Schilling	Technological lockout: An integrative model of the economic and strategic factors driving technology success and failure	Included
24	ProQuest	1999	Siddiqi	Strategic geography and strategic corporate challenges: A regiocentric perspective to the Middle East	Excluded
25	ProQuest	1997	Kim & Mauborgne	Value innovation: The strategic logic of high growth	Included
26	ProQuest	2005	Sood & Tellis	Technological evolution and radical innovation	Excluded
27	ProQuest	2014	Wareham, Fox, & Giner	Technology ecosystem governance	Excluded
28	ProQuest	2008	Miller & Côté	The games that innovators play	Excluded
29	ProQuest	2011	Cardinal, Turner, Fern, & Burton	Organizing for product development across technological environments: Performance trade-offs and priorities	Excluded
30	ProQuest	1997	Evans & Wurster	Strategy and the new economics of information	Excluded

31	ProQuest	2001	Amit & Zott	Value creation in e-Business	Excluded
32	ProQuest	2019	Pharmaceutical Executive	Spain: Maturing with grace	Excluded
33	ProQuest	2001	Johnson-Page & Thatcher	B2C data privacy policies: Current trends	Excluded
34	ProQuest	2017	Looney	Eyes unflinching	Excluded
35	ProQuest	2000	Bashe	Global branding challenge	
36	ProQuest	2002	Strategic Management Journal	Strategic Management Journal Contents, Volumes 16-20, 1995-1999	Excluded
37	ProQuest	2019	Alexius & Furusten	Enabling sustainable transformation: Hybrid organizations in early phases of path generation	Excluded
38	ProQuest	2016	Nguyen	Brewed to perfection	Excluded
39	ProQuest	2006	Quader	The strategic implication of electronic commerce for small and medium sized enterprises	Included
40	ProQuest	1997	Slywotzky & Linticum	Capturing value in five moves of less: The new game of business	Excluded
41	ProQuest	2014	Newman	Search, antitrust, and the economics of the control of user data	Excluded
42	ProQuest	2008	Meyer, Willcocks, & Boushell	Corporate Venturing: An expanded role for R&D	Included
43	ProQuest	2008	Rauniar, Doll, Rawski, & Hong	The role of heavyweight product manager in new product development	Excluded
44	ProQuest	2011	Prajogo & McDermott	The relationship between multidimensional organizational culture and performance	Excluded
45	ProQuest	2006	Meyer & Gelbuda	Process perspectives in international business research in CEE1	Excluded
46	ProQuest	2013	Naiman	Systematically gathering clinician opinions on health care technology	Excluded
47	ProQuest	2018	Shimasaki	Moleculera Labs story: Lessons in a capital efficient start-up	Excluded
48	ProQuest	2009	Contraceptive Technology Update	CNE/CME objectives/questions	Excluded
49	ProQuest	2015	Nguyen & McDonald	Hack your growth	Excluded
50	ProQuest	2015	Gilbert & Von Glinow	National context and organizational performance across three sectors	Excluded
51	ProQuest	2009	Paul	MAOY bronze: Cossette grows its own (people, that is)	Excluded
52	ProQuest	2018	Hull & Pasquale	Toward a critical theory of corporate wellness	Excluded

53	ProQuest	2008	MacEwen, Regan, & Ribstein	Law firms, ethics, and equity capital	Excluded
54	ProQuest	2010	Business Monitor International	United Kingdom pharmaceuticals & healthcare report - Q1 2010	Excluded
55	ProQuest	1996	Conrad & Shortell	Integrated health systems: Promise and performance	Excluded
56	ProQuest	2014	Business Monitor International	Israel pharmaceuticals & healthcare report - Q4 2014	Excluded
57	ProQuest	2017	Journal of Economic Literature	Book reviews	Excluded
58	ProQuest	2005	Gavetti, Levinthal, & Rivkin	Strategy making in novel and complex worlds: The power of analogy	Excluded
59	ProQuest	2010	Business Monitor International	Brazil pharmaceuticals & healthcare report - Q4 2010	Excluded
60	ProQuest	2013	Champagne	The development of community-based health information exchanges: A comparative assessment of organizational models	Excluded
61	ProQuest	2009	Business Monitor International	United Kingdom pharmaceuticals & healthcare report - Q4 2009	Excluded
62	ProQuest	2005	Gavetti, Levinthal, & Rivkin	Strategy making in novel and complex worlds: The power of analogy	Excluded
63	ProQuest	2018	Voinea & van Kranenburg	Feeling the squeeze: Nonmarket institutional pressures and firm nonmarket strategies	Excluded
64	ProQuest	2010	Business Monitor International	United Kingdom pharmaceuticals & healthcare report - Q3 2010	Excluded
65	ProQuest	2010	Business Monitor International	United Kingdom pharmaceuticals & healthcare report - Q2 2010	Excluded
66	ProQuest	2009	Erdil	Systems analysis of electronic health record adoption in the U.S. healthcare system	Excluded
67	ProQuest	2012	Phillips	An integrative review of the literature on technology transformation in healthcare	Excluded
68	ProQuest	2013	Business Monitor International	South Africa pharmaceuticals & healthcare report - Q1 2013	Excluded
69	ProQuest	2007	Juan, Olmos, & Ashkeboussi	Evaluation of international joint venture agreements: Real options in practice	Excluded
70	ProQuest	1999	Lajoie	Peripherals, from screens to supplies	Excluded
71	ProQuest	2012	Gorman	Management insights	Excluded
72	ProQuest	2013	Canadian Business	A great year for billionaires	Excluded

73	ProQuest	2010	Anand, Oriani, & Vassolo	Alliance activity as a dynamic capability in the face of a discontinuous technological change	Included
74	ProQuest	2007	López-Duarte & García-Canal	Stock market reaction to foreign direct investments: Interaction between entry mode and FDI attributes	Excluded
75	ProQuest	2005	Powell, White, Koput, & Owen-Smith	Network dynamics and field evolution: The growth of interorganizational collaboration in the life Sciences	Excluded
76	ProQuest	2012	Campos	The BioBrick(TM) road	Excluded
77	ProQuest	2010	Business Monitor International	Israel pharmaceuticals & healthcare report - Q2 2010	Excluded
78	ProQuest	2011	Business Monitor International	Brazil pharmaceuticals & healthcare report - Q1 2011	Excluded
79	ProQuest	2009	Business Monitor International	United Kingdom pharmaceuticals and healthcare report - Q1 2009	Excluded
80	ProQuest	2016	Business Monitor International	China pharmaceuticals & healthcare report - Q3 2016	Excluded
81	ProQuest	2011	Business Monitor International	Brazil pharmaceuticals & healthcare report - Q3 2011	Excluded
82	ProQuest	2014	Jamieson	Strategic flexibility in not-for-profit acute care hospitals	Excluded
83	ProQuest	2011	Business Monitor International	Brazil pharmaceuticals & healthcare report - Q2 2011	Excluded
84	ProQuest	2016	Business Monitor International	China pharmaceuticals & healthcare report - Q4 2016	Excluded
85	ProQuest	2011	Maslach	Learning from interorganizational product failure experience in the medical device industry	Excluded
86	ProQuest	2017	Business Monitor International	China pharmaceuticals & healthcare report - Q1 2017	Excluded
87	ProQuest	2015	Watts, Adger, Agnolucci, Blackstock, Byass, Cai, Chaytor, Colbourn, Collins, Cooper, Cox, Depledge, Drummond, Ekins, Galaz, Grace, Graham, Grubb, Haines, ... Costello	Health and climate change: Policy responses to protect public health	Excluded
88	ProQuest	2017	Mashaw & Harfst	From command and control to collaboration and deference: The transformation of auto safety regulation	Excluded
89	ProQuest	2011	Business Monitor International	Bangladesh pharmaceuticals & healthcare report - Q2 2011	Excluded

90	ProQuest	2018	Journal of Economic Literature	Annotated listing of new books	Excluded
91	ProQuest	2012	Business Monitor International	Bangladesh pharmaceuticals & healthcare report - Q1 2012	Excluded
92	ProQuest	2011	Business Monitor International	Bangladesh pharmaceuticals & healthcare report - Q4 2011	Excluded
93	ProQuest	2006	Unsal-Aktas	Quality and valuation problems in healthcare	Excluded
94	ProQuest	2011	Nolen	Barriers to reforming the U.S. health care system for patient safety: A study of ten years of policy implementation for three health information technology (HIT) strategies	Excluded
95	ProQuest	2011	Business Monitor International	Bangladesh pharmaceuticals & healthcare report - Q3 2011	Excluded
96	ProQuest	2006	Kogan	Rediscovering the value of intellectual property rights: How Brazil's recognition and protection of foreign IPRs can stimulate domestic innovation and generate economic growth	Excluded
97	ProQuest	2013	Neumeier	The relation of hospital choices in IT infrastructure spending and deployment with HIT/EHR strategies and operational efficiency	Excluded
98	ProQuest	2010	Schaller	Secrets of the trade: Tactical and legal considerations from the trade secret plaintiff's perspective	Excluded
99	Google	2005	Suarez & Lanzolla	The half-truth of first-mover advantage	Included
100	Google Scholar	2007	Zhu & Iansiti	Dynamics of platform competition: Exploring the role of installed base, platform quality and consumer expectations	Included
101	From References	1988	Lieberman & Montgomery	First-mover advantages	Included

Appendix J

Summary of Utilized Articles for Coding Tree: First to Market

FIRST TO MARKET (n=16)

- Anand, Oriani, & Vassolo (2010)
- Burke (2002)
- Constantinides (2004)
- Dike & Rose (2017)
- Gnyawali, Fan, & Penner (2010)
- Kim & Mauborgne (1997)
- Lieberman & Montgomery (1988)
- Meyer, Willcocks, & Boushell (2008)
- Mooney (2016)
- Quader (2006)
- Rangan & Adner (2001)
- Schilling (1998)
- Schilling & Hill (1998)
- Suarez & Lanzolla (2005)
- Yun, Lee, & Aoshima (2019)
- Zhu & Iansiti (2007)

Beneficial Implementations (n=10)

- Burke (2002)
- Constantinides (2004)
- Lieberman & Montgomery (1988)
- Meyer, Willcocks, & Boushell (2008)
- Mooney (2016)
- Quader (2006)
- Rangan & Adner (2001)
- Schilling & Hill (1998)
- Suarez & Lanzolla (2005)
- Zhu & Iansiti (2007)

Leadership in Product or Process Technologies (n=8)

- Burke (2002)
- Constantinides (2004)
- Lieberman & Montgomery (1988)
- Meyer, Willcocks, & Boushell (2008)
- Mooney (2016)
- Rangan & Adner (2001)
- Schilling & Hill (1998)
- Suarez & Lanzolla (2005)

Preemption of Assets (n=4)

- Lieberman & Montgomery (1988)
- Quader (2006)
- Rangan & Adner (2001)
- Zhu & Iansiti (2007)

Development of Buyer Switching Costs (n=2)

- Lieberman & Montgomery (1988)
- Zhu & Iansiti (2007)

Misconceptions and Disadvantages (n=11)

- Anand, Oriani, & Vassolo (2010)
- Gnyawali, Fan, & Penner (2010)
- Kim & Mauborgne (1997)
- Lieberman & Montgomery (1988)
- Mooney (2016)
- Quader (2006)
- Rangan & Adner (2001)
- Schilling (1998)
- Schilling & Hill (1998)
- Yun, Lee, & Aoshima (2019)
- Zhu & Iansiti (2007)

Free-rider Effects (n=2)

- o Lieberman & Montgomery (1988)
- o Mooney (2016)

Resolution of Market and Design Uncertainties (n=7)

- o Gnyawali, Fan, & Penner (2010)
- o Kim & Mauborgne (1997)
- o Lieberman & Montgomery (1988)
- o Quader (2006)
- o Schilling (1998)
- o Yun, Lee, & Aoshima (2019)
- o Zhu & Iansiti (2007)

Changes in Technology and the Ensuing Impacts on Consumer Needs (n=7)

- o Anand, Oriani, & Vassolo (2010)
- o Gnyawali, Fan, & Penner (2010)
- o Lieberman & Montgomery (1988)
- o Mooney (2016)
- o Quader (2006)
- o Rangan & Adner (2001)
- o Schilling & Hill (1998)

Incumbent Inertia (n=3)

- o Anand, Oriani, & Vassolo (2010)
- o Lieberman & Montgomery (1988)
- o Rangan & Adner (2001)

Appendix K

Summary of Reviewed Articles: Best of Breed

	Source	Year	Author/s	Title/Topic	Results
1	ProQuest	2001	Rangan & Adner	Profits and the internet: Seven misconceptions	Included
2	ProQuest	1999	Jury	Ex-Schroder partner to head eVentures	Excluded
3	ProQuest	2001	Prince	To B2B or not to B2B	Included
4	ProQuest	2016	Su, Levina, & Ross	The long-tail strategy of IT outsourcing	Included
5	ProQuest	2010	Physician Law Weekly	Augme Technologies, Inc.; Aaugme expands mobile health division capitalizing on major growth trend in pharmaceutical mobile marketing	Excluded
6	ProQuest	2000	Korn	Investments - Fractured fundamentals: Traditional analysis may be of limited use in evaluating new high-tech companies with scant sales, earnings or assets	Excluded
7	ProQuest	2001	Tieman	Taming an IT 'conglomeration'	Excluded
8	ProQuest	2002	Coile	Health care 2010: The "new rules" of health care strategy and management	Included
9	ProQuest	2000	Vogl	Getting an edge	Included
10	ProQuest	2004	Blackman	Moving the market -- tracking the numbers / quite contrary: Is consensus wisdom on Oracle -- 'buy' -- wrong?; Lone analyst naysayer on stock cites high P/E, too little software growth	Excluded
11	ProQuest	2013	Hoejmose, Brammer, & Millington	An empirical examination of the relationship between business strategy and socially responsible supply chain management	Excluded
12	ProQuest	2011	Du, Bhattacharya, & Sen	Corporate social responsibility and competitive advantage: Overcoming the trust barrier	Excluded
13	ProQuest	2000	Frank, Williams, & Veiel	Digital health care: Where health care, information technology, and the internet converge	Excluded
14	ProQuest	2005	Ettlie, Perotti, Joseph, & Cotteleer	Strategic predictors of successful enterprise system deployment	Excluded
15	ProQuest	2019	Benedettini & Neely	Service providers and firm performance: Investigating the non-linear effect of dependence	Excluded
16	ProQuest	2013	Neumeier	The relation of hospital choices in IT infrastructure spending and deployment with HIT/EHR strategies and operational efficiency	Excluded

17	ProQuest	2010	Caniato, Golini, Luzzini, & Ronchi	Towards full integration: eProcurement implementation stages	Excluded
18	ProQuest	1996	Slovensky	Developing an outcomes report card: A case study of one hospital's process	Excluded
19	ProQuest	2012	Phillips	An integrative review of the literature on technology transformation in healthcare	Excluded
20	ProQuest	2006	Unsal-Aktas	Quality and valuation problems in healthcare	Excluded
21	EBSCOhost	2001	Rangan & Adner	Profits and the internet: Seven misconceptions	Excluded
22	Google Scholar	1994	Partovi	Determining what to benchmark: An analytic hierarchy process approach	Included

Appendix L

Summary of Reviewed Articles: Search Costs and Transaction Costs

	Source	Year	Author/s	Title/Topic	Results
1	Scopus	2019	Yoshimoto & Nakabayashi	Search and resale frictions in a two-sided online platform: A case of multi-use assets	Included
2	Scopus	2016	Sheng & Shi	Multi-attribute decision making method of online group buying based on prospect theory	Excluded
3	Scopus	2008	Zhang & Wang	The study on the factors influence of consumer purchases virtual goods behavior	Included
4	ProQuest	2008	Chen & Yu	Using a strategic approach to analysis the location selection for high-tech firms in Taiwan	Excluded
5	ProQuest	2015	Abroud, Choong, Muthaiyah, & Fie	Adopting e-Finance: Decomposing the technology acceptance model for investors	Excluded
6	ProQuest	2014	Muthusamy & Dass	Toward a smarter enterprise: Disaggregation and dispersion for innovation and excellence	Excluded
7	ProQuest	2000	Mahadevan	Business models for internet-based e-Commerce: An anatomy	Excluded
8	ProQuest	2015	Schlaegel	Understanding individuals' initial and continued use of online auction marketplaces: A meta-analysis	Excluded
9	EBSCOhost	2019	Yoshimoto & Nakabayashi	Search and resale frictions in a two-sided online platform: A case of multi-use assets	Excluded

Appendix M

Summary of Reviewed Articles: Minimally Viable Product

	Source	Year	Author/s	Title/Topic	Results
1	ProQuest	2014	Kamat	Getting a connected device to market	Excluded
2	ProQuest	2018	Henry	Leadership and strategy in the news	Excluded
3	ProQuest	2018	Colony	CIOs and the future of IT	Excluded

Appendix N

Summary of Reviewed Articles: Evolutionary Phases of Platforms

	Source	Year	Author/s	Title/Topic	Results
1	Scopus	2019	Kim & Yoo	Platform growth model: The four stages of growth model	Included
2	Scopus	2019	Saarikko, Jonsson, & Burström	Software platform establishment: Effectuation and entrepreneurial awareness	Included
3	Scopus	2019	Rankey, Schlaich, Mokhtar, Ghon, Ali, & Poppelreiter	Seismic architecture of a Miocene isolated carbonate platform and associated off-platform strata (Central Luconia Province, offshore Malaysia)	Excluded
4	Scopus	2018	Fernández-Mendiola, Mendicoa, Owen, & García-Mondéjar	The Early Aptian (Cretaceous) stratigraphy of Mount Pagasarri (N Spain): Oceanic anoxic event-1a	Excluded
5	Scopus	2017	Seeling, Emmerich, Bechstädt, & Zühlke	Sequence stratigraphic framework and evolution of carbonate platform-basin systems in the Triassic of the Eastern Lombardian Alps	Excluded
6	Scopus	2017	Dechnik, Webster, Webb, Nothdurft, Dutton, Braga, Zhao, Duce, & Sadler	The evolution of the Great Barrier Reef during the last interglacial period	Excluded
7	Scopus	2016	Chesnel, Samankassou, Merino-Tomé, Fernández, & Villa	Facies, geometry and growth phases of the Valdorria carbonate platform (Pennsylvanian, northern Spain)	Excluded
8	Scopus	2015	Zhou, Wu, Guo, & Liu	RNA interference mediated JAM-A gene silencing promotes human epidermal stem cell proliferation	Excluded
9	Scopus	2013	Chow, George, Trinajstić, & Chen	Stratal architecture and platform evolution of an early Frasnian syn-tectonic carbonate platform, Canning Basin, Australia	Excluded
10	Scopus	2012	Wang, Zhang, Pei, & Fang	Phase field simulation for high-temperature oxidation behavior of thermal barrier coatings under shot peening	Excluded
11	Scopus	2012	Kim, Fouke, Petter, Quinn, Kerans, & Taylor	Sea-level rise, depth-dependent carbonate sedimentation and the paradox of drowned platforms	Excluded
12	Scopus	2011	Li, Liu, & Li	Cultivation of endothelial progenitor cells from human peripheral blood	Excluded

13	Scopus	2011	Najarro, Rosales, & Martín-Chivelet	Major palaeoenvironmental perturbation in an Early Aptian carbonate platform: Prelude of the oceanic anoxic event 1a?	Excluded
14	Scopus	2011	Yaman, Khudiyev, Ozgur, Kanik, Aktas, Ozgur, Deniz, Korkut, & Bayindir	Arrays of indefinitely long uniform nanowires and nanotubes	Excluded
15	Scopus	2010	Yuan, Guan, Dang, Yang, Shen, & Zhang	Culture and identification of sheep bone marrow-derived endothelial progenitor cells	Excluded
16	Scopus	2010	Godet, Föllmi, Bodin, de Kaenel, Matera, & Adatte	Stratigraphic, sedimentological and palaeoenvironmental constraints on the rise of the Urganian platform in the western Swiss Jura	Excluded
17	Scopus	2009	George, Chow, & Trinajstic	Syn depositional fault control on lower Frasnian platform evolution Lennard Shelf, Canning Basin, Australia	Excluded
18	Scopus	2009	Emmerich, Tscherny, Bechstädt, Büker, Glasmacher, Littke, & Zühlke	Numerical simulation of the syn- to post-depositional history of a prograding carbonate platform: The Rosengarten, Middle Triassic, Dolomites, Italy	Excluded
19	Scopus	2009	Li, Guan, Li, Bai, & Ma	Establishment and characterization of the fibroblast line from Silkie Bantam	Excluded
20	Scopus	2008	Scheibner & Speijer	Late Paleocene-early Eocene Tethyan carbonate platform evolution - A response to long- and short-term paleoclimatic change	Excluded
21	Scopus	2007	Wei, Zhang, & Xu	Culture of 293 cells for the package of adeno-associated viruses	Excluded
22	Scopus	2007	Wang, Xu, Miao, Zhu, & Huan	Culture of multipotent cells isolated from human term placenta	Excluded
23	Scopus	2007	Cuevas Castell, Betzler, Rössler, Hüssner, & Peinl	Integrating outcrop data and forward computer modelling to unravel the development of a Messinian carbonate platform in SE Spain (Sorbas Basin)	Excluded
24	Scopus	2007	Brack, Rieber, Mundil, Bledinger, & Maurer	Geometry and chronology of growth and drowning of Middle Triassic carbonate platforms (Cernera and Bivera/Clapsavon) in the Southern Alps (northern Italy)	Excluded
25	Scopus	2004	Williams, Moran, & Vorhees	Behavioral and growth effects induced by low dose methamphetamine administration during the neonatal period in rats	Excluded

26	Scopus	2004	Webster, Wallace, Silver, Potts, Braga, Renema, Riker-Coleman, & Gallup	Coralgal composition of drowned carbonate platforms in the Huon Gulf, Papua New Guinea; Implications for lowstand reef development and drowning	Excluded
27	Scopus	2004	Schulze, Marzuok, Bassiouni, & Kuss	The Late Albian-Turonian carbonate platform succession of west-central Jordan: Stratigraphy and crises	Excluded
28	Scopus	2004	Tornors & Chiaradia	Plumbotectonic evolution of the Ossa Morena zone, Iberian Peninsula: Tracing the influence of mantle-crust interaction in ore-forming processes	Excluded
29	Scopus	2002	Ehrenberg, Pickard, Svåná, & Oxtoby	Cement geochemistry of Photozoan carbonate strata (Upper Carboniferous - Lower Permian), Finnmark Carbonate Platform, Barents Sea	Excluded
30	Scopus	1999	Cañas	Facies and sequences of the Late Cambrian-Early Ordovician carbonates of the Argentine Precordillera: A stratigraphic comparison with Laurentian platforms	Excluded
31	Scopus	1997	Bahamonde, Colmenero, & Vera	Growth and demise of Late Carboniferous carbonate platforms in the eastern Cantabrian Zone, Asturias, northwestern Spain	Excluded
32	Scopus	1996	Coniglio, James, & Aissaoui	Abu Shaar Complex (Miocene) Gulf of Suez, Egypt: Deposition and diagenesis in an active rift setting	Excluded
33	ProQuest	2010	Mahmoud-Jouini & Lenfle	Platform re-use lessons from the automotive industry	Excluded
34	ProQuest	2007	Biotech Week	Pharmacology; Data from C.V. Horhees et al provide new insights into pharmacology	Excluded
35	ProQuest	2015	Medical Devices & Surgical Technology Week	Surgical techniques; Findings on laparoendoscopy detailed by investigators at Shandong University (Laparoscopic varicocelelectomy: Virtual reality training and learning curve)	Excluded
36	ProQuest	2006	Yang & Jiang	Strategies for technology platforms	Included
37	ProQuest	2003	Maiello	The futurist	Excluded
38	ProQuest	2018	Klitsie, Ansair, & Volberda	Maintenance of cross-sector partnerships: The role of frames in sustained collaboration	Excluded
39	ProQuest	2017	Lee, Kim, & Hong	Key success factors for mobile app platform activation	Excluded

40	EBSCOhost	2019	Rankey, Schlaich, Mokhtar, Ghon, Ali, & Poppelreiter	Seismic architecture of a Miocene isolated carbonate platform and associated off-platform strata (Central Luconia Province, offshore Malaysia)	Excluded
41	EBSCOhost	2019	Gangolli, Benetatos, Esparza, Fountain, Seneviratne, & Brody	Repetitive concussive and subconcussive injury in a human tau mouse model results in chronic cognitive dysfunction and disruption of white matter tracts, but not tau pathology	Excluded
42	EBSCOhost	2018	Fernández-Mendiola, Mendicoa, Owen, & García-Mondéjar	The early Aptian (Cretaceous) stratigraphy of Mount Pagasarri (N Spain): Oceanic anoxic event-1a	Excluded
43	EBSCOhost	2017	Seeling, Emmerich, Bechstädt, & Zühlke	Sequence stratigraphic framework and evolution of carbonate platform-basin systems in the Triassic of the Eastern Lombardian Alps	Excluded
44	EBSCOhost	2017	Tire Business	ZC Rubber eyes 25% increase in car tire production	Excluded
45	EBSCOhost	2016	Campagna, Gasparini, Franchi, Vitulo, Ballin, Manni, Valle, & Ballarin	Transcriptome dynamics in the asexual cycle of the chordate <i>Botryllus schlosseri</i>	Excluded
46	EBSCOhost	2015	Freyler, Gollhofer, Colin, Brüderlin, & Ritzmann	Reactive balance control in response to perturbation in unilateral stance: Interaction effects of direction, displacement and velocity on compensatory neuromuscular and kinematic responses	Excluded
47	EBSCOhost	2013	Höntzsch, Scheibner, Brock, & Kuss	Circum-Tethyan carbonate platform evolution during the Palaeogene: The Prebetic Platform as a test for climatically controlled facies shifts	Excluded
48	EBSCOhost	2013	Fernández-Mendiola, Mendicoa, Hernandez, Owen, & García-Mondéjar	A facies model for an early Aptian carbonate platform (Zamaia, Spain)	Excluded
49	EBSCOhost	2012	Curran, Altenhofen, Ashworth, Brown, Kamau-Cheggeh, Curran, Evans, Floyd, Fowler, Garber, Hays, Kraemer, Lang, Mynhier, Samuels, & Strohmaier	Ahr ^d Cyp1a2(-/-) mice show increased susceptibility to PCB-induced developmental neurotoxicity	Excluded
50	EBSCOhost	2012	Olvera-Cortés, García-Alcántar, Gutiérrez-Guzmán, Hernández-Pérez, López-Vázquez, & Cervantes	Differential learning-related changes in theta activity during place learning in young and old rats	Excluded

51	EBSCOhost	2011	Asama, Nakamura, Sugimoto, & Chiba	Evaluation of magnetic suspension performance in a multi-consequent-pole bearingless motor	Excluded
52	EBSCOhost	2011	Berra, Jadoul, Binda, & Lanfranchi	Large-scale progradation, demise and rebirth of a high-relief carbonate platform (Triassic, Lombardy Southern Alps, Italy)	Excluded
53	EBSCOhost	2011	Höntzsch, Scheibner, Kuss, Marzouk, & Rasser	Tectonically driven carbonate ramp evolution at the Southern Tethyan Shelf: The Lower Eocene succession of the Galala Mountains, Egypt	Excluded
54	EBSCOhost	2009	Security Distributing & Marketing	Mace CSSS introduces new monitoring center platform	Excluded
55	EBSCOhost	2009	Sugimoto, Kamiya, Nakamura, Asama, Chiba, & Fukao	Design and basic characteristics of multi-consequent-pole bearingless motor with bi-tooth main poles	Excluded
56	EBSCOhost	2009	Forsey	Positioning private-label to boost profits	Excluded
57	EBSCOhost	2009	George, Chow, & Trinajstic	Syn depositional fault control on lower Frasnian platform evolution, Lennard Shelf, Canning Basin, Australia	Excluded
58	EBSCOhost	2006	Krill	Firm rallies to address agile growth	Excluded
59	EBSCOhost	2005	School Planning & Management	Portable wheelchair lift serves multiple locations	Excluded
60	EBSCOhost	2004	Stackpole	Merging the platform	Excluded
61	EBSCOhost	2004	Rouillon, Starr, & Stith	Stolt salvages platform using mechanical cutting devices	Excluded
62	EBSCOhost	2003	Williams, Morford, Wood, Wallace, Fukumura, Broening, & Vorhees	Developmental D-methamphetamine treatment selectively induces spatial navigation impairments in reference memory in the Morris water maze while sparing working memory	Excluded
63	EBSCOhost	2002	Olvera-Cortés, Cervantes, & González-Burgos	Place-learning, but not cue-learning training, modifies the hippocampal theta rhythm in rats	Excluded
64	EBSCOhost	2002	Whalen, Day, Eberli, & Homewood	Microbial carbonates as indicators of environmental change and biotic crises in carbonate systems: Examples from the Late Devonian, Alberta Basin, Canada	Excluded
65	EBSCOhost	2001	Financial Technology Bulletin	NDS is next step for Euronext	Excluded
66	EBSCOhost	1999	Little	Targeting operator requirements for standardized platform components	Excluded
67	Google	2015	Muzellec, Ronteau, & Lambkin	Two-sided internet platforms: A business model lifecycle perspective	Included

68	Google	2017	Woodall	The ecommerce lifecycle and the three stages of growth	Included
69	Google	2001	Adner & Levinthal	Demand heterogeneity and technology evolution: Implications for product and process innovation	Included
70	Google Scholar	2006	Eisenmann, Parker, & Van Alstyne	Strategies for two-sided markets	Included
71	From References	2014	Gawer & Cusumano	Industry platforms and ecosystem innovation	Included
72	From References	1997	Teece, Pisano, & Shuen	Dynamic capabilities and strategic management	Included
73	From References	1997	Nobeoka & Cusumano	Multiproject strategy and sales growth: The benefits of rapid design transfer in new product development	Included
74	From References	2016	Kim	The platform business model and business ecosystem: Quality management and revenue structures	Included
75	From References	1998	Robertson & Ulrich	Planning for product platforms	Included
76	From References	1998	Sawhney	Leveraged high-variety strategies: From portfolio thinking to platform thinking	Included
77	From References	2003	Caillaud & Jullien	Chicken & egg: Competition among intermediation service providers	Included

Appendix O

Summary of Utilized Articles for Coding Tree: Evolutionary Phases of Platforms

EVOLUTIONARY PHASES OF PLATFORMS (n=14)

- Adner & Levinthal (2001)
- Caillaud & Jullien (2003)
- Eisenmann, Parker, & Van Alstyne (2006)
- Gawer & Cusumano (2014)
- Kim (2016)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)
- Nobeoka & Cusumano (1997)
- Robertson & Ulrich (1998)
- Saarikko, Jonsson, & Burström (2019)
- Sawhney (1998)
- Teece, Pisano, & Shuen (1997)
- Woodall (2017)
- Yang & Jiang (2006)

Entry Stage (n=7)

- Gawer & Cusumano (2014)
- Kim & Yoo (2019)
- Robertson & Ulrich (1998)
- Saarikko, Jonsson, & Burström (2019)
- Sawhney (1998)
- Teece, Pisano, & Shuen (1997)
- Woodall (2017)

Choosing a Platform Business Service (n=4)

- Kim & Yoo (2019)
- Saarikko, Jonsson, & Burström (2019)
- Sawhney (1998)
- Teece, Pisano, & Shuen (1997)

External Analysis (n=2)

- Kim & Yoo (2019)
- Robertson and Ulrich (1998)

Internal Analysis (n=6)

- Gawer & Cusumano (2014)
- Kim & Yoo (2019)
- Robertson & Ulrich (1998)
- Sawhney (1998)
- Teece, Pisano, & Shuen (1997)
- Woodall (2017)

Growth Stage (n=4)

- Adner & Levinthal (2001)
- Caillaud & Jullien (2003)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)

Building a Two-sided Market (n=4)

- Adner & Levinthal (2001)
- Caillaud & Jullien (2003)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)

Subsidization (n=2)

- Caillaud & Jullien (2003)
- Kim & Yoo (2019)

Cross-subsidization (n=2)

- Caillaud & Jullien (2003)
- Kim & Yoo (2019)

Expansion Stage (n=7)

- Adner & Levinthal (2001)
- Eisenmann, Parker, & Van Alstyne (2006)
- Gawer & Cusumano (2014)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)
- Nobeoka & Cusumano (1997)
- Woodall (2017)

Promoting Network Effects (n=5)

- Adner & Levinthal (2001)
- Gawer & Cusumano (2014)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)
- Nobeoka & Cusumano (1997)

Same-sided/Cross-sided Network Effects (n=2)

- Eisenmann, Parker, & Van Alstyne (2006)
- Kim & Yoo (2019)

Critical Mass (n=4)

- Adner & Levinthal (2001)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)
- Woodall (2017)

Maturity Stage (n=8)

- Adner & Levinthal (2001)
- Gawer & Cusumano (2014)
- Kim (2016)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)
- Nobeoka & Cusumano (1997)
- Woodall (2017)
- Yang & Jiang (2006)

Completing the Business Ecosystem (n=4)

- Adner & Levinthal (2001)
- Kim (2016)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)

Quality Management (n=5)

- Kim (2016)
- Kim & Yoo (2019)
- Nobeoka & Cusumano (1997)
- Woodall (2017)
- Yang & Jiang (2006)

Revenue Structure (n=4)

- Gawer & Cusumano (2014)
- Kim (2016)
- Kim & Yoo (2019)
- Muzellec, Ronteau, & Lambkin (2015)

Appendix P

Summary of Reviewed Articles: Platform Theory

	Source	Year	Author/s	Title/Topic	Results
1	Scopus	2019	Wang, Bi, Wang, Jia, & Mao	A mining technology collaboration platform theory and its product development and application to support China's digital mine construction	Excluded
2	Scopus	2019	Ma, Reiners, Cao, Williams, Jiao, and van der Tol	A non-reciprocal polarization converter on InP membrane platform: Theory and simulation	Excluded
3	Scopus	2019	Li, He, Han, & Xiao	A new modeling scheme for powered parafoil unmanned aerial vehicle platforms: Theory and experiments	Excluded
4	Scopus	2019	Wei, Tian, Peng, Liu, & Zhang	Product family flexibility design method based on hybrid adaptive ant colony algorithm	Excluded
5	Scopus	2019	Mukhopadhyay, Bouwman, & Jaiswal	An open platform centric approach for scalable government service delivery to the poor: The Aadhaar case	Included
6	Scopus	2019	Rong, Xiao, Zhang, & Wang	Platform strategies and user stickiness in the online video industry	Included
7	Scopus	2019	Ding, Ye, & Wu	Platform strategies for innovation ecosystem: Double-case study of Chinese automobile manufactures	Included
8	Scopus	2019	Wang & Lobato	Chinese video streaming services in the context of global platform studies	Included
9	Scopus	2019	Antonialli, Gandia, Sugano, Nicolai, & Neto,	Business platforms for autonomous vehicles within urban mobility	Excluded
10	Scopus	2019	Mou, Lu, Zhang, & Yang	Characterization of in-plane load bearing of a honeycomb paperboard	Excluded
11	Scopus	2019	Lamb, Lien, & Diamessis	Internal solitary waves and mixing	Excluded
12	Scopus	2019	Farrelly & Chew	Transforming the worldwide market in personal information	Included
13	Scopus	2018	Skalistis, Angiolini, De Micheli, & Simalatsar	Safe and efficient deployment of data-parallelizable applications on many-core platforms: Theory and practice	Excluded
14	Scopus	2018	Hasegawa	Toward the mobility-oriented heterogeneous transport system based on new ICT environments - Understanding from a viewpoint of the systems innovation theory	Excluded

15	Scopus	2018	Zheng & Mason	Brand platform in the professional sport industry: Sustaining growth through innovation	Excluded
16	Scopus	2018	Faber	National and international legal platforms, theory and practice: The example of Luxembourg and the current immigration crisis	Excluded
17	Scopus	2018	Benedict, Herrmann, & Esswein	eHealth-platforms - The case of Europe	Excluded
18	Scopus	2018	Thajudeen, Lennartsson, & Elgh	Impact on the design phase of industrial housing when applying a product platform approach	Excluded
19	Scopus	2017	Wei & Tian	An improved multi-objective optimization method based on adaptive mutation particle swarm optimization and fuzzy statistics algorithm	Excluded
20	Scopus	2017	Johannesson, Landahl, Levandowski, & Raudberget	Development of product platforms: Theory and methodology	Excluded
21	Scopus	2017	Itälä & Töhönen	Difficult business models of digital business platforms for health data: A framework for evaluation of the ecosystem viability	Excluded
22	Scopus	2017	Shi & Antai	Architecture of regional transportation logistics public information platform based on platform theory	Excluded
23	Scopus	2017	de Reuver & Ondrus	When technological superiority is not enough: The struggle to impose the SIM card as the NFC secure element for mobile payment platforms	Excluded
24	Scopus	2017	Steinberg	A genesis of the platform concept: i-Mode and platform theory in Japan	Excluded
25	Scopus	2017	Li & Jiang	Demand forecasting and information platform in tourism	Excluded
26	Scopus	2017	Steinberg & Li	Introduction: Regional platforms	Excluded
27	Scopus	2016	Naughton, Norbäck, & Tekin-Koru	Aggregation issues of foreign direct investment estimation in an interdependent world	Excluded
28	Scopus	2016	Karavaev & Kilin	Nonholonomic dynamics and control of a spherical robot with an internal omniwheel platform: Theory and experiments	Excluded
29	Scopus	2016	Guo & Bouwman	An ecosystem view on third party mobile payment providers: A case study of Alipay wallet	Included

30	Scopus	2016	García-Gallego, Georgantzis, Pereira, & Pernias-Cerrillo	Bias and size effects of price-comparison platforms: Theory and experimental evidence	Excluded
31	Scopus	2015	Campbell-Kelly, Garcia-Swartz, Lam, & Yang	Economic and business perspectives on smartphones as multi-sided platforms	Included
32	Scopus	2015	Dahlberg	Mobile payments in the light of money theories-means to accelerate mobile payment service acceptance?	Excluded
33	Scopus	2015	Adams	The common HOL platform	Excluded
34	Scopus	2015	Rits, Delaere, & Ballon	Spectrum as a platform: A critical assessment of the value promise of spectrum sharing solutions	Excluded
35	Scopus	2015	Gimpel	Alternative views of ICT & time: An application of scenario analysis and platform theory	Excluded
36	Scopus	2015	Ilies & Ilies	Identity based geo- and tourism branding strategies derived from rural Maramure? Land (Romania)	Excluded
37	Scopus	2015	Pon, Seppälä, & Kenney	One ring to unite them all: Convergence, the smartphone, and the cloud	Included
38	Scopus	2015	de Reuver, Verschuur, Nikayin, Cerpa, & Bouwman	Collective action for mobile payment platforms: A case study on collaboration issues between banks and telecom operators	Excluded
39	Scopus	2015	Gimpel	The future of video platforms: Key questions shaping the TV and video industry	Excluded
40	Scopus	2014	He, Qin, & Wang	Application of cloud counting in product platform design services research	Excluded
41	Scopus	2014	Pon, Seppälä, & Kenney	Android and the demise of operating system-based power: Firm strategy and platform control in the post-PC world	Included
42	Scopus	2014	Zhong, Nickel, Kannengiesser, Dale, Kiefer, & Bashir	Liver fat quantification using a multi-step adaptive fitting approach with multi-echo GRE imaging	Excluded
43	Scopus	2013	Eng, Kozacik, Kosilkin, Wilson, Ross, Shi, Dalton, Olbricht, & Prather	Simple fabrication and processing of an all-polymer electrooptic modulator	Excluded
44	Scopus	2013	Baron & Mathieu	PCS interoperability in Europe: A market for PCS operators?	Included

45	Scopus	2013	Mirza & Beltrán	Modeling the access market of the two-sided ultra fast broadband platform in New Zealand	Included
46	Scopus	2013	Karippacheril, Nikayin, de Reuver, & Bouwman	Serving the poor: Multisided mobile service platforms, openness, competition, collaboration and the struggle for leadership	Excluded
47	Scopus	2012	Casey & Ali-Vehmas	Value system evolution towards a cognitive radio era: Implications of underlying market dynamics	Excluded
48	Scopus	2012	Wicker, Weingaertner, Breuer, & Dietl	The effect of a sports institution's legal structure on sponsorship income: The case of amateur equestrian sports in Germany	Excluded
49	Scopus	2012	Reynolds, Foulkes, Furbank, Griffiths, King, Murchie, Parry, & Slafer	Achieving yield gains in wheat	Excluded
50	Scopus	2012	Bleyen & Balloon	The double platform structure of the audiovisual media industry in Flanders	Excluded
51	Scopus	2012	Regard, Dewez, Bourlès, Anderson, Duperré, Costa, Leanni, Lasseur, Pedoja, & Maillet	Late Holocene seacliff retreat recorded by ¹⁰ Be profiles across a coastal platform: Theory and example from the English Channel	Excluded
52	Scopus	2012	Mura	Multi-dofs MEMS displacement sensors based on the Stewart platform theory	Excluded
53	Scopus	2011	Kenney & Pon	Structuring the smartphone industry: Is the mobile Internet OS platform the key?	Included
54	Scopus	2010	Barrie, Delaere, & Ballon	Potential viability of third party mobile service platforms for spectrum sensing	Excluded
55	Scopus	2010	Wang, Hu, Sun, Becla, Agarwal, & Kimerling	Cavity-enhanced multispectral photodetector on a Si platform: Theory, materials, and devices	Excluded
56	Scopus	2010	Ke, Zhang, & Wu	The curriculum reform of database system principle based on paperless examination platform	Excluded
57	Scopus	2010	Hasegawa	Diffusion of electric vehicles and novel social infrastructure from the viewpoint of systems innovation theory	Excluded
58	Scopus	2008	Liu & Jiao	Study on China state-owned enterprise management platform based on competitiveness	Excluded

59	Scopus	2006	Janz, Cheben, Dalacu, Del�age, Densmore, Lamontagne, Picard, Post, Schmid, Waldron, Xu, Yap, & Ye	Microphotonic elements for integration on the silicon-on-insulator waveguide platform	Excluded
60	Scopus	2006	Eliasson	From employment to entrepreneurship: Shifting perspectives in Europe and the US on knowledge creation and labour market competition	Excluded
61	Scopus	2005	Tan & Gu	Investigation of trajectory tracking control algorithms for autonomous mobile platforms: Theory and simulation	Excluded
62	Scopus	2003	Zhao & Huang	"Portalet" platform for D.I.Y. e-Business solutions for SME's	Excluded
63	Scopus	1995	Vickery	Wind-induced response of tension leg platform: Theory and experiment	Excluded
64	ProQuest	2002	Health & Medicine Week	Alzheimer disease; Prana's platform theory presented at conference on antiaging medicine	Excluded
65	ProQuest	2012	Suarez & Kirtley	Dethroning an established platform	Included
66	ProQuest	2016	Health & Medicine Week	Aging research; Findings from Linkoping University in the area of gerontology reported (Loneliness among older people as a social problem: The perspectives of medicine, religion and economy)	Excluded
67	ProQuest	2019	MacDonald	How digital platforms have become double-edged swords	Excluded
68	ProQuest	2002	Vogl	The way it is	Excluded
69	ProQuest	1998	Donlon	The CEO's CEO	Excluded
70	ProQuest	2003	Evans	The antitrust economics of multi-sided platform markets	Excluded
71	EBSCOhost	2019	Wei, Tian, Peng, Liu, & Zhang	Product family flexibility design method based on hybrid adaptive ant colony algorithm	Excluded
72	EBSCOhost	2019	Mukhopadhyay, Bouwman, & Jaiswal	An open platform centric approach for scalable government service delivery to the poor: The Aadhaar case	Excluded
73	EBSCOhost	2019	Mou, Lu, Zhang, & Yang	Characterization of in-plane load bearing of a honeycomb paperboard	Excluded
74	EBSCOhost	2017	Wei & Tian	An improved multi-objective optimization method based on adaptive mutation particle swarm optimization and fuzzy statistics algorithm	Excluded

75	EBSCOhost	2017	Steinberg & Li	Introduction: Regional platforms	Excluded
76	EBSCOhost	2017	Steinberg	A genesis of the platform: i-Mode and platform theory in Japan	Excluded
77	EBSCOhost	2017	de Reuver & Ondrus	When technological superiority is not enough: The struggle to impose the SIM card as the NFC secure element for mobile payment platforms.	Excluded
78	EBSCOhost	2016	Naughton, Norbäck, & Tekin-Koru	Aggregation issues of foreign direct investment estimation in an independent world	Excluded
79	EBSCOhost	2016	Guo & Bouwman	An ecosystem view on third party mobile payment providers: A case study of Alipay wallet	Excluded
80	EBSCOhost	2015	de Reuver, Verschuur, Nikayin, Cerpa, & Bouwman	Collective action for mobile payment platforms: A case study on collaboration issues between banks and telecom operators	Excluded
81	EBSCOhost	2015	Campbell-Kelly, Garcia-Swartz, Lam, & Yang	Economic and business perspectives on smartphones as multi-sided platforms	Excluded
82	EBSCOhost	2015	Pon, Seppälä, & Kenney	One ring to unite them all: Convergence, the smartphone, and the cloud	Excluded
83	EBSCOhost	2015	Gimpel	The future of video platforms: Key questions shaping the TV and video industry	Excluded
84	EBSCOhost	2014	Olleros & Zhegu	Hybrid multisided platforms: Nature, challenges and prospects	Included
85	EBSCOhost	2013	Baron & Mathieu	PCS interoperability in Europe: A market for PCS operators	Excluded
86	EBSCOhost	2013	Karippacheril, Nikayin, de Reuver, & Bouwman	Serving the poor: Multisided mobile service platforms, openness, competition, collaboration and the struggle for leadership	Excluded
87	EBSCOhost	2012	Reynolds, Foulkes, Furbank, Griffiths, King, Murchie, Parry, & Slafer	Achieving yield gains in wheat	Excluded
88	EBSCOhost	2012	Mura	Multi-dofs MEMS displacement sensors based on the Stewart Platform Theory	Excluded
89	EBSCOhost	2011	Kenney & Pon	Structuring the smartphone industry: Is the mobile internet OS platform the key	Excluded

90	EBSCOhost	2011	Dietl & Weingaertner	The effect of professional football clubs' legal structure on sponsoring revenue	Excluded
91	EBSCOhost	2006	Eliasson	From employment to entrepreneurship: Shifting perspectives in Europe and the US on knowledge creation and labour market competition	Excluded
92	EBSCOhost	1996	Rogers	Gerrard Winstanley on crime and punishment	Excluded
93	EBSCOhost	1995	Vickery	Wind-induced response of tension leg platform: Theory and experiment	Excluded
94	Google	2010	Lee, Kim, Noh, & Lee	Success factors of platform leadership in web 2.0 service business	Included
95	Google	2019	Ikeda & Marshall	Strategies for competing in markets enabled by digital platforms	Included
96	From References	2013	Rong, Lin, Shi, & Yu	Linking business ecosystem lifecycle with platform strategy: A triple view of technology, application, and organisation	Included
97	From References	1986	Teece	Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy	Included

Appendix Q

Summary of Reviewed Articles: Platform Business Model

	Source	Year	Author/s	Title/Topic	Results
1	Scopus	2019	Sekloča	The centre and the periphery: Productivity and the global networked public sphere	Excluded
2	Scopus	2019	Lee & Kim	A peer-to-peer (P2P) platform business model: The case of Airbnb	Excluded
3	Scopus	2019	Zhao, Wang, & Chen	How to maintain the sustainable development of a business platform: A case study of Pinduoduo social commerce platform in China	Excluded
4	Scopus	2019	Wirtz, So, Mody, Liu, & Chun	Platforms in the peer-to-peer sharing economy	Excluded
5	Scopus	2019	Zutshi & Grilo	The emergence of digital platforms: A conceptual platform architecture and impact on industrial engineering	Excluded
6	Scopus	2019	Kim & Min	Supplier, tailor, and facilitator: Typology of platform business models	Included
7	Scopus	2019	Zehir, Zehir, & Zehir	New strategies for evolution of business ecosystems: Platform strategies	Included
8	Scopus	2019	Rusthollkarhu & Aarikka-Stenroos	The effects of AI-human-interaction to value creation in multi-actor systems: How AI shapes digital B2B sales	Excluded
9	Scopus	2019	Yan, Ye, & Sun	Optimal pricing strategies for delivery alliance in online retailing platform	Excluded
10	Scopus	2019	Yang, Wang, Zhao	Improving relationship performance on platforms: The role of platform technology usage in promoting justice	Excluded
11	Scopus	2019	Rahman & Thelen	The rise of the platform business model and the transformation of twenty-first-century capitalism	Excluded
12	Scopus	2019	Papachristos	System dynamics modelling and simulation for sociotechnical transitions research	Excluded
13	Scopus	2019	Hou	Social media celebrity and the institutionalization of YouTube	Excluded
14	Scopus	2019	Bostoën	Online platforms and pricing: Adapting abuse of dominance assessments to the economic reality of free products	Excluded
15	Scopus	2019	Steglich, Marczak, Guerra, Mosmann, Perin, Figueira Filho, & De Souza	Revisiting the mobile software ecosystems literature	Excluded

16	Scopus	2019	Tseng, Imadali, Houatra, Aravinthan, & Thomas	Demo abstract: Monitoring virtualized Telco services for multisided platforms with SQL-like query	Excluded
17	Scopus	2019	Linder	Surveillance capitalism and platform policing: The surveillant assemblage-as-a-service	Excluded
18	Scopus	2019	McLoughlin, McNicoll, Beecher, Kelk, Cornford, & Hutchinson	A 'Tripadvisor' for disability? Social enterprise and 'digital disruption' in Australia	Excluded
19	Scopus	2019	Bivona & Cosenz	Designing a multi-sided platform business model assessment framework: A dynamic performance management perspective	Included
20	Scopus	2019	Zhao, von Delft, Morgan-Thomas, & Buck	The evolution of platform business models: Exploring competitive battles in the world of platforms	Included
21	Scopus	2019	Markfort, Haugk, & Tangour	So you want to be a platform: Where to start?	Excluded
22	Scopus	2019	Shah & Shome	Platform economy: Evidence from Indian market	Excluded
23	Scopus	2019	Stopka, Schäfer, & Kreisel	Business and billing models for mobile services using secure identities	Excluded
24	Scopus	2019	Mancha, Gordon, & Stoddard	Seven mistakes to avoid in launching and scaling digital platforms	Included
25	Scopus	2019	Geiger & Gross	A tidal wave of inevitable data? Assetization in the consumer genomics testing industry	Excluded
26	Scopus	2019	Ahokangas, Matinmikko-Blue, Yrjola, Seppanen, Hammainen, Jurva, & Latva-aho	Business models for local 5G micro operators	Excluded
27	Scopus	2018	Barletta, Massimiani, Pierangeli, Spada, Marotta, & Graziosi	5G networks. An overall perspective for the innovation management	Excluded
28	Scopus	2018	Berde, Van Rossem, Ramos, Orru, & Shatnawi	Dev-for-operations and multi-sided platform for next generation platform as a service	Excluded
29	Scopus	2018	Barni, Montini, Menato, Sorlini, Anaya, & Poler	Integrating agent based simulation in the design of multi-sided platform business model: A methodological approach	Excluded
30	Scopus	2018	Wu	On theory and application studies of online to offline platform business model in upgrading and transforming traditional industries	Excluded

31	Scopus	2018	Association for Computing Machinery	ACM international conference proceeding series	Excluded
32	Scopus	2018	Hawlitschek, Stofberg, Teubner, Tu, & Weinhardt	How corporate sharewashing practices undermine consumer trust	Excluded
33	Scopus	2018	Fehrer, Woratschek, & Brodie	A systemic logic for platform business models	Included
34	Scopus	2018	Yablonsky	A multidimensional framework for digital platform innovation and management: From business to technological platforms	Included
35	Scopus	2018	Illieva & Rajasekharan	Energy storage as a trigger for business model innovation in the energy sector	Excluded
36	Scopus	2018	Wang, Zhang, Wang, Wang, Zheng, & Sun	Evaluation on business model of smart grid value-added service	Excluded
37	Scopus	2018	Täuscher & Laudien	Understanding platform business models: A mixed methods study of marketplaces	Excluded
38	Scopus	2018	de Broeck	Crowdfunding platforms for renewable energy investments: An overview of best practices in the EU	Excluded
39	Scopus	2018	Katz & Sallet	Multisided platforms and antitrust enforcement	Excluded
40	Scopus	2018	Cozmiuc & Petrisor	Innovation in the age of digital disruption: The case of Siemens	Excluded
41	Scopus	2018	Yablonsky	Multi-sided platforms (MSPs) and sharing strategies in the digital economy: Emerging research and opportunities	Excluded
42	Scopus	2018	Kiesling	Toward a market epistemology of the platform economy	Excluded
43	Scopus	2018	Drewel & Gausemeier	Digital B2B-platforms and how to find the right one	Excluded
44	Scopus	2018	Advances in e-Business Research Series	Digital platforms: Definitions, strategy, and business models	Excluded
45	Scopus	2018	Svensson, Angelin, Olrog, Regårdh, & Ribbing	Digital connectivity marketplaces to enrich 5G and IoT value propositions	Excluded
46	Scopus	2018	Advances in e-Business Research Series	Integrated and transactional platforms: Search platforms	Excluded

47	Scopus	2018	Pinzaru, Mitan, & Mihalcea	Reshaping competition in the age of platforms: The winners of the sharing economy	Excluded
48	Scopus	2018	Liu, Ming, Song, Qui, & Qu	A perspective on value co-creation-oriented framework for smart product-service system	Excluded
49	Scopus	2018	Hein, Böhm, & Krcmar	Platform configurations within information systems research: A literature review on the example of IoT platforms	Excluded
50	Scopus	2018	Oppong-Tawiah & Bassellier	Digital innovation, platform orientation and the performance of IT startups	Excluded
51	Scopus	2018	Rothe, Täuscher, & Basole	Competition between platform ecosystems: A longitudinal study of MOOC platforms	Excluded
52	Scopus	2017	Wang & Yin	Internet platform business model renovate catering industries: Evidence from 3199 catering enterprises on Dianping.com in Haidian district	Excluded
53	Scopus	2017	Zarakas	Two-sided markets and the utility of the future: How services and transactions can shape the utility platform	Excluded
54	Scopus	2017	Hadiana, Dahlan, Wardoyo, & Syamsi	Kansei analysis for transmedia storytelling products based on story and character	Excluded
55	Scopus	2017	Greenwood, Burtch, & Carnahan	Unknowns of the gig-economy: Seeking multidisciplinary research into the rapidly evolving gig-economy	Excluded
56	Scopus	2017	Suroso & Jamilah	Implementation model of smart connected motorbike service: An engineering economic analysis of machine to machine application	Excluded
57	Scopus	2017	Yun, Won, Park, Yang, & Zhao	Growth of a platform business model as an entrepreneurial ecosystem and its effects on regional development	Excluded
58	Scopus	2017	Wang, Liu, & Lin	Licensing vs. platform business model: Quality investment and competition	Excluded
59	Scopus	2017	Srinivasan	Organising the unorganised: Role of platform intermediaries in the Indian real estate market	Excluded
60	Scopus	2017	Srnicek	The challenges of platform capitalism: Understanding the logic of a new business model	Excluded
61	Scopus	2017	Gatautis	The rise of the platforms: Business model innovation perspectives	Included

62	Scopus	2017	Espeche, Messervey, Lennard, Puglisi, Sissini, & Vinyals	Use cases and business models of multi-agent system (MAS) ICT solutions for LV flexibility management	Excluded
63	Scopus	2017	Laine, Alhava, Peltokorpi, & Seppänen	Platform ecosystems: Unlocking the subcontractors' business model opportunities	Excluded
64	Scopus	2017	Bonakdar, Frankenberger, Bader, & Gassmann	Capturing value from business models: The role of formal and informal protection strategies	Excluded
65	Scopus	2017	Yarali	5G mobile: From research and innovations to deployment aspects	Excluded
66	Scopus	2016	Kim	The platform business model and business ecosystem: Quality management and revenue structures	Excluded
67	Scopus	2016	Velu & Jacob	Business model innovation and owner-managers: The moderating role of competition	Excluded
68	Scopus	2016	Belleflamme & Jacqmin	An economic appraisal of MOOC platforms: Business models and impacts on higher education	Excluded
69	Scopus	2016	Mack & Veil	Platform business models and internet of things as complementary concepts for digital disruption	Included
70	Scopus	2016	Yablonsky	Crowdfunding innovations	Excluded
71	Scopus	2016	Han, Suh, & Shin	Developing a reference model for analyzing mobile platform business: From an ecosystem view	Excluded
72	Scopus	2015	The International Conference on e-Business	ICE-B 2013 - 10th International Conference on e-Business, Part of the ICETE 2013: 10th International Joint Conference on e-Business and Telecommunications, Proceedings	Excluded
73	Scopus	2015	Buchinger, Ranaivoson, & Ballon	Virtual currency for online platforms: Business model implications	Excluded
74	Scopus	2015	Staykova & Damsgaard	A typology of multi-sided platforms: The core and the periphery	Excluded
75	Scopus	2015	Wu, Chen, & Gao	How SaaS application led to cloud enabled business innovation: A case study from China	Excluded
76	Scopus	2014	Li	Design and management of intelligent transportation integrated command platform	Excluded

77	Scopus	2014	Kuebel & Zarnekow	Evaluating platform business models in the telecommunications industry via framework-based case studies of cloud and smart home service platforms	Excluded
78	Scopus	2014	Rickmann, Wenzel, & Fischbach	Software ecosystem orchestration: The perspective of complementors	Excluded
79	Scopus	2013	Berre, De Man, & Lindgren	Business model innovation with the NEFFICS platform and VDML	Excluded
80	Scopus	2013	Buchinger, Ranaivoson, & Ballon	Virtual currency for online platforms business model implications	Excluded
81	Scopus	2013	Walravens & Ballon	Platform business models for smart cities: From control and value to governance and public value	Excluded
82	Scopus	2013	Martinho & Paulo Reis	Web portal for matching loan requests and investment offers in peer-to-peer lending	Excluded
83	Scopus	2012	Yao, Wu, Wu, Wu, & Chen	Business model innovation of modern service company: A value network perspective	Excluded
84	Scopus	2012	Schaarschmidt & Kilian	Peripheral motivation and creativity in controlled platforms: An analysis based on Facebook and Iphone application developers	Excluded
85	Scopus	2012	Tilson, Sørensen, & Lyytinen	Change and control paradoxes in mobile infrastructure innovation: The Android and iOS mobile operating systems cases	Excluded
86	Scopus	2011	Tilson, Sørensen, & Lyytinen	The paradoxes of change and control in digital infrastructures: The mobile operating systems case	Excluded
87	Scopus	2010	Nicaisse & Dufoulon	Emerginov platform's business model based on revenue sharing	Excluded
88	Scopus	2010	Bailon, Walravens, Spedalieri, & Venezia	The reconfiguration of mobile service provision: Towards platform business models	Excluded
89	Scopus	2008	Boddy	A century of electronic cinema	Excluded
90	Scopus	2008	Chen & Hu	Entering the mobile service market via mobile platforms: Qualcomm's BREW platform and Nokia's Preminet platform	Excluded
91	Scopus	2003	Schiff	Open and closed systems of two-sided networks	Excluded
92	ProQuest	2019	Kwang-Ho & Kim	A peer-to-peer (P2P) platform business model: The case of Airbnb	Excluded

93	ProQuest	2018	Fehrer, Woratschek, & Brodie	A systemic logic for platform business models	Excluded
94	ProQuest	2018	Davidson, Giesen, Harmer, & Marshall	How industry leaders enhance the value of ecosystems	Excluded
95	ProQuest	2002	Fisken & Rutherford	Business models and investment trends in the biotechnology industry in Europe	Excluded
96	ProQuest	2019	Santoso, Prijadi, & Balqiah	Synergizing multi-sided platform firms and crowds: A typology of an open innovation mechanism in a digital ecosystem	Excluded
97	ProQuest	2017	Fu, Wang, & Zhao	The influence of platform service innovation on value co-creation activities and the network effect	Included
98	ProQuest	2018	Berman, Davidson, Ikeda, & Marshall	Navigating disruption with ecosystems, partners and platforms	Included
99	ProQuest	2015	Biotech Week	Manufacturing, production; Arrowhead Gold to sign definitive agreement to acquire Bio Therapeutic Molecules Inc.	Excluded
100	ProQuest	2010	Journal of Commercial Biotechnology	Time for a new business model?	Excluded
101	ProQuest	2002	Feinberg	Single marketing unit formed for 3 management firms	Excluded
102	ProQuest	2005	Ahn, Vitale, & Tong	It's all academic	Excluded
103	ProQuest	2017	Abbosh & Nunes	Let's get digitally physcial	Excluded
104	ProQuest	2019	Hänninen & Smedlund	On retail digital platforms suppliers have to become responsive customer service organizations	Excluded
105	ProQuest	2018	Best's Review	Top global insurance brokers	Excluded
106	ProQuest	2019	Kambli	The coming of a platform revolution	Excluded
107	ProQuest	2017	Poon & Ng	Beyond varieties of capitalism: Implications of global political changes and the emerging shared economy for comparative and international employment relations	Excluded
108	ProQuest	2016	Shaughnessy	Harnessing platform-based business models to power disruptive innovation	Excluded
109	ProQuest	2019	Diamond, Drury, Lipp, Marshall, Ramamurthy, & Wagle	The future of banking in the platform economy	Excluded
110	ProQuest	2004	Lim & Gregory	Singapore's biomedical science sector development strategy: Is it sustainable?	Excluded

111	ProQuest	2009	Konde	Biotechnology business models: An Indian perspective	Excluded
112	ProQuest	2008	March-Chorda & Yagüe-Perales	New directions for the biopharma industry in Canada: Modelling and empirical findings	Excluded
113	ProQuest	2006	Rothman & Kraft	Downstream and into deep biology: Evolving business models in 'top tier' genomics companies	Excluded
114	ProQuest	2009	Boudreau & Lakhani	How to manage outside innovation	Excluded
115	ProQuest	2017	Mangelsdorf & Posner	12 essential innovation insights	Included
116	ProQuest	2014	Weijters, Goedertier, & Verstreken	Online music consumption in today's technological context: Putting the influence of ethics in perspective	Excluded
117	ProQuest	2014	Gay	Open innovation, networking, and business model dynamics: The two sides	Excluded
118	ProQuest	2019	Jabagi, Croteau, Audebrand, & Marsan	Gig-workers' motivation: Thinking beyond carrots and sticks	Excluded
119	ProQuest	2019	Wirtz, So, Mody, Liu, & Chun	Platforms in the peer-to-peer sharing economy	Excluded
120	EBSCOhost	2019	Zutshi & Grilo	The emergence of digital platforms: A conceptual platform architecture and impact on industrial engineering	Excluded
121	EBSCOhost	2019	Kim & Min	Supplier, tailor, and facilitator: Typology of platform business models	Excluded
122	EBSCOhost	2019	Yang, Wang, & Zhao	Improving relationship performance on platforms: The role of platform technology usage in promoting justice	Excluded
123	EBSCOhost	2019	Rahman & Thelen	The rise of the platform business model and the transformation of twenty-first-century capitalism	Excluded
124	EBSCOhost	2019	Jung & Pfister	Blockchain-enabled clinical study consent management	Excluded
125	EBSCOhost	2019	Bostoën	Online platforms and pricing: Adapting abuse of dominance assessments to the economic reality of free products	Excluded
126	EBSCOhost	2019	Sorri, Seppänen, Still, & Valkokari	Business model innovation with platform canvas	Included
127	EBSCOhost	2019	Corrales, Fenwick, Haapio, & Vermeulen	Tomorrow's lawyer today? Platform-driven LegalTech, smart contracts & the new world of legal design	Excluded

128	EBSCOhost	2019	Ozcan, Zachariadis, & Dinckol	"Platformification" of banking: Strategy and challenges of challenger versus incumbent banks in UK	Excluded
129	EBSCOhost	2018	Merrifield	Uberization of local deliveries?	Excluded
130	EBSCOhost	2018	Jensen	Blocking out the disruptors	Excluded
131	EBSCOhost	2018	Mirică (Dumitrescu)	Online contingent labor in a precarious capitalism: Platform business models, nonstandard forms of employment, and digitally driven sharing-economy services	Excluded
132	EBSCOhost	2018	Yablonsky	A multidimensional framework for digital platform innovation and management: From business to technological platforms	Excluded
133	EBSCOhost	2018	Katz & Sallet	Multisided platforms and antitrust enforcement	Excluded
134	EBSCOhost	2018	Drewel & Gausemeier	Digital B2B-platforms and how to find the right one	Excluded
135	EBSCOhost	2017	Gatautis	The rise of the platforms: Business model innovation perspectives	Excluded
136	EBSCOhost	2017	Yun, Won, Park, Yang, & Zhao	Growth of a platform business model as an entrepreneurial ecosystem and its effects on regional development	Excluded
137	EBSCOhost	2017	Bonakdar, Frankenberger, Bader, & Gassmann	Capturing value from business models: The role of formal and informal protection strategies	Excluded
138	EBSCOhost	2017	Srinivasan	Organising the unorganised: Role of platform intermediaries in the Indian real estate market	Excluded
139	EBSCOhost	2017	Srnicek	The challenges of platform capitalism: Understanding the logic of a new business model	Excluded
140	EBSCOhost	2016	Kim	The platform business model and business ecosystem: Quality management and revenue structures	Excluded
141	EBSCOhost	2016	Moser & Gassmann	Innovating platform business models: Insights from major tech-companies	Included
142	EBSCOhost	2016	Brown	3 questions to ask before adopting a platform business model	Included
143	EBSCOhost	2015	Tavalaei & Santalo	The impact of within platform competition in two-sided business models	Excluded
144	EBSCOhost	2012	Thaker & Casadesus-Masanell	eBay, Inc. and Amazon.com (A)	Excluded

145	EBSCOhost	2012	Thaker & Casadesus-Masanell	eBay, Inc. and Amazon.com (B)	Excluded
146	EBSCOhost	2009	Boudreau & Lakhani	How to manage outside innovation	Excluded
147	EBSCOhost	2002	Gangahar	New model Mellon	Excluded

Appendix R

Summary of Reviewed Articles: Platform Economy

	Source	Year	Author/s	Title/Topic	Results
1	Scopus	2019	Radonjic-Simic & Pfisterer	Beyond platform economy: A comprehensive model for decentralized and self-organizing markets on internet-scale	Excluded
2	Scopus	2019	Mäntymäki, Baiyere, & Islam	Digital platforms and the changing nature of physical work: Insights from ride-hailing	Excluded
3	Scopus	2019	Yi, He, & Yang	Platform heterogeneity, platform governance and complementors' product performance: An empirical study of the mobile application industry	Excluded
4	Scopus	2019	Simon, Hinnekens, Listl, & Usai	Daimler/BMW/Car sharing JV: New mobility and the platform economy	Excluded
5	Scopus	2019	Diamond, Drury, Lipp, Marshall, Ramamurthy, & Wagle	The future of banking in the platform economy	Excluded
6	Scopus	2019	Berde & Tökés	The platform economy as a working opportunity for older people: The case of the Hungarian carpooling company Oszkár	Excluded
7	Scopus	2019	Jonas	Off limits: Virtual schools in an era of connection and inequality	Excluded
8	Scopus	2019	Haberly, MacDonald-Korth, Urban, & Wójcik	Asset management as a digital platform industry: A global financial network perspective	Excluded
9	Scopus	2019	Pelzer, Frenken, & Boon	Institutional entrepreneurship in the platform economy: How Uber tried (and failed) to change the Dutch taxi law	Excluded
10	Scopus	2019	Morell & Espelt	A framework to assess the sustainability of platform economy: The case of Barcelona ecosystem	Excluded
11	Scopus	2019	Solel	If Uber were a cooperative: A democratically biased analysis of platform economy	Excluded
12	Scopus	2019	Nemkova, Demirel, & Baines	In search of meaningful work on digital freelancing platforms: The case of design professionals	Excluded
13	Scopus	2019	Huws	The hassle of housework: Digitalisation and the commodification of domestic labor	Excluded

14	Scopus	2019	Schwartz & Neff	The gendered affordances of Craigslist “new-in-town girls wanted” ads	Excluded
15	Scopus	2019	Liu, Yang, & Sun	On the determinants of the business model of online ride-hailing market	Excluded
16	Scopus	2019	Zhong, He, Qui, & Sun	Socioeconomic impacts of new transaction modes: A survey	Excluded
17	Scopus	2019	Kalpokas	Algorithmic governance: Politics and law in the post-human era	Excluded
18	Scopus	2019	Scassa	Ownership and control over publicly accessible platform data	Excluded
19	Scopus	2019	Huang, Zhao, Mei, Wu, Zhao, & Mao	Structural holes in the multi-sided market: A market allocation structure analysis of China's car-hailing platform in the context of open innovation	Excluded
20	Scopus	2019	Chen	“Bike litter” and obligations of the platform operators: Lessons from China's dockless sharing bikes	Excluded
21	Scopus	2019	Uzunca & Borlenghi	Regulation strictness and supply in the platform economy: The case of Airbnb and couchsurfing	Excluded
22	Scopus	2019	Aine, Björkroth, & Koponen	Horizontal information exchange and innovation in the platform economy -A need to rethink?	Excluded
23	Scopus	2019	Colutto, Kahle, Guenter, & Muehlberger	Transkribus. A platform for automated text recognition and searching of historical documents	Excluded
24	Scopus	2019	Tubaro & Casilli	Micro-work, artificial intelligence and the automotive industry	Excluded
25	Scopus	2019	Rustholkarhu & Arikka-Stenroos	The effects of AI-human-interaction to value creation in multi-actor systems: How AI shapes digital B2B sales	Excluded
26	Scopus	2019	Montalban, Frigant, & Jullien	Platform economy as a new form of capitalism: A Régulationist research programme	Excluded
27	Scopus	2019	Garben	The regulatory challenge of occupational safety and health in the online platform economy	Excluded
28	Scopus	2019	Hänninen, Mitronen, & Kwan	Multi-sided marketplaces and the transformation of retail: A service systems perspective	Included
29	Scopus	2019	Shibata	Paradoxical autonomy in Japan's platform economy	Excluded
30	Scopus	2019	Lüthje	Platform capitalism ‘Made in China’? Intelligent manufacturing, Taobao villages and the structuring of work	Excluded

31	Scopus	2019	Lettieri, Guarino, Malandrino, & Zaccagnino	Platform economy and techno-regulation - Experimenting with reputation and nudge	Excluded
32	Scopus	2019	Behrendt, Nguyen, & Rani	Social protection systems and the future of work: Ensuring social security for digital platform workers	Excluded
33	Scopus	2019	Lenard	Introduction to the RIO special issue on antitrust and the platform economy	Excluded
34	Scopus	2019	Muralidhar, Bossen, & O'Neill	Rethinking financial inclusion: From access to autonomy	Excluded
35	Scopus	2019	Broecke & Cazes	The platform economy can deliver for its workers too	Excluded
36	Scopus	2019	Bates, Zwick, Spicer, Kerzher, Kim, Baber, Green, & Moulden	Gigs, side hustles, freelance: What work means in the platform economy city/ Blight or remedy: Understanding ridehailing's role in the precarious "gig economy"/ Labour, gender and making rent with Airbnb/ The gentrification of 'sharing': From Bandit Cab to Ride Share Tech / The 'sharing economy'? Precarious labor in neoliberal cities/ Where is economic development in the platform city?/ Shared economy: WeWork or we work together	Excluded
37	Scopus	2019	Hesenius, Usov, Rink, Schmidt, & Gruhn	A flexible platform architecture for the dynamic composition of third-party-services	Excluded
38	Scopus	2019	Bauer & Trapp	Tangible ecosystem design - Developing disruptive services for digital ecosystems	Excluded
39	Scopus	2019	Kim, Brown, Nelson, Ehrenfeucht, Holman, Gurran, Sadowski, Ferreri, Sanyal, Bastos, & Kresse	Planning and the so-called 'sharing' economy / Can shared mobility deliver equity?/ The sharing economy and the ongoing dilemma about how to plan for informality/ Regulating platform economies in cities - Disrupting the disruption?/ Regulatory combat? How the 'sharing economy' is disrupting planning practice/ Corporatized enforcement: Challenges of regulating Airbnb and other platform economies/ Nurturing a generative sharing economy for local public goods and service provision	Excluded
40	Scopus	2019	Pulkka	"This time may be a little different" - Exploring the Finnish view on the future of work	Excluded
41	Scopus	2019	Lehmann, Schenkenhofer, & Wirsching	Hidden champions and unicorns: A question of the context of human capital investment	Excluded

42	Scopus	2019	Black, Fox Miller, & Leslie	Gender, precarity and hybrid forms of work identity in the virtual domestic arts and crafts industry in Canada and the US	Excluded
43	Scopus	2019	Wood, Graham, Lehdonvirta, & Hjorth	Good gig, bad gig: Autonomy and algorithmic control in the global gig economy	Excluded
44	Scopus	2019	Lehdonvirta, Kässi, Hjorth, Barnard, & Graham	The global platform economy: A new offshoring institution enabling emerging-economy microproviders	Excluded
45	Scopus	2019	Dann, Teubner, & Weinhardt	Poster child and guinea pig - Insights from a structured literature review on Airbnb	Excluded
46	Scopus	2019	Goldkind & McNutt	Vampires in the technological mist: The sharing economy, employment and the quest for economic justice and fairness in a digital future	Excluded
47	Scopus	2019	Shah & Shome	Platform economy: Evidence from Indian market	Excluded
48	Scopus	2019	Vallas	Platform capitalism: What's at stake for workers?	Excluded
49	Scopus	2019	Meilhan	Customer value co-creation behavior in the online platform economy	Excluded
50	Scopus	2019	Gniza & Strecker	Interoperability network - The internet of actors	Excluded
51	Scopus	2019	Kenney & Zysman	Work and value creation in the platform economy	Excluded
52	Scopus	2019	McMeel	Robots and AR: Towards a platform economy for construction	Excluded
53	Scopus	2019	Veen, Barratt, & Goods	Platform-capital's 'app-etite' for control: A labour process analysis of food-delivery work in Australia	Excluded
54	Scopus	2019	Nieto-Mengotti, López-Arranz, & Novo-Corti	Smart city as a platform economy: Civic engagement and self-employment in focus	Excluded
55	Scopus	2019	Wang	Chinese affective platform economies: dating, live streaming, and performative labor on Blued	Excluded
56	Scopus	2019	Ó Fathaigh & van Hoboken	European regulation of smartphone ecosystems	Excluded
57	Scopus	2019	Melamed & Petit	The misguided assault on the consumer welfare standard in the age of platform markets	Excluded
58	Scopus	2019	Kathuria & Karhade	You are not you when you are hungry: Machine learning investigation of impact of ratings on ratee decision making	Excluded

59	Scopus	2019	Abbasian Fereidouni & Kawa	Dark side of digital transformation in tourism	Excluded
60	Scopus	2019	Arzoglou, Elo, & Nikander	The case of iOS and Android: Applying system dynamics to digital business platforms	Excluded
61	Scopus	2019	Frenken, van Waes, Pelzer, Smink, & van Est	Safeguarding public interests in the platform economy	Excluded
62	Scopus	2019	Wortmann, Joppen, Drewel, Kühn, & Dumitrescu	Developing and evaluating concepts for a digital platform	Excluded
63	Scopus	2019	Coin	Your data or your life. On demonetisation, cashlessness and the digital panopticon in India	Excluded
64	Scopus	2019	Reilly & Lozano-Paredes	Ride hailing regulations in Cali, Colombia: Towards autonomous and decent work	Excluded
65	Scopus	2019	Gramano	Digitalisation and work: Challenges from the platform-economy	Excluded
66	Scopus	2019	Hernández	“There’s something compelling about real life”: Technologies of security and acceleration on Chaturbate	Excluded
67	Scopus	2019	Polyanin, Golovina, Avdeeva, Vertakova, & Kharlamov	Standardization of business processes based on the use of digital platforms	Excluded
68	Scopus	2019	Sahut, Iandoli, & Teulon	The age of digital entrepreneurship	Excluded
69	Scopus	2019	Seppänen, Hasu, Käpykangas, & Poutanen	On-demand work in platform economy: Implications for sustainable development	Excluded
70	Scopus	2019	Scolere	Negotiating collaboration and commodification: The social media logic of co-design on Pinterest	Excluded
71	Scopus	2019	Gerber & Krzywdzinski	Brave new digital work? New forms of performance control in crowdwork	Excluded
72	Scopus	2019	Adamiak	Current state and development of Airbnb accommodation offer in 167 countries	Excluded
73	Scopus	2019	Nespoli	When labour goes populist: How Italian populist leaders framed the labour market and industrial relations on social media	Excluded
74	Scopus	2019	Chong	Cashless China: Securitization of everyday life through Alipay’s social credit system - Sesame Credit	Excluded

75	Scopus	2019	Hänninen	Review of studies on digital transaction platforms in marketing journals	Excluded
76	Scopus	2019	Kim & Lee	Typology and unified model of the sharing economy in open innovation dynamics	Excluded
77	Scopus	2019	Young & Farber	The who, why, and when of Uber and other ride-hailing trips: An examination of a large sample household travel survey	Excluded
78	Scopus	2019	Zhang & Elsner	Social leverage, a core mechanism of cooperation. Locality, assortment, and network evolution	Excluded
79	Scopus	2019	International Astronautical Congress	Industry 4.0 standards for rideshare aggregation management	Excluded
80	Scopus	2018	Thelen	Regulating Uber: The politics of the platform economy in Europe and the United States	Excluded
81	Scopus	2018	Cox	Gender, work, non-work and the invisible migrant: Au pairs in contemporary Britain	Excluded
82	Scopus	2018	Sutherland & Jarrahi	The sharing economy and digital platforms: A review and research agenda	Excluded
83	Scopus	2018	Ruggieri, Savastano, Scalingi, Bala, & D'Ascenzo	The impact of digital platforms on business models: An empirical investigation on innovative start-ups	Included
84	Scopus	2018	Reijers & Ossewaarde	Digital commoning and its challenges	Excluded
85	Scopus	2018	Ferreri & Sanyal	Platform economies and urban planning: Airbnb and regulated deregulation in London	Excluded
86	Scopus	2018	Lampinen, McGregor, Comber, & Brown	Member-owned alternatives: Exploring participatory forms of organising with cooperatives	Excluded
87	Scopus	2018	Lampinen, Lutz, Newlands, Light, & Immorlica	Power struggles in the digital economy: Platforms, workers, and markets	Excluded
88	Scopus	2018	Fehrer, Benoit, Aksoy, Baker, Bell, Brodie, & Marimuthu	Future scenarios of the collaborative economy: Centrally orchestrated, social bubbles or decentralized autonomous?	Excluded
89	Scopus	2018	Leshinsky & Schatz	"I don't think my landlord will find out." Airbnb and the challenges of enforcement	Excluded
90	Scopus	2018	Klopfenstein, Delpriori, Aldini, & Bogliolo	Introducing a flexible rewarding platform for mobile crowd-sensing applications	Excluded

91	Scopus	2018	Domurath	Platforms as contract partners: Uber and beyond	Excluded
92	Scopus	2018	Nass, Trapp, & Villela	Tangible design for software ecosystem with PlayMobil®	Excluded
93	Scopus	2018	Muralidhar	Opportunities and challenges for creating a digital payments ecosystem: A case of auto-rickshaw and cabdrivers in India	Excluded
94	Scopus	2018	Woods	Asking more of Siri and Alexa: Feminine persona in service of surveillance capitalism	Excluded
95	Scopus	2018	Naab, Rost, & Knodel	Architecting a software-based ecosystem for the automotive aftermarket: An experience report	Excluded
96	Scopus	2018	Feng & Ots	Seeing native advertising production via the business model lens: The case of Forbe's BrandVoice unit	Excluded
97	Scopus	2018	Sharma	Formalising the informal: A critical appraisal	Excluded
98	Scopus	2018	Hyrnsalmi, Ruohonen, & Seppänen	Healthy until otherwise proven: Some proposals for renewing research of software ecosystem health	Excluded
99	Scopus	2018	Fumagalli, Lucarelli, Musolino, & Rocchi	Digital labour in the platform economy: The case of Facebook	Excluded
100	Scopus	2018	Hall & Krueger	An analysis of the labor market for Uber's driver-partners in the United States	Excluded
101	Scopus	2018	Münzel, Boon, Frenken, & Vaskelainen	Carsharing business models in Germany: Characteristics, success and future prospects	Excluded
102	Scopus	2018	Pongratz	Of crowds and talents: Discursive constructions of global online labour	Excluded
103	Scopus	2018	Salmony	Rethinking digital identity	Excluded
104	Scopus	2018	Finck	Digital co-regulation: Designing a supranational legal framework for the platform economy	Excluded
105	Scopus	2018	Lenaerts, Kilhoffer, & Akgüç	Traditional and new forms of organisation and representation in the platform economy	Excluded
106	Scopus	2018	Kiesling	Toward a market epistemology of the platform economy	Included
107	Scopus	2018	Popescu, Petrescu, & Sabie	Algorithmic labor in the platform economy: Digital infrastructures, job quality, and workplace surveillance	Excluded

108	Scopus	2018	Mitea	The expansion of digitally mediated labor: Platform-based economy, technology-driven shifts in employment, and the novel modes of service work	Excluded
109	Scopus	2018	Hu, Li, Wang, & Zhuang	Structural pattern recognition of fraudster groups in P2P transaction websites	Excluded
110	Scopus	2018	Drewel & Gausemeier	Digital B2B-platforms and how to find the right one	Excluded
111	Scopus	2018	Boutueil	New mobility services	Excluded
112	Scopus	2018	Drugău-Constantin	Non-employment work arrangements in digital labor marketplaces: Who's fooling who?	Excluded
113	Scopus	2018	Schneider	An internet of ownership: Democratic design for the online economy	Excluded
114	Scopus	2018	Gareev	Platform markets: Their place in the theory of mesoeconomic system: Development and a challenge to spatial studies	Excluded
115	Scopus	2018	Teubner & Glaser	Up or out - The dynamics of star rating scores on Airbnb	Excluded
116	Scopus	2018	Sinha	Gender digital divide in India: Impacting women's participation in the labour market	Excluded
117	Scopus	2018	David-West, Umukoro, & Onuoha	Platforms in Sub-Saharan Africa: Startup models and the role of business incubation	Excluded
118	Scopus	2018	Hänninen, Smedlund, & Mitronen	Digitalization in retailing: Multi-sided platforms as drivers of industry transformation	Included
119	Scopus	2017	Brail	Promoting innovation locally: Municipal regulation as barrier or boost?	Excluded
120	Scopus	2017	Acquier, Daudigeos, & Pinkse	Promises and paradoxes of the sharing economy: An organizing framework	Excluded
121	Scopus	2017	Corujo	The 'gig' economy and its impact on social security: The Spanish example	Excluded
122	Scopus	2017	Greve	Technology and the future of work: The impact on labour markets and welfare states	Excluded
123	Scopus	2017	De Groen, Kilhoffer, Lenaerts, & Salez	The impact of the platform economy on job creation	Excluded
124	Scopus	2017	Drahokoupil & Piasna	Work in the platform economy: Beyond lower transaction costs	Excluded

125	Scopus	2017	McKee	The platform economy: Natural, neutral, consensual and efficient?	Excluded
126	Scopus	2017	Biber, Light, Ruhl, & Salzman	Regulating business innovation as policy disruption: From the Model T to Airbnb	Excluded
127	Scopus	2017	Schor & Attwood-Charles	The “sharing” economy: Labor, inequality, and social connection on for-profit platforms	Excluded
128	Scopus	2017	Chang & Chen	Does visualize industries matter? A technology foresight of global virtual reality and augmented reality industry	Excluded
129	Scopus	2017	Schor	Does the sharing economy increase inequality within the eighty percent?: Findings from a qualitative study of platform providers	Excluded
130	Scopus	2017	Davies, Donald, Gray, & Knox-Hayes	Sharing economies: Moving beyond binaries in a digital age	Excluded
131	Scopus	2017	van Doorn	Platform labor: On the gendered and racialized exploitation of low-income service work in the ‘on-demand’ economy	Excluded
132	Scopus	2017	Surie	Tech in work organising informal work in India	Excluded
133	Scopus	2017	Smith & MacGill	The great rebalancing: Rattling the electricity value chain from behind the meter	Excluded
134	Scopus	2017	Savirimuthu	Do algorithms dream of ‘data’ without bodies?	Excluded
135	Scopus	2017	Lampinen & Brown	Market design for HCI: Successes and failures of peer-to-peer exchange platforms	Excluded
136	Scopus	2017	Fabo, Karanovic, & Dukova	In search of an adequate European policy response to the platform economy	Excluded
137	Scopus	2017	Gamito	Regulation.com. Self-regulation and contract governance in the platform economy: A research agenda	Excluded
138	Scopus	2017	Leong & Belzer	The new public accommodations: Race discrimination in the platform economy	Excluded
139	Scopus	2017	Eichhorst, Hinte, Rinne, & Tobsch	How big is the gig? Assessing the preliminary evidence on the effects of digitalization on the labor market	Excluded
140	Scopus	2017	Casilli	How venture labor sheds light on the digital platform economy	Excluded
141	Scopus	2017	Casilli	Digital labor studies go global: Toward a digital decolonial turn	Excluded

142	Scopus	2016	Nerinckx	The 'Uberization' of the labour market: Some thoughts from an employment law perspective on the collaborative economy	Excluded
143	Scopus	2016	Lampinen, Bellotti, Cheshire, & Gray	CSCW and the "sharing economy": The future of platforms as sites of work, collaboration and trust	Excluded
144	Scopus	2016	Ardolino, Saccani, & Perona	The rise of platform economy: A framework to describe multisided platforms	Excluded
145	Scopus	2016	Kenney & Zysman	The rise of the platform economy	Excluded
146	Scopus	2016	Hawlitschek, Teubner, Adam, Borchers, Möhlmann, & Weinhardt	Trust in the sharing economy: An experimental framework	Excluded
147	Scopus	2015	Bauer, Elezi, Roth, & Maurer	Determination of the required product platform flexibility from a change perspective	Excluded
148	Scopus	2007	Li, Li, & Xie	Posted price model based on GRS and its optimization using in grid resource allocation	Excluded
149	Scopus	2003	Dana	Remark on "Appropriateness and impact of platform-based product development"	Excluded
150	ProQuest	2019	Diamond, Drury, Lipp, Marshall, Ramamurthy, & Wagle	The future of banking in the platform economy	Excluded
151	ProQuest	2019	Lehdonvirta, Kässi, Hjorth, Barnard, & Graham	The global platform economy: A new offshoring institution enabling emerging-economy microproviders	Excluded
152	ProQuest	2018	Fehrer, Benoit, Askoy, Baker, Bell, Brodie, & Marimuthu	Future scenarios of the collaborative economy	Excluded
153	ProQuest	2019	Hänninen & Smedlund	On retail digital platforms suppliers have to become responsive customer service organizations	Included
154	ProQuest	2018	Andreassen, Lervik-Olsen, Snyder, van Riel, Sweeny, & van Vaerenbergh	Business model innovation and value-creation: The triadic way	Included
155	ProQuest	2019	Rodriguez	The guarantee of fair and just working conditions in the new collaborative economy models in Europe	Excluded
156	ProQuest	2019	Nahavandi	U.S. economy on track for record uninterrupted expansion	Excluded
157	ProQuest	2019	Goodson	Quick takes	Excluded

158	ProQuest	2017	Journal of Consumer Policy	Book notes law 1/2017	Excluded
159	ProQuest	2019	Nahavandi	U.S. economy continues to reveal productive capacity despite no innovation	Excluded
160	ProQuest	2017	Gobble	Defining the sharing economy	Excluded
161	ProQuest	2018	Goodson	Quick takes	Excluded
162	ProQuest	2018	Berman, Davidson, Ikeda, & Marshall	Navigating disruption with ecosystems, partners and platforms	Excluded
163	ProQuest	2015	Weber	With Etsy, some 86% of sellers are female	Excluded
164	ProQuest	2017	Luthi	Gig-economy tech companies promote ACA enrollment	Excluded
165	ProQuest	2016	Fordham	Ursula Huws: How can employers support wellbeing in the gig economy?	Excluded
166	ProQuest	2019	Strategy & Leadership	Editor's letter	Excluded
167	ProQuest	2017	Meichtry & Horobin	The calculated rise of Macron --- Frenchman acquired skills, connected with elite	Excluded
168	ProQuest	2016	Dobson	Worker rights in need of clarity in gig economy	Excluded
169	ProQuest	2017	Luthi	Vitals	Excluded
170	ProQuest	2018	Sampler	Platforms that grow are more than matchmakers	Included
171	ProQuest	2016	Beebe	Change management for a fast moving world	Excluded
172	ProQuest	2019	Vith, Oberg, Höllerer, & Meyer	Envisioning the 'sharing city': Governance strategies for the sharing economy	Excluded
173	ProQuest	2019	Henry	Leadership and strategy in the news	Excluded
174	ProQuest	2019	Goodson	Quick takes	Excluded
175	ProQuest	2018	Healthcare Financial Management	Staying ahead of the consumerism curve	Excluded
176	ProQuest	2017	Ng	'Employment across markets or nations': A review paper on <i>International and Comparative Employment Relations</i>	Excluded
177	ProQuest	2019	Burkard & Craven	The gig economy is here: Is HR ready, and how will it impact employee benefits?	Excluded
178	ProQuest	2017	Micklitz	Book notes law 4/2017	Excluded

179	ProQuest	2019	Whelan	Trust in surveillance: A reply to Etzioni	Excluded
180	ProQuest	2018	Chee	An Uber ethical dilemma: Examining the social issues at stake	Excluded
181	ProQuest	2019	Ruiner, Wilkesmann, & Apitzsch	Staffing agencies in work relationships with independent contractors	Excluded
182	ProQuest	2019	Jarmin	Evolving measurement for an evolving economy: Thoughts on 21st century US economic statistics	Excluded
183	ProQuest	2019	Sedziniauskiene, Sekliuckiene, & Zucchella	Networks' impact on the entrepreneurial internationalization: A literature review and research agenda	Excluded
184	ProQuest	2018	Monthly Labor Review	Electronically mediated work: New questions in the contingent worker supplement	Excluded
185	ProQuest	2017	Hooton	America's online 'jobs': Conceptualizations, measurements, and influencing factors	Excluded
186	ProQuest	2019	Wruk, Oberg, Klutt, & Maurer	The presentation of self as good and right: How value propositions and business model features are linked in the sharing economy	Excluded
187	ProQuest	2019	Ciulli, Kolk, & Boe-Lillegraven	Circularity brokers: Digital platform organizations and waste recovery in food supply chains	Excluded
188	ProQuest	2017	Mas & Pallais	Valuing alternative work arrangements	Excluded
189	ProQuest	2017	Journal of Economic Literature	Annotated listing of new books	Excluded
190	EBSCOhost	2019	Mäntymäki, Baiyere, & Islam	Digital platforms and the changing nature of physical work: Insights from ride-hailing	Excluded
191	EBSCOhost	2019	Kim & Lee	Typology and unified model of the sharing economy in open innovation dynamics	Excluded
192	EBSCOhost	2019	Pawlowska	Employability market orientation of employee on the gig economy labour market	Excluded
193	EBSCOhost	2019	Gregg & Andrijasevic	Virtually absent: The gendered histories and economies of digital labour	Excluded
194	EBSCOhost	2019	Huws	The hassle of housework: Digitalisation and the commodification of domestic labour	Excluded
195	EBSCOhost	2019	Schwartz & Neff	The gendered affordances of Craigslist "new-in-town girls wanted" ads	Excluded

196	EBSCOhost	2019	Nemkova, Demirel, & Baines	In search of meaningful work on digital freelancing platforms: The case of design professionals	Excluded
197	EBSCOhost	2019	Diamond, Drury, Lipp, Marshall, Ramamurthy, & Wagle	The future of banking in the platform economy	Excluded
198	EBSCOhost	2019	Johnston	Book review: Uberland: How algorithms are rewriting the rules of work. By Alex Rosenblat	Excluded
199	EBSCOhost	2019	Albert-Deitch & Meyer	The platform economy	Excluded
200	EBSCOhost	2019	Uzunca & Borlenghi	Regulation strictness and supply in the platform economy: The case of Airbnb and couchsurfing	Excluded
201	EBSCOhost	2019	Scassa	Ownership and control over publicly accessible platform data	Excluded
202	EBSCOhost	2019	Markeeva & Gavrilenko	Future of platform economy: Digital platform as new economic actor and instance of social control	Excluded
203	EBSCOhost	2019	Yi, He, & Yang	Platform heterogeneity, platform governance and complementors' product performance: An empirical study of the mobile application industry	Excluded
204	EBSCOhost	2019	Aine, Björkroth, & Koponen	Horizontal information exchange and innovation in the platform economy - A need to rethink?	Excluded
205	EBSCOhost	2019	Larner & Walldius	The Platform Review Alliance Board: Designing an organizational model to bring together producers and consumers in the review and commissioning of platform software	Excluded
206	EBSCOhost	2019	Montalban, Frigant, & Jullien	Platform economy as a new form of capitalism: A Régulationist research programme	Excluded
207	EBSCOhost	2019	Behrendt, Nguyen, & Rani	Social protection systems and the future of work: Ensuring social security for digital platform workers	Excluded
208	EBSCOhost	2019	Garben	The regulatory challenge of occupational safety and health in the online platform economy	Excluded
209	EBSCOhost	2019	Hänninen, Mitronen, & Kwan	Multi-sided marketplaces and the transformation of retail: A service systems perspective	Excluded

210	EBSCOhost	2019	Esparza Rodríguez, Martínez Arroyo, & Ávila Carreón	Department location: Factor for Airbnb user's valuation perception	Excluded
211	EBSCOhost	2019	Bates, Zwick, Spicer, Kerzher, Kim, Baber, Green, & Moulden	Gigs, side hustles, freelance: What work means in the platform economy city/ Blight or remedy: Understanding ridehailing's role in the precarious "gig economy"/ Labour, gender and making rent with Airbnb/ The gentrification of 'sharing': From Bandit Cab to Ride Share Tech / The 'sharing economy'? Precarious labor in neoliberal cities/ Where is economic development in the platform city?/ Shared economy: WeWork or we work together	Excluded
212	EBSCOhost	2019	Muralidhar, Bossen, O'Neil	Rethinking financial inclusion: From access to autonomy	Excluded
213	EBSCOhost	2019	Rosner	The need for speed: A platform-based approach to digitisation	Included
214	EBSCOhost	2019	Lenard	Introduction to the RIO special issue on antitrust and the platform economy	Excluded
215	EBSCOhost	2019	Melamed & Petit	The misguided assault on the consumer welfare standard in the age of platform markets	Excluded
216	EBSCOhost	2019	Farrell, Greig, & Hamoudi	The evolution of the online platform economy: Evidence from five years of banking data	Excluded
217	EBSCOhost	2019	Dubois	Revolution in B2B retail: From perfume to platform economy	Excluded
218	EBSCOhost	2019	Hartley	Uber's VAT battles illustrate different approaches to taxing the platform economy	Excluded
219	EBSCOhost	2019	Mezulanik, Kmeco, Civelek, & Kloudova	Transport services in the shared economy segment compared to traditional taxi services: The case study of the Czech Republic	Excluded
220	EBSCOhost	2019	Naomi, Carbone, & Levit	Discrimination by design?	Excluded
221	EBSCOhost	2019	Schumacher	"Every company needs to have a strategy for the platform economy"	Excluded
222	EBSCOhost	2019	Choudary	How the platform economy is reshaping global trade	Excluded
223	EBSCOhost	2019	Black, Fox Miller, & Leslie	Gender, precarity and hybrid forms of work identity in the virtual domestic arts and crafts industry in Canada and the US	Excluded

224	EBSCOhost	2019	Lehdonvirta, Kässi, Hjorth, Barnard, & Graham	The global platform economy: A new offshoring institution enabling emerging-economy microproviders	Excluded
225	EBSCOhost	2019	Lehman, Schenkenhofer, & Wirsching	Hidden champions and unicorns: A question of the context of human capital investment	Excluded
226	EBSCOhost	2019	Corporaal, Sessions, Jarvenpaa, Levina, Ashford, Caza, Karanovic, Moehlmann, Berends, Engel, Gregory, Henfridsson, Lehdonvirta, Nahrgang, Reid, & Zalmanson	Changing models of work in the digital platform economy	Excluded
227	EBSCOhost	2019	Dann, Teubner, & Weinhardt	Poster child and guinea pig - Insights from a structured literature review on Airbnb	Excluded
228	EBSCOhost	2019	Journal of International Affairs	The future of work: Advancing labor market resilience	Excluded
229	EBSCOhost	2019	Meilhan	Customer value co-creation behavior in the online platform economy	Excluded
230	EBSCOhost	2019	Vallas	Platform capitalism: What's at stake for workers?	Excluded
231	EBSCOhost	2019	Broecke & Cazes	The platform economy can deliver for its workers too	Excluded
232	EBSCOhost	2019	Hänninen & Smedlund	On retail digital platforms suppliers have to become responsive customer service organizations	Excluded
233	EBSCOhost	2019	Young & Farber	The who, why, and when of Uber and other ride-hailing trips: An examination of a large sample household travel survey	Excluded
234	EBSCOhost	2018	Brail	From renegade to regulated: The digital platform economy, ride-hailing and the case of Toronto	Excluded
235	EBSCOhost	2018	Sutherland & Jarrahi	The sharing economy and digital platforms: A review and research agenda	Excluded
236	EBSCOhost	2018	Drewel, Gausemeier, Koldewey, & Özcan	Pattern based development of digital platforms	Included
237	EBSCOhost	2018	Leshinsky & Schatz	"I don't think my landlord will find out:" Airbnb and the challenges of enforcement	Excluded

238	EBSCOhost	2018	Ferreri & Sanyal	Platform economies and urban planning: Airbnb and regulated deregulation in London	Excluded
239	EBSCOhost	2018	Fehrer, Benoit, Aksoy, Baker, Bell, Brodie, & Marimuthu	Future scenarios of the collaborative economy	Excluded
240	EBSCOhost	2018	Reijers & Ossewaarde	Digital commoning and its challenges	Excluded
241	EBSCOhost	2018	Economist	Serfs up: Worries about the rise of the gig economy are mostly overblown	Excluded
242	EBSCOhost	2018	Woods	Asking more of Siri and Alexa: Feminine persona in service of surveillance capitalism	Excluded
243	EBSCOhost	2018	Finneran	Overdetermined	Excluded
244	EBSCOhost	2018	Mitea	The expansion of digitally mediated labor: Platform-based economy, technology driven shifts in employment, and the novel modes of service work	Excluded
245	EBSCOhost	2018	Hultin	Legacies, logics, logistics: Essays in the anthropology of the platform economy	Excluded
246	EBSCOhost	2018	Popescu, Petrescu, & Sabie	Algorithmic labor in the platform economy: Digital infrastructures, job quality, and workplace surveillance	Excluded
247	EBSCOhost	2018	Maultzsch	Contractual liability of online platform operators: European proposals and established principles	Excluded
248	EBSCOhost	2018	Bolt	Legacies, logics, logistics: Essays in the anthropology of the platform economy	Excluded
249	EBSCOhost	2018	Mirică (Dumitrescu)	Online contingent labor in a precarious capitalism: Platform business models, nonstandard forms of employment, and digitally driven sharing-economy services	Excluded
250	EBSCOhost	2018	Drugău-Constantin	Non-employment work arrangements in digital labor marketplaces: Who's fooling who?	Excluded
251	EBSCOhost	2018	Oei	The trouble with gig talk: Choice of narrative and the worker classification fights	Excluded
252	EBSCOhost	2018	Women's Wear Daily	Recognizing the revolution: Lectra presents 4 tech trends driving the digitalization of fashion	Excluded
253	EBSCOhost	2018	Hall & Krueger	An analysis of the labor market for Uber's driver-partners in the United States	Excluded

254	EBSCOhost	2018	Münzel, Boon, Frenken, & Vaskelainen	Carsharing business models in Germany: Characteristics, success and future prospects	Excluded
255	EBSCOhost	2018	Sukhodolov & Beryozkin	From the institutional to the platform economy	Excluded
256	EBSCOhost	2018	Malin	Protecting platform workers in the gig economy: Look to the FTC	Excluded
257	EBSCOhost	2018	Salmony	Rethinking digital identity	Excluded
258	EBSCOhost	2018	Pongratz	Of crowds and talents: Discursive constructions of global online labour	Excluded
259	EBSCOhost	2018	Schneider	An internet of ownership: Democratic design for the online economy	Excluded
260	EBSCOhost	2018	Jing	Platform economy in legal profession: An empirical study of online legal service providers in China	Excluded
261	EBSCOhost	2018	Karanovic, Berends, & Engel	Is platform capitalism legit? Ask the workers	Excluded
262	EBSCOhost	2018	Drewel & Gausemeier	Digital B2B-platforms and how to find the right one	Excluded
263	EBSCOhost	2018	Koppel & Kolencik	The future of workers: Contingent forms of labor contracting in the platform economy	Excluded
264	EBSCOhost	2017	Turnšek & Ladkin	Changing employment in the sharing economy: The case of Airbnb	Excluded
265	EBSCOhost	2017	Bamberger & Lobel	Platform market power	Excluded
266	EBSCOhost	2017	Brail	Promoting innovation locally: Municipal regulation as barrier or boost?	Excluded
267	EBSCOhost	2017	McKee	The platform economy: Natural, neutral, consensual and efficient?	Excluded
268	EBSCOhost	2017	Zysman, Kenney, Drahokoupil, Piasna, Petropoulos, De Groen, Kilhoffer, Lenaerts, & Salez	Regulating the platform economy: How to protect workers while promoting innovation	Excluded
269	EBSCOhost	2017	Drahokoupil & Piasna	Work in the platform economy: Beyond lower transactions costs	Excluded
270	EBSCOhost	2017	De Groen, Kilhoffer, Lenaerts, & Salez	The impact of the platform economy on job creation	Excluded
271	EBSCOhost	2017	Biber, Light, Ruhl, & Salzman	Regulating business innovation as policy disruption: From the Model T to Airbnb	Excluded
272	EBSCOhost	2017	Lee	After the miracle: Labor politics under China's new normal	Excluded

273	EBSCOhost	2017	Ranchordás	Peers or professionals? The P2P-economy and competition law	Excluded
274	EBSCOhost	2017	Eichhorst, Hinte, Rinne, & Tobsch	How big is the gig? Assessing the preliminary evidence on the effects of digitalization on the labor market	Excluded
275	EBSCOhost	2017	Davies, Donald, Gray, & Knox-Hayes	Sharing economies: Moving beyond binaries in a digital age	Excluded
276	EBSCOhost	2017	Schor	Does the sharing economy increase inequality within the eighty percent?: Findings from a qualitative study of platform providers	Excluded
277	EBSCOhost	2017	Savirimuthu	Do algorithms dream of 'data' without bodies?	Excluded
278	EBSCOhost	2017	van Doorn	Platform labor: On the gendered and racialized exploitation of low-income service work in the 'on-demand' economy	Excluded
279	EBSCOhost	2017	Dufva, Koivisto, Ilmola-Sheppard, & Junno	Anticipating alternative futures for platform economy	Excluded
280	EBSCOhost	2017	Korhonen, Still, Seppänen, Kumpulainen, Suominen, & Valkokari	Start-ups innovating digital platforms: Towards successful interaction	Excluded
281	EBSCOhost	2017	Moser, Wecht, & Gassmann	Open platforms at incumbents	Included
282	EBSCOhost	2017	Leong & Belzer	The new public accommodations: Race discrimination in the platform economy	Excluded
283	EBSCOhost	2016	Acevedo	Addressing the retirement crisis with shadow 401(k)s	Excluded
284	EBSCOhost	2016	Vizard	ConnectWise taps into platform economy	Excluded
285	EBSCOhost	2016	Greengard	The pros and cons of the on-demand economy	Excluded
286	EBSCOhost	2016	Farrell & Greig	Paychecks, paydays, and the online platform economy: Big data on income volatility	Excluded
287	EBSCOhost	2016	Lobel	The law of the platform	Excluded
288	EBSCOhost	2016	Robles & McGee	Exploring online and offline informal work: Findings from the Enterprising and Informal Work Activities (EIWA) survey	Excluded
289	EBSCOhost	2016	Orton-Jones	The irresistible rise of the platform economy	Excluded

290	EBSCOhost	2016	Biltz	How to maximize the benefits of a platform economy	Excluded
291	EBSCOhost	2016	Rogers	Employment rights in the platform economy: Getting back to basics	Excluded
292	EBSCOhost	2016	Kocieniewski	Airbnb, others pay out billions beneath IRS's radar, study finds	Excluded
293	EBSCOhost	2016	Evans & Schmalensee	Why winner-takes-all thinking doesn't apply to the platform economy	Excluded
294	EBSCOhost	2016	Evans & Schmalensee	Why winner-takes-all thinking doesn't apply to the platform economy	Excluded
295	EBSCOhost	2016	Kenney & Zysman	The rise of the platform economy	Excluded
296	Google	2016	Kim	The platform business model and business ecosystem: Quality management and revenue structures	Included
297	Google Scholar	2018	Davidson, Giesen, Harmer, & Marshall	How industry leaders enhance the value of ecosystems	Included
298	From References	2011	Sorescu, Frambach, Singh, Rangaswamy, & Bridges	Innovations in retail business models	Included
299	From References	2014	Breidbach, Brodie, & Hollebek	Beyond virtuality: From engagement platforms to engagement ecosystems	Included

Appendix S

Summary of Reviewed Articles: Types of Platforms

	Source	Year	Author/s	Title/Topic	Results
1	Scopus	2019	Zhu, Mou, & Benyoucef	Exploring purchase intention in cross-border e-Commerce: A three stage model	Excluded
2	Scopus	2019	Tarr & Alvarez León	Will review for points: The unpaid affective labour of placemaking for Google's 'Local Guides'	Excluded
3	Scopus	2019	Huang, Zhao, Mei, Wu, Zhao, & Mao	Structural holes in the multi-sided market: A market allocation structure analysis of China's car-hailing platform in the context of open innovation	Excluded
4	Scopus	2019	Hughes, Swaminathan, & Brooks	Driving brand engagement through online social influencers: An empirical investigation of sponsored blogging campaigns	Excluded
5	Scopus	2019	Kim & Min	Supplier, tailor, and facilitator: Typology of platform business models	Excluded
6	Scopus	2019	Mulyani, Aryanto, & Chang	Understanding digital consumer: Generation Z online shopping preferences	Excluded
7	Scopus	2019	De Melo & Godoy	Controller interface for industry 4.0 based on RAMI 4.0 and OPC UA	Excluded
8	Scopus	2019	Petroulakis, Lakka, Sakic, Kulkarni, Fysarakis, Somarakis, Serra, Sanabria-Russo, Pau, Falchetto, Presenza, Marktscheffel, Ramantas, Mekikis, Ciechomski, & Waledzik	SEMIoTICS architectural framework: End-to-end security, connectivity and interoperability for industrial IoT	Excluded
9	Scopus	2019	Walker, Tikoff, Newman, Clark, Ash, Good, Bunse, Möller, Kahn, Williams, Michels, Andrew, & Ruffedt	StraboSpot data system for structural geology	Excluded
10	Scopus	2019	Gates	Policing as digital platform	Excluded
11	Scopus	2019	Singh & Srivastava	Engaging consumers in multichannel online retail environment: A moderation study of platform type on interaction of e-Commerce and m-Commerce	Included

12	Scopus	2019	Bittner, Logghe, Kane, Goldberg, Alseidi, Aggarwal, & Jacob	A Society of Gastrointestinal and Endoscopic Surgeons (SAGES) statement on closed social media (Facebook®) groups for clinical education and consultation: Issues of informed consent, patient privacy, and surgeon protection	Excluded
13	Scopus	2019	Eklund, Stamm, & Liebermann	The crowd in crowdsourcing: Crowdsourcing as a pragmatic research method	Excluded
14	Scopus	2019	Willard, van Rossum, Spreuwwenberg, & de Witte	A typology of online care platforms for community-dwelling older adults in the Netherlands: A scoping review	Excluded
15	Scopus	2019	Kenney & Zysman	Work and value creation in the platform economy	Excluded
16	Scopus	2019	Van Lohuizen & Trujillo-Barrera	The influence of online reviews on restaurants: The roles of review valence, platform, and credibility	Excluded
17	Scopus	2019	Garyfallidou & Ioannidis	LMS use in primary school as an internet-accessible notice board	Excluded
18	Scopus	2019	Malik & Zatar	An IoT enabled framework to support structural health monitoring applications	Excluded
19	Scopus	2019	Moutinho, Brazdil, & Cordeiro	Association and temporality between news and tweets	Excluded
20	Scopus	2019	Aranha, Gandelman, dos Santos, Hougaz, Clemente, Dumlao, Teixeira, & Mazzi	Development of an integrated well planning platform in a NoC	Excluded
21	Scopus	2018	Boumiza, Bekiarski, Pleshkova, & Souilem	Development of simulation models for interactive audiovisual control students in the e-Learning environment	Excluded
22	Scopus	2018	da Cruz, Rodrigues, Saleem, & Aquino	Towards ranking IoT middleware platforms based on quantitative and qualitative metrics	Excluded
23	Scopus	2018	Seddighi, Sharifi, & Seddighi	The role of consumer decision making styles on the purchasing process in digital games	Excluded
24	Scopus	2018	da Cruz, Rodrigues, Sangaiah, Al-Muhtadi, & Korotaev	Performance evaluation of IoT middleware	Excluded
25	Scopus	2018	Heine, Kuper, & Neururer	Which platform to use? - Social media platform types and their suitability for sound decision making by voluntary helpers	Included

26	Scopus	2018	Settani, Azucar, & Marengo	Predicting individual characteristics from digital traces on social media: A meta-analysis	Excluded
27	Scopus	2018	Petrenko, Petrenko, Makoveichuk, & Chetyrbok	The IIoT/IoT device control model based on narrow-band IoT (NB-IoT)	Excluded
28	Scopus	2018	Kazan, Tan, Lim, Sørensen, & Damsgaard	Disentangling digital platform competition: The case of UK mobile payment platforms	Excluded
29	Scopus	2018	Advances in e-Business Research Series	Digital platforms: Definitions, strategy, and business models	Excluded
30	Scopus	2018	Asadullah, Faik, & Kankanhalli	Evolution mechanisms for digital platforms: A review and analysis across platform types	Excluded
31	Scopus	2018	Swier & Peterson	3D digital games, virtual worlds, and language learning in higher education: Continuing challenges in Japan	Excluded
32	Scopus	2018	de Silva	Assessing online platform mergers: Taking up the new challenges faced by the French Competition Authority in the digital	Excluded
33	Scopus	2018	Ali, Muthaly, & Dada	Adoption of Shariah compliant peer-to-business financing platforms by SMEs: A conceptual strategic framework for FinTechs in Bahrain	Excluded
34	Scopus	2018	Vilarinho, Pappas, Mora, Dinant, Floch, Oliveira, & Jaccheri	Experimenting a digital collaborative platform for supporting social innovation in multiple settings	Excluded
35	Scopus	2018	Alenzuela & Kamilova	Synchronous and asynchronous engagement in virtual library services as learning support systems from the perspectives of post-graduate students: A case study	Excluded
36	Scopus	2017	Rosellini & D'Haese	Data is driving the future of neurotechnology with CranialCloud	Excluded
37	Scopus	2017	Iftikar & Abaalkhail	Health-seeking influence reflected by online health-related messages received on social media: Cross-sectional survey	Excluded
38	Scopus	2017	Danneels, Viaene, & Van den Bergh	Open data platforms: Discussing alternative knowledge epistemologies	Excluded
39	Scopus	2017	Ordonez, Gupta, Reese, Seegmiller, Kelly, & Collins	Learning of skid-steered kinematic and dynamic models for motion planning	Excluded
40	Scopus	2017	Yamakami	A gap analysis framework of IoT-empowered city platform as a service	Excluded

41	Scopus	2017	Kwon, Oh, & Kim	Platform structures, homing preferences, and homophilous propensities in online social networks	Excluded
42	Scopus	2017	Ménascé, Vincent, & Moreau	Smart cities and new forms of employment	Excluded
43	Scopus	2017	Voytenko Palgan, Zvolska, & Mont	Sustainability framings of accommodation sharing	Excluded
44	Scopus	2017	de Rivera, Gordo, Cassidy, & Apesteguía	A netnographic study of P2P collaborative consumption platforms' user interface and design	Excluded
45	Scopus	2017	Swist & Collin	Platforms, data and children's rights: Introducing a 'networked capability approach	Excluded
46	Scopus	2017	Huo & Mu	Research on the development of e-Commerce model of agricultural products	Excluded
47	Scopus	2017	Steinberg & Li	Introduction: Regional platforms	Included
48	Scopus	2017	Liu	Research on the influence of interaction on customers' behavioral intention under the platform-type B2C mode	Excluded
49	Scopus	2017	Ogaji, Okoyeukwu, Wanjiku, Osiro, & Ogutu	Pattern of use of social media networking by pharmacy students of Kenyatta University, Nairobi, Kenya	Excluded
50	Scopus	2017	Thelwall & Vis	Gender and image sharing on Facebook, Twitter, Instagram, Snapchat and WhatsApp in the UK: Hobbying alone or filtering for friends?	Excluded
51	Scopus	2016	Ji, Choi, & Ryu	The economic effects of domestic search engines on the development of the online advertising market	Excluded
52	Scopus	2016	Kedzierski & Wierzbicki	Methodology of improvement of radiometric quality of images acquired from low altitudes	Excluded
53	Scopus	2016	Petrescu, Ciotirnae, Rincu, Aloman, & Nichita	Performance evaluation of the integrated platforms using VoIP signaling protocols analysis	Excluded
54	Scopus	2016	International Conference on Emerging Security Technologies	Proceedings - 2015 6th International Conference on Emerging Security Technologies, EST 2015	Excluded
55	Scopus	2016	Wang, Min, & Han	Understanding the effects of trust and risk on individual behavior toward social media platforms: A meta-analysis of the empirical evidence	Excluded
56	Scopus	2016	Jiang	Platform based e-Commerce credit evaluation system based on fuzzy comprehensive evaluation	Excluded

57	Scopus	2016	Yu, Bang, Lee, & Lee	Adaptive Internet of Things and Web of Things convergence platform for Internet of reality services	Excluded
58	Scopus	2016	Rafiee & Shen	The impact of corporate response strategies to negative online word of mouth on complainers' brand attitude	Excluded
59	Scopus	2016	Tufiş	Challenges in building a publicly available reference corpus (Invited tutorial)	Excluded
60	Scopus	2016	Desrochers, Laplante, Martin, Quan-Haase, & Spiteri	Illusions of a "Bond": Tagging cultural products across online platforms	Excluded
61	Scopus	2015	Mohebifar & Sajadi	Chemozart: A web-based 3D molecular structure editor and visualizer platform	Excluded
62	Scopus	2015	Mandran, Ortega, Luengo, & Bouhineau	DOP8: Merging both data and analysis operators life cycles for technology enhanced learning	Excluded
63	Scopus	2015	Negi & Brohman	Co-creation of value in digital ecosystems: A conceptual framework	Excluded
64	Scopus	2014	Bagust	'Honey, they stole my Flickr!' Social network typologies, online trust and dissent, and the monetisation of immaterial labour	Excluded
65	Scopus	2014	Hidalgo & Malagón	Opportunities and challenges of building a books-as-a-service platform	Excluded
66	Scopus	2014	Grošelj	A webometric analysis of online health information: Sponsorship, platform type and link structures	Excluded
67	Scopus	2014	Ma, Melkote, & Castle	PVDF sensor-based monitoring of milling torque	Excluded
68	Scopus	2014	Gainsbury, Hing, Delfabbro, & King	A taxonomy of gambling and casino games via social media and online technologies	Excluded
69	Scopus	2014	Foerderer, Kude, & Schuetz	Add-on solution success: A configurational view on knowledge sharing in digital platforms	Included
70	Scopus	2014	Li, Cao, & Yang	Audio and video media asset management system based on cloud storage	Excluded
71	Scopus	2014	Kazan & Damsgaard	An investigation of digital payment platform designs: A comparative study of four European solutions	Excluded
72	Scopus	2014	Ssembatya & Zawedde	Issues of adoption: Can health services designed for developed countries be adopted in developing countries?	Excluded

73	Scopus	2013	Tashiro, Martin, & Hung	MISSED - Studying students' development of misconceptions in hybrid courses	Excluded
74	Scopus	2013	Enkling, Jöhren, Katsoulis, Jervøe-Storm, Mericske-Stern, & Jepsen	Influence of platform switching on bone-level alterations: A three-year randomized clinical trial	Excluded
75	Scopus	2013	Cha	Does genre type influence choice of video platform? A study of college student use of internet and television for specific video genres	Excluded
76	Scopus	2013	Ssembatya, Kayem, & Marsden	On the challenge of adopting standard EHR systems in developing countries	Excluded
77	Scopus	2013	Nishino, Wang, Tsuji, Kageyama, & Ueda	Five models of platform-type product service systems in manufacturing	Excluded
78	Scopus	2013	Elmeleegy, Li, Qi, Wilmot, Wu, Kolay, Dasdan, & Chen	Overview of turn data management platform for digital advertising	Excluded
79	Scopus	2013	Lee	Conjoint analysis for mobile devices for ubiquitous learning in higher education: The Korean case	Excluded
80	Scopus	2012	Bernabé Sanchez, Díaz-Sánchez, & Muñoz Organero	Flex-box: A flexible software architecture for IPTV set-top boxes	Excluded
81	Scopus	2012	Casey & Töyli	Dynamics of two-sided platform success and failure: An analysis of public wireless local area access	Included
82	Scopus	2012	Kang, Lu, & Lu	Reconfiguration of app stores for communications service providers	Excluded
83	Scopus	2012	Bento, e Silva, da Silva, & Okimoto	Assessment of parameters of accessibility based on the intuitive use	Excluded
84	Scopus	2011	Lee, Lee, & Kweon	Examining consumer preferences for mobile devices to read digital content for the diffusion of ubiquitous learning in higher education	Excluded
85	Scopus	2011	International Conference on Mobile Business	Proceedings - 2011 10th International Conference on Mobile Business, ICMB 2011	Excluded
86	Scopus	2011	Sands, Harper, & Ferraro	Customer-to-noncustomer interactions: Extending the 'social' dimension of the store environment	Excluded
87	Scopus	2011	Lee & Faulkner	The roles of extrinsic factors in a community of inquiry model of e-Learning	Excluded

88	Scopus	2011	Miller & Leake	Using courseware for more than courses: You may already hold the lease on a versatile virtual meeting space	Excluded
89	Scopus	2011	Clarkson & Hiscock	Estimating original flake mass from 3D scans of platform area	Excluded
90	Scopus	2010	Moore-Russo, Grantham, Lewis, & Bateman	Comparing physical and cyber-enhanced product dissection: Analysis from multiple perspectives	Excluded
91	Scopus	2010	Grantham, Moore-Russo, & Lewis	Comparing physical and cyber-enhanced dissection: An analysis from multiple perspectives	Excluded
92	Scopus	2010	Eubank, Atkins, & Ogura	Fault detection and fail-safe operation with a multiple-redundancy air-data system	Excluded
93	Scopus	2010	Abdellaoui, Gravier, Belmekki, & Fayolle	Towards the loose coupling between LMS and remote laboratories in online engineering education	Excluded
94	Scopus	2010	Lusch, Liu, & Chen	The phase transition of markets and organizations: The new intelligence and entrepreneurial frontier	Included
95	Scopus	2010	Gertskauser & Schirner	Platform modeling for exploration and synthesis	Excluded
96	Scopus	2010	Zhang, Lee, & Zhao	Understanding the informational social influence of online review platforms	Excluded
97	Scopus	2009	Kitayama, Lee, & Sumiya	A method of analyzing credibility based on LOD control of digital maps	Excluded
98	Scopus	2009	Belleflamme & Neysen	Coopetition in infomediation: General analysis and application to e-Tourism	Included
99	Scopus	2009	Cappos, Beschastnikh, Krishnamurthy, & Anderson	Seattle: A platform for educational cloud computing	Excluded
100	Scopus	2009	Bottaro, Gürgen, Vincent, Ottogalli, & Seyvoz	Software management of heterogeneous execution platforms	Excluded
101	Scopus	2009	Kitayama, Lee, & Sumiya	A credibility analyzing method of geographical objects from digital maps	Excluded
102	Scopus	2008	Rogers, Gibbons, & Tinney	Cross-cultural knowledge communication in online communities of practice	Excluded
103	Scopus	2007	Blair, Brown, Cromwell, Kim, & Milne	Porting lessons learned from Soldier Radio Waveform (SRW)	Excluded
104	Scopus	2007	Lee	3D urban modeling and rendering with high resolution remote sensing imagery on mobile 3D and web 3D environments system architecture and prototype implementation	Excluded

105	Scopus	2007	Lahdenoja, Laiho, Maunu, & Paasio	A massively parallel face recognition system	Excluded
106	Scopus	2006	Shin, Woo, & Park	An internet-based platform for structural analysis using component models	Excluded
107	Scopus	2006	Thirer & Souhami	Parallel processing for a DSP application using FPGA	Excluded
108	Scopus	2006	Reza, Lopez, & Reyes	Shared memory in Win32 for systems integration using file mapping	Excluded
109	Scopus	2006	Klafft & Spikerman	Reverse procurement and auctions for consumers: A new trend on the horizon of e-Commerce?	Excluded
110	Scopus	2004	Odijk	ScanSoft's technologies	Excluded
111	Scopus	2004	Ruotsalainen	A cross-platform model for secure electronic health record communication	Excluded
112	Scopus	2004	Odijk	Scansoft's technologies	Excluded
113	Scopus	2003	Long, Hunt, & Siemon	Applications for a software programmable space platform	Excluded
114	Scopus	2003	Goldshstein & Matveyev	Computer-aided coulometric control system	Excluded
115	Scopus	2002	Fournier	NewsML, a multimedia standard for information distribution	Excluded
116	Scopus	2002	Buranatned & Vickers	An investigation of the impact of mobile phone and PDA interfaces on the usability of mobile-commerce applications	Excluded
117	Scopus	2001	Deutsch, Latonio, Burdea, & Boian	Post-stroke rehabilitation with the Rutgers Ankle system: A case study	Excluded
118	Scopus	2001	Girone, Burdea, Bouzit, Popescu, & Deutsch	Stewart platform-based system for ankle telerehabilitation	Excluded
119	Scopus	2000	Grunsky	The International Association for Mathematical Geology WWW/FTP site: An analysis of the first five years and some thoughts for the future	Excluded
120	Scopus	1997	Chadwick	Design and simulate air circuits on your PC	Excluded
121	ProQuest	2019	Santini & Carvalho	The rise of participatory despotism: A systematic review of online platforms for political engagement	Excluded
122	ProQuest	2019	Ciulli, Kolk, & Boe-Lillegraven	Circularity brokers: Digital platform organizations and waste recovery in food supply chains	Excluded

123	ProQuest	2019	Riso, Tupasela, Vears, Felzmann, Cockbain, Loi, Kongsholm, Zullo, & Rakic	Ethical sharing of health data in online platforms - Which values should be considered?	Excluded
124	ProQuest	2019	MacDonald	How digital platforms have become double-edged swords	Included
125	ProQuest	2019	Bliss & Dalto	Technical communication: Key elements for the safety practitioner	Excluded
126	ProQuest	2010	Goode	Exploring the supply of pirate software for mobile devices: An analysis of software types and piracy groups	Excluded
127	ProQuest	2017	Orellana	Digitalizing collaboration	Excluded
128	ProQuest	2016	Geum, Jeon, & Lee	Developing new smart services using integrated morphological analysis: Integration of the market-pull and technology-push approach	Excluded
129	ProQuest	2016	Economic Indicators	Chapter 5: Technology and Innovation	Excluded
130	ProQuest	2019	Jabagi, Croteau, Audebrand, & Marsan	Gig-workers' motivation: Thinking beyond carrots and sticks	Excluded
131	ProQuest	2017	Sim & Plewa	Customer engagement with a service provider and context: An empirical examination	Excluded
132	ProQuest	2012	Pink	The benefits of continuing education online	Excluded
133	ProQuest	2010	Pink	The benefits of continuing education online	Excluded
134	ProQuest	2018	Berman, Davidson, Ikeda, & Marshall	Navigating disruption with ecosystems, partners and platforms	Excluded
135	ProQuest	2014	Nesterowicz, Librowski, & Edelbring	Validating e-Learning in continuing pharmacy education: User acceptance and knowledge change	Excluded
136	ProQuest	2019	Bramblet & Lehman	Unlocking the potential	Excluded
137	ProQuest	2019	Diamond, Drury, Lipp, Marshall, Shanker, & Likhit	The future of banking in the platform economy	Excluded
138	ProQuest	2017	Uneke, Sombie, Keita, Lokossou, Johnson, & Ongolo-Zogo	Improving maternal and child health policymaking processes in Nigeria: An assessment of policymakers needs, barriers and facilitators of evidence-informed policymaking	Excluded
139	ProQuest	2019	Wirtz, So, Mody, Liu, & Chun	Platforms in the peer-to-peer sharing economy	Excluded

140	ProQuest	2018	Bakanauskas & Kisieliauskas	Building a travel influencer brand using Instagram tools	Excluded
141	ProQuest	2013	Khiabani, Idris, & Ab Manan	Unified trust establishment by leveraging remote attestation - Modeling and analysis	Excluded
142	ProQuest	2014	Cohen	Electronic signatures: Convenient and enforceable	Excluded
143	ProQuest	2002	Piazza	NIST releases raft of resources	Excluded
144	ProQuest	2016	Kim, Sohn, Lee, & Chung	DRR technology sharing and transfer through web-based platforms	Excluded
145	ProQuest	2017	Cryts	Tech trends to watch	Excluded
146	ProQuest	2016	Attour & Peruta	Architectural knowledge: Key flows and processes in designing an inter-organisational technological platform	Included
147	ProQuest	2016	Cloughley	Navigating the start-up airways - The hybrid game changer!	Excluded
148	ProQuest	2016	Byrum & Bingham	Improving analytics capabilities through crowdsourcing	Excluded
149	ProQuest	2015	Karunakaran, Krishnaswamy, & Sundarraj	Business view of cloud: Decisions, models and opportunities - A classification and review of research	Excluded
150	ProQuest	2003	Gottschalk & Khandelwal	Determinants of knowledge management technology projects in Australian law firms	Excluded
151	ProQuest	2015	Trees	Encouraging millennials to collaborate and learn on the job	Excluded
152	ProQuest	2018	Jamison	Disease control priorities , 3rd edition: Improving health and reducing poverty	Excluded
153	ProQuest	2017	Li, Juric, & Brodie	Dynamic multi-actor engagement in networks: The case of United Breaks Guitars	Excluded
154	ProQuest	2010	Medical Letter on the CDC & FDA	Research and markets; Global SMS infrastructure markets	Excluded
155	ProQuest	2019	Berkowitz & Souchaud	(Self-)regulation of sharing economy platforms through partial meta-organizing	Excluded
156	ProQuest	1998	Cupito	Upgrading the infrastructure	Excluded
157	ProQuest	2011	Health & Medicine Week	Archaeological science; Study findings from University of Queensland broaden understanding of archaeological science	Excluded
158	ProQuest	2013	Nation	Should your practice be focused on blogging or Facebook - Or both?	Excluded
159	ProQuest	1997	Jarvis	Demystifying computer viruses	Excluded

160	ProQuest	2018	Jamison, Alwan, Mock, Nugent, Watkins, Adeyi, Anand, Atun, Bertozzi, Bhutta, Binagwaho, Black, Blecher, Bloom, Brouwer, Bundy, Chisholm, Cieza, Cullen, ... Zhao	Universal health coverage and intersectoral action for health: Key messages from disease control priorities, 3 rd edition	Excluded
161	ProQuest	1998	Ruggles	The state of the notion: Knowledge management in practice	Excluded
162	ProQuest	2016	Harrison, Radhakrishnan, Lam, Allocco, Brar, Fahy, Fisher, Ikeno, Génereux, Kimura, Liu, Lye, Mintz, Nagai, Suzuki, White, Allen, & Krucoff	Rationale and design of the East-West late lumen loss study: Comparison of late lumen loss between eastern and western drug-eluting stent study cohorts	Excluded
163	ProQuest	2015	Rocha & Freixo	Information architecture for quality management support in hospitals	Excluded
164	EBSCOhost	2019	McDonall, Hutchinson, Redley, Livingston, & Botti	Usability and feasibility of multimedia interventions for engaging patients in their care in the context of acute recovery: A narrative review	Excluded
165	EBSCOhost	2019	Tarr & Alvarez León	Will review for points: The unpaid affective labour of placemaking for Google's 'Local Guides'	Excluded
166	EBSCOhost	2019	Nelson, Moore, & Swanson	Fashion and social networking: A motivations framework	Excluded
167	EBSCOhost	2019	Hua	China's industrial internet development: Viewed from a consumer-internet perspective	Excluded
168	EBSCOhost	2019	MacDonald	How digital platforms have become double-edged swords	Excluded
169	EBSCOhost	2018	Jiang, Wang, Wang, & Ding	Loan default prediction by combining soft information extracted from descriptive text in online peer-to-peer lending	Excluded
170	EBSCOhost	2017	Danneels, Viaene, & Van den Bergh	Open data platforms: Discussing alternative knowledge epistemologies	Excluded
171	EBSCOhost	2017	Steinberg & Li	Introduction: Regional platforms	Excluded
172	EBSCOhost	2017	Kwon, Oh, & Kim	Platforms structures, homing preferences, and homophilous propensities in online social networks	Excluded

173	EBSCOhost	2017	Swist & Collin	Platforms, data and children's rights: Introducing a 'networked capability approach'	Excluded
174	EBSCOhost	2016	Hidas, Proctor, Atkins, Atkinson, Besnard, Blain, Bohm, Burgess, Finney, Fruehauf, Galibert, Hoenner, Hope, Jones, Mancini, Pasquer, Nahodil, Reid, & Tattersall	Information infrastructure for Australia's Integrated Marine Observing System	Excluded
175	EBSCOhost	2016	Kuchta & Miklošik	Refining digital marketing taxonomies: Advertising platforms and digital metrics	Included
176	EBSCOhost	2015	Mohebifar & Sajadi	Chemozart: A web-based 3D molecular structure editor and visualizer platform	Excluded
177	EBSCOhost	2014	Eremenco, Coons, Paty, Coyne, Bennett, & McEntegart	PRO data collection in clinical trials using mixed modes: Report of the ISPOR PRO mixed modes good research for practices task force	Excluded
178	EBSCOhost	2014	Xu & Ignatov	In situ SST quality monitor (iQuam)	Excluded
179	EBSCOhost	2013	Gudenas	The variety of e-Book platforms for textbooks on mobile devices	Excluded
180	EBSCOhost	2012	Calderón, García-Carballeira, Bergua, Sánchez, & Carretero	Expanding the volunteer computing scenario: A novel approach to use parallel applications on volunteer computing	Excluded
181	EBSCOhost	2011	Ordysiński	Ontology of e-Commerce solution	Excluded
182	EBSCOhost	2011	Schell	Systems evolve for a new multichannel world	Excluded
183	EBSCOhost	2011	Clarkson & Hiscock	Estimating original flake mass from 3D scans of platform area	Excluded
184	EBSCOhost	2010	Smart Business Tampa Bay	The cloud -- Why now?	Excluded
185	EBSCOhost	2010	Chamberlain, Franklin, Tyson, Buckley, Buhler, Galloway, Gayen, Hall, Shands, & Singla	Auto-Pipe: Streaming applications on architecturally diverse systems	Excluded
186	EBSCOhost	2009	Karpinski	Help is here for publishers looking to boost ad yield	Excluded
187	EBSCOhost	2008	Benoit & Robert	Mapping pipeline skeletons onto heterogeneous platforms	Excluded

188	EBSCOhost	2007	Cravotta	Robots on the march	Excluded
189	EBSCOhost	2006	Schwartz	Getting cryptic	Excluded
190	EBSCOhost	2006	Microwave Journal	A 20 to 2500 MHz, 20 W solid-state amplifier	Excluded
191	EBSCOhost	2005	Brown & Galli	e-Learning goes mainstream	Excluded
192	EBSCOhost	2004	Duguet & Drettakis	Flexible point-based rendering on mobile devices	Excluded
193	EBSCOhost	2004	Ruotsalainen	A cross-platform model for secure electronic health record communication	Excluded
194	EBSCOhost	2002	Smith	Microsoft goes blue and compact	Excluded
195	EBSCOhost	2001	Shan & Singh	A comparison of MPI, SHMEM and cache-coherent shared address space programming models on a tightly-coupled multiprocessors	Excluded
196	EBSCOhost	2001	Brown	The inevitability of consolidation	Excluded
197	EBSCOhost	2000	Robertshaw	Coming attractions	Excluded
198	EBSCOhost	1997	Nass	Mobile NCs must get more intelligent	Excluded
199	EBSCOhost	1997	Carter	Tailor-made	Excluded
200	EBSCOhost	1997	Houts	StoreManager 2.0: Online catalogs for the rest of us	Excluded
201	EBSCOhost	1995	Rizzo	Cross-platform myths debunked	Excluded
202	Google	2015	Oxera	Benefits of online platforms	Included
203	Google	2017	Uenlue	The complete guide to the revolutionary platform business model	Included
204	Google Scholar	2018	Täuscher & Laudien	Understanding platform business models: A mixed methods study of marketplaces	Included

Appendix T

Summary of Utilized Articles for Coding Tree: Platform Structure and Function

PLATFORM STRUCTURE AND FUNCTIONS (n=60)

- Andreassen, Lervik-Olsen, Snyder, Van Riel, Sweeney, & Van Vaerenbergh (2018)
- Attour & Perute (2016)
- Baron & Mathieu (2013)
- Belleflamme & Neysen (2009)
- Berman, Davidson, Ikeda, & Marshall (2018)
- Bivona & Cosenz (2019)
- Breidbach, Brodie, & Hollebeck (2014)
- Brown (2016)
- Campbell-Kelly, Garcia-Swartz, Lam, & Yang (2015)
- Casey & Töyli (2012)
- Davidson, Giesen, Harmer, & Marshall (2018)
- Ding, Ye, & Wu (2019)
- Drewel, Gausemeier, Koldewey, & Özcan (2018)
- Farrelly & Chew (2019)
- Fehrer, Woratschek, & Brodie (2018)
- Foerderer, Schuetz, & Kude (2014)
- Fu, Wang, & Zhao (2017)
- Gatautis (2017)
- Guo & Bouwman (2016)
- Hänninen, Mitronen, & Kwan (2019)
- Hänninen & Smedlund (2019)
- Hänninen, Smedlund, & Mitronen (2018)
- Heine, Kuper, & Neururer (2018)
- Ikeda & Marshall (2019)
- Kenney & Pon (2011)
- Kiesling (2018)
- Kim (2016)
- Kim & Min (2019)
- Kuchta & Miklošik (2016)
- Lee, Kim, Noh, & Lee (2010)
- Lusch, Liu, & Chen (2010)
- MacDonald (2019)
- Mack & Veil (2016)
- Mancha, Gordon, & Stoddard (2019)
- Mirza & Beltrán (2013)
- Moser & Gassmann (2016)
- Moser, Wecht, & Gassmann (2017)
- Mukhopadhyay, Bouwman, & Jaiswal (2019)
- Olleros & Zhegu (2014)
- Oxera (2015)
- Pon, Seppälä, Kenney (2014)
- Pon, Seppälä, Kenney (2015)
- Posner & Mangelsdorf (2017)
- Rong, Lin, Shi, & Yu (2013)
- Rong, Xiao, Zhang, & Wang, (2019)
- Rosner (2019)
- Ruggieri, Savasto, Scalingi, Bala, & D'Ascenzo (2018)
- Sampler (2018)
- Singh & Srivastava (2019)
- Sorescu, Frambach, Singh, Rangaswamy, & Bridges (2011)
- Sorri, Seppänen, Still, & Valkokari (2019)
- Steinberg & Li (2017)
- Suarez & Kirtley (2012)
- Täuscher & Laudien (2018)
- Teece (1986)
- Uenlue (2017)
- Wang & Lobato (2019)
- Yablonsky (2018)
- Zehir, Zehir, & Zehir (2019)
- Zhao, von Delft, Morgan-Thomas, & Buck (2019)

Interactive Interface (n=29)

- Andreassen, Lervik-Olsen, Snyder, Van Riel, Sweeney, & Van Vaerenbergh (2018)
- Attour & Perute (2016)
- Baron & Mathieu (2013)
- Berman, Davidson, Ikeda, & Marshall (2018)
- Bivona & Cosenz (2019)
- Drewel, Gausemeier, Koldewey, & Özcan (2018)
- Farrelly & Chew (2019)
- Fehrer, Woratschek, & Brodie (2018)
- Foerderer, Schuetz, & Kude (2014)
- Ikeda & Marshall (2019)
- Kenney & Pon (2011)
- Kiesling (2018)
- Kim (2016)
- Kuchta & Miklošik (2016)
- Lee, Kim, Noh, & Lee (2010)
- MacDonald (2019)
- Mirza & Beltrán (2013)
- Moser & Gassmann (2016)
- Mukhopadhyay, Bouwman, & Jaiswal (2019)
- Pon, Seppälä, Kenney (2014)
- Pon, Seppälä, Kenney (2015)
- Rong, Lin, Shi, & Yu (2013)
- Rong, Xiao, Zhang, & Wang, (2019)
- Sampler (2018)
- Suarez & Kirtley (2012)
- Teece (1986)
- Wang & Lobato (2019)
- Yablonsky (2018)
- Zehir, Zehir, & Zehir (2019)

Technological Requirements (n=23)

- Andreassen, Lervik-Olsen, Snyder, Van Riel, Sweeney, & Van Vaerenbergh (2018)
- Attour & Perute (2016)
- Baron & Mathieu (2013)
- Bivona & Cosenz (2019)
- Drewel, Gausemeier, Koldewey, & Özcan (2018)
- Farrelly & Chew (2019)
- Fehrer, Woratschek, & Brodie (2018)
- Foerderer, Schuetz, & Kude (2014)
- Ikeda & Marshall (2019)
- Kenney & Pon (2011)
- Kiesling (2018)
- Kuchta & Miklošik (2016)
- Lee, Kim, Noh, & Lee (2010)
- Moser & Gassmann (2016)
- Mukhopadhyay, Bouwman, & Jaiswal (2019)
- Pon, Seppälä, Kenney (2014)
- Pon, Seppälä, Kenney (2015)
- Rong, Lin, Shi, & Yu (2013)
- Rong, Xiao, Zhang, & Wang, (2019)
- Suarez & Kirtley (2012)
- Teece (1986)
- Wang & Lobato (2019)
- Zehir, Zehir, & Zehir (2019)

Organizational Aspects (n=12)

- Baron & Mathieu (2013)
- Berman, Davidson, Ikeda, & Marshall (2018)
- Bivona & Cosenz (2019)
- Kiesling (2018)
- Kim (2016)
- Lee, Kim, Noh, & Lee (2010)
- MacDonald (2019)
- Mirza & Beltrán (2013)
- Rong, Lin, Shi, & Yu (2013)
- Sampler (2018)
- Wang & Lobato (2019)
- Yablonsky (2018)

Network Formulation (n=49)

- Andreassen, Lervik-Olsen, Snyder, Van Riel, Sweeney, & Van Vaerenbergh (2018)
- Belleflamme & Neysen (2009)
- Berman, Davidson, Ikeda, & Marshall (2018)
- Bivona & Cosenz (2019)
- Breidbach, Brodie, & Hollebeek (2014)
- Brown (2016)
- Campbell-Kelly, Garcia-Swartz, Lam, & Yang (2015)
- Casey & Töyli (2012)
- Davidson, Giesen, Harmer, & Marshall (2018)
- Ding, Ye, & Wu (2019)
- Drewel, Gausemeier, Koldewey, & Özcan (2018)
- Fehrer, Woratschek, & Brodie (2018)
- Foerderer, Schuetz, & Kude (2014)
- Fu, Wang, & Zhao (2017)
- Gatautis (2017)
- Guo & Bouwman (2016)
- Hänninen, Mitronen, & Kwan (2019)
- Hänninen & Smedlund (2019)
- Hänninen, Smedlund, & Mitronen (2018)
- Heine, Kuper, & Neururer (2018)
- Ikeda & Marshall (2019)
- Kenney & Pon (2011)
- Kiesling (2018)
- Lee, Kim, Noh, & Lee (2010)
- Lusch, Liu, & Chen (2010)
- MacDonald (2019)
- Mack & Veil (2016)
- Mancha, Gordon, & Stoddard (2019)
- Moser & Gassmann (2016)
- Moser, Wecht, & Gassmann (2017)
- Mukhopadhyay, Bouwman, & Jaiswal (2019)
- Olleros & Zhegu (2014)
- Oxera (2015)
- Pon, Seppälä, Kenney (2014)
- Pon, Seppälä, Kenney (2015)
- Posner & Mangelsdorf (2017)
- Rong, Xiao, Zhang, & Wang, (2019)
- Rosner (2019)
- Ruggieri, Savasto, Scalingi, Bala, & D'Ascenzo (2018)
- Singh & Srivastava (2019)
- Sorescu, Frambach, Singh, Rangaswamy, & Bridges (2011)
- Sorri, Seppänen, Still, & Valkokari (2019)
- Steinberg & Li (2017)
- Suarez & Kirtley (2012)
- Täuscher & Laudien (2018)
- Uenlue (2017)
- Yablonsky (2018)
- Zehir, Zehir, & Zehir (2019)
- Zhao, von Delft, Morgan-Thomas, & Buck (2019)

Types of Platforms (n=9)

- Belleflamme & Neysen (2009)
- Drewel, Gausemeier, Koldewey, & Özcan (2018)
- Foerderer, Schuetz, & Kude (2014)
- Gatautis (2017)
- Heine, Kuper, & Neururer (2018)
- MacDonald (2019)
- Olleros & Zhegu (2014)
- Oxera (2015)
- Steinberg & Li (2017)

Formulating Relationships (n=40)

- o Andreassen, Lervik-Olsen, Snyder, Van Riel, Sweeney, & Van Vaerenbergh (2018)
- o Berman, Davidson, Ikeda, & Marshall (2018)
- o Bivona & Cosenz (2019)
- o Breidbach, Brodie, & Hollebeek (2014)
- o Brown (2016)
- o Campbell-Kelly, Garcia-Swartz, Lam, & Yang (2015)
- o Casey & Töyli (2012)
- o Davidson, Giesen, Harmer, & Marshall (2018)
- o Ding, Ye, & Wu (2019)
- o Fehrer, Woratschek, & Brodie (2018)
- o Fu, Wang, & Zhao (2017)
- o Guo & Bouwman (2016)
- o Hänninen, Mitronen, & Kwan (2019)
- o Hänninen & Smedlund (2019)
- o Hänninen, Smedlund, & Mitronen (2018)
- o Ikeda & Marshall (2019)
- o Kenney & Pon (2011)
- o Kiesling (2018)
- o Lee, Kim, Noh, & Lee (2010)
- o Lusch, Liu, & Chen (2010)
- o Mack & Veil (2016)
- o Mancha, Gordon, & Stoddard (2019)
- o Moser & Gassmann (2016)
- o Moser, Wecht, & Gassmann (2017)
- o Mukhopadhyay, Bouwman, & Jaiswal (2019)
- o Pon, Seppälä, Kenney (2014)
- o Pon, Seppälä, Kenney (2015)
- o Posner & Mangelsdorf (2017)
- o Rong, Xiao, Zhang, & Wang, (2019)
- o Rosner (2019)
- o Ruggieri, Savasto, Scalingi, Bala, & D'Ascenzo (2018)
- o Singh & Srivastava (2019)
- o Sorescu, Frambach, Singh, Rangaswamy, & Bridges (2011)
- o Sorri, Seppänen, Still, & Valkokari (2019)
- o Suarez & Kirtley (2012)
- o Täuscher & Laudien (2018)
- o Uenlue (2017)
- o Yablonsky (2018)
- o Zehir, Zehir, & Zehir (2019)
- o Zhao, von Delft, Morgan-Thomas, & Buck (2019)