iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** V **Month of publication:** May 2020

DOI: http://doi.org/10.22214/ijraset.2020.5135

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue V May 2020- Available at www.ijraset.com

Servitization Implementation in Manufacturing Organizations - A Systematic Review to Identify Obstacles and Critical Success Factors

Alok Tewari
University of Maryland Global Campus

Abstract: ***The move from product-centric to the service-centric business model, also known as servitization, directly impacts the end-users, i.e., customers, in terms of getting superior value-added services and experiences in using products.*** *Purpose****: The purpose of this paper is to bridge the existing knowledge gap in the available literature on servitization by identifying the obstacles and critical success factors towards the implementation of servitization in manufacturing organizations.*** *Method****: A systematic review of 22 academic articles has been conducted to formulate the recommendations. Entire research is presented from the lens of four guiding theories in the areas of resources, capabilities, innovation, and information.*** *Findings****: This paper identifies 13 obstacles towards adoption and recommends 17 critical success factors towards the successful implementation of servitization within the manufacturing organizations.*** *Limitations****: The findings need to be validated with industry leaders.*** *Implications****: This article presents the findings in the form of a conceptual framework and a managerial checklist. They will aid with the decision making within the domain of servitization.*** *Originality/Value****: The advent of industry 4.0 related manufacturing technologies is aiding in servitization adoption. The details presented in this article will lead to a better understanding of obstacles that management faces and the critical success factors that can lead to successful implementation of servitization.***

Keywords: servitization; manufacturing; obstacles; success; implementation, technology, industry 4.0

I. SERVITIZATION IMPLEMENTATION IN MANUFACTURING ORGANIZATIONS

The general problem within the manufacturing industry are the risks associated with changing the business models when moving from being a pure product manufacturer to providing services in support of the products, a move also known as servitization (Vandermerwe & Rada, 1988). The specific problem with servitization in the manufacturing industry are the obstacles faced by the organizations during the implementation. The purpose of this research is twofold. First, the primary purpose of this research is to identify the critical success factors that contribute to the successful implementation of servitization models in manufacturing companies globally. The second purpose is to identify the obstacles that impact the adoption of servitization models within the manufacturing industry. By understanding the obstacles and identifying the critical success factors, as part of future studies, a holistic roadmap may be created to support the move towards servitization. Two research questions have been formulated to guide the research. Leveraging systematic review of academic articles, and displaying rigor and transparency, the research questions have been addressed along with documenting the findings, identifying managerial implications, and documenting limitations, recommendations for future, and conclusion.

II. BACKGROUND

The concepts of products and services in the manufacturing industry has been in existence since the beginning of the manufacturing industry itself. The movement from pure product manufacturer continuum to service providers has been relatively recent (Gebauer & Friedli, 2005). "Servitization is the transformation of a firm from taking a product to taking a service-centric approach. It represents a significant change in the business model and mission of the firm, whereby the service business serves as a growth engine of the firm" (Raddats, Kowalkowski, Benedettini, Burton, & Gebauer, 2019).

A. Move to Servitization

Manufactured products can be sold either once for a fixed sum or can be sold as a service with recurring revenue over the product lifetime with services revenues being potentially one or two orders of magnitude higher than new product sales (Ambroise, Prim-Allaz, & Teyssier, 2018; Gebauer & Friedli, 2005). One of many reasons to move to servitization is to generate additional revenue

©IJRASET: All Rights are Reserved

streams through services business when the manufacturing products have generally attained a maturity stage. Gebauer and Friedli (2005) state that "because of stagnating product sales and a high installed base of products, these firms attempt to move from product manufacturing to service provision by extending their service business."

B. Potential Significance

The potential significance of this research is to bring the obstacles and the critical success factors that contribute to the successful implementation of servitization in one article as a comprehensive whole. "The digitalization of users, things, manufacturers, and service providers in the cloud-based environment provides potential service innovation opportunities" (Peillon & Dubruc, 2019). With the advent of the latest technological evolutions such as cloud technologies, IoT, etc., the concepts and process of servitization implementation have had a profound impact on business models as well as being extremely relevant to the management of manufacturing industries.

C. Implications for Positive Social Change

The move from product-centric to the service-centric business model, directly impacts the end-users, i.e., customers, in terms of getting superior value-added services and experiences in using products. "The value of service lies in the cooperation of the provider and the customer, rather than the creation of the product by the producer and the delivery of products to the customer" (Yang & Chiu, 2014). The details presented in this article and the managerial recommendations will lead to a better understanding of obstacles and barriers that management faces and the critical success factors that can lead to successful implementation or servitization models, thereby benefiting the end consumers of products.

D. Research Gap

Academic literature is relatively scarce on servitization. The word "servitization" itself was coined in 1988 in an article by Vandermerwe and Rada (1988). While the information presented in this research is touched upon in various distinct articles, this is perhaps the first article to bring the barriers impacting the adoption of servitization in manufacturing industry as well as highlighting the critical success factors that attribute to the successful implementation of servitization in one article as a comprehensive whole. Leveraging the four inter-related focus areas of resources, capabilities, innovation, and information, organizations can create a strategic roadmap for a successful move to servitization.

III. RESEARCH METHOD

A systematic review of the existing academic literature published in reputed journals has been conducted. The principles of evidence-based management have been leveraged which include the conscientious, explicit and judicious use of the best available evidence by asking, acquiring, appraising, aggregating, applying, and assessing the outcome of the decision to increase the likelihood of a favorable outcome (Barends, Rousseau, & Briner, 2014). The stages of research activity include formulating the research question, defining studies to be considered, searches for studies, screening of studies, identifying quality and relevance assessment fit using weight of evidence framework, and synthesizing the studies (Gough, 2007). Four guiding theories were leveraged to assist with focusing the research and putting them in perspective by leveraging four different lenses.

A. Research Question

Two research questions (RQ) were formulated to address the research. The first RQ is: "What are the obstacles impacting the adoption of servitization models in the manufacturing industry globally?", and the second RQ is: "What critical success factors attribute to the successful implementation of servitization models in mid-size manufacturing companies?".

The context or population of interest has been identified as manufacturing firms globally. The intervention or primary cause to investigate are the obstacles and critical success factors that support the implementation of servitization models. The mechanism consists of multiple research studies that were reviewed across various databases to understand the impact of the servitization on the organization. The primary outcome of this research is to find relevant evidence to address the question and, after that, to identify practical, evidence-based outcomes that ensure management's success in attaining their goals.

B. Guiding Theories

The move to servitization is a strategic decision taken by any organization as it impacts all the facets of the organization, including culture, finance, operations, sales, marketing, services, technology, etc. Four pillars have been established, namely resources,

©IJRASET: All Rights are Reserved

capabilities, innovation, and information, to guide this research and synthesize the results from four different lenses. A theoretical framework was created (Appendix A) that defines the interrelations between all the four pillars that support the critical success factors for implementing servitization models. The four pillars are based on the following four theories that support strategic management.

First, the resource-based theory guides the resource aspects of this research. It contends that the possession of strategic resources, including competencies and capabilities rather than its positioning in the chosen markets, provides an organization with an opportunity to develop competitive advantages over its competitors (Barney, 1991).

Second, the dynamic capabilities theory which guides the capabilities aspect of this research relates to the organization and its management's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece, 2014). Servitization impacts the entire organization, and leveraging the dynamic capabilities theory can guide the change management aspects throughout the entire organization.

Third, the diffusion of innovation theory explains how, over time, an idea or product gains momentum and diffuses through a specific population or social system (Rogers, 2003). The move to servitization is a strategic and innovative concept for product-based organizations. Leveraging the diffusion of innovation theory guides the concepts of innovation adoption within the firms.

Finally, the theory of bounded rationality is the idea that in decision-making, rationality of individuals is limited by the information they have, the cognitive limitations of their minds, and the finite amount of time they have to make a decision (Simon, 1972). The theory of bounded rationality is an appropriate theory to guide the information related aspects of this research.

C. Study Selection

A systematic review of existing literature (peer-reviewed scholarly articles) in academic databases was conducted as part of this research. Also, a boolean search was conducted in the UMGC OneSearch tool, which consists of numerous databases, including business source complete, emerald insight, JSTOR, science direct, etc. among others. The initial search was conducted only on the keyword "servitization" to gather the extent of existing literature in all databases. It provided a total of unique 472 articles overall with no exclusion criteria applied. Filtering the results from 2017 onwards provided the total article count of 228, which provides an impression that a large amount of existing literature on servitization has been created in the last few years aided by the advancement of manufacturing technologies.

For selecting the articles in this study, a search string was utilized (Appendix B). A total of 20 articles were selected using the string. The inclusion criteria for the search string included academic peer-reviewed articles published since 2017. An additional nine articles were selected using the snowball search method. The preferred reporting items for systematic reviews and meta-analysis (PRISMA) flow diagram for literature search and selection process are provided in Appendix C. The list of articles is included in Appendix D.

D. Quality and Relevance Assessment Fit

Quality and relevance assessment fit using the weight of the evidence framework (Gough, 2007) was conducted for all the selected articles. Overall results are presented in Appendix E. A total of 22 articles were selected for further coding and synthesis.

E. Coding Details - Prisma

A systematic review of 22 articles was performed. All articles were code using MaxQDA software, leading to a total of 383 coded segments. The codes leveraged to assess the articles have been reflected in Appendix F. The coded segments helped with the synthesis by looking at them from the lens of four guiding theories.

IV. FINDINGS

Synthesizing the evidence from the 22 articles reviewed as part of this study, the findings that help answer the research questions are presented in this section. Specifically, both obstacles and critical success factors for implementing servitization are presented under the four domains of resources, capabilities, innovation, and information.

A. Obstacles Impacting Adoption of Servitization Models

Based on the thematic analysis, 13 obstacles have been identified as impacting the adoption of servitization models in the manufacturing industry. The purpose of this section is to highlight the obstacles. The recommendations and managerial implications for overcoming these obstacles have been defined in the subsequent sections.

©IJRASET: All Rights are Reserved

B. Resources - Existing Culture As A Resistance To Change

Manufacturing companies globally have a process in place for the product being manufactured along with the culture that supports it. "Overcoming the strong manufacturing culture associated with the existing business model was explicitly identified as being a barrier to servitization intent" (Crowley, Burton, & Zolkiewski, 2018). The adoption of servitization models, including customer-centric service culture, introduces newer processes and technologies to the organizations that existing employees may not be comfortable with (T. S. Baines, Lightfoot, Benedettini, & Kay, 2009; Peillon & Dubruc, 2019; Rymaszewska, Helo, & Gunasekaran, 2017).

C. Resources - Service Paradox - Trying To Do It Alone

Servitization is not a standalone process that can be implemented within the manufacturing organization on its own, as its success is dependent upon many different vendors, partners, suppliers, and other network actors (Raddats et al., 2019). Raddats et al. (2019) go on to explain citing other authors that "if servitization is only seen as a manufacturer-focused transition, then it might explain why some companies fail to achieve success with services, the so-called 'service paradox.'"

D. Resources - Lack Of Relationships As A Barrier

Difficulties in developing appropriate relationships with counterparts in manufacturing due to newness to the relationship as well as learning about each other's capabilities may be impeded if good working relationships between managers do not exist (Raddats et al., 2017). Servitization requires building newer service-oriented partnerships across the manufacturing industry value chain, which may be difficult for established companies that are used to the current state of the process.

E. Resources - Employee Change Constraints

Within manufacturing industries, employee's thoughts about servitization may be bounded by the constraints of a product-centric manufacturing heritage (Crowley et al., 2018). It will take a coordinated and collaborative change management approach to explain the benefits of servitization to all the employees, along with explaining the value proposition for the end customers of service.

F. Capabilities - Lack Of Managerial Experience

Constraints resulting from a limited breadth of managerial experience, as well as the influence of the executive's prior experiences, are considered barriers to change that have to be overcome (Crowley et al., 2018). Manufacturing industries traditionally promote employment for life, which makes it challenging to promote newer concepts such as servitization to the existing employees without extensive retraining effort.

G. Capabilities - Organizational Structure As A Barrier

Organizational rigidity, failure to establish the necessary organizational structures and processes, organizational boundary fuzziness and process ownership problems have been identified as organizational structure barriers to the implementation of servitization models (T. Baines, Lightfoot, & Smart, 2011; Batista, Davis-Poynter, Ng, & Maull, 2017; Crowley et al., 2018; Gebauer & Friedli, 2005; Peillon & Dubruc, 2019). Leadership support and a conscious effort is needed to overcome the organizational structure as a barrier.

H. Capabilities - Risk Aversion

The risk of failure with servitization models is high as servitization requires business model innovation in terms of not selling the product to the customers, but retaining the ownership and associated costs, hence the risk (Ambroise et al., 2018). A detailed risk management plan is needed to anticipate, plan, and mitigate the risks. "Managers prefer risk free outcomes from investing resources in products to the uncertain outcome of investing in services." (Gebauer & Friedli, 2005).

I. Capabilities - Lack Of Internal Technical Capabilities

An extensive set of partners, networks, and internal and external capabilities are needed to move to servitization models and to substitute for lack of internal technical capabilities as there is no previous internal work providing tools, processes, and guidelines (Peillon & Dubruc, 2019; Raddats et al., 2017). "Being more labor-intensive and less technology-intensive, most traditional manufacturers cannot meet the requirement of knowledge-based economy" (Yang & Chiu, 2014).

©IJRASET: All Rights are Reserved

J. Capabilities - Lack Of Customer Relationship Management Tools

Customer relationship is the key to any successful outcome. "The most significant issues that emerged regarding digitalization are customer-related: how to deploy and use efficiently a CRM software; how to monitor the customer use of their equipment within its production process; how to secure data exchanges" (Peillon & Dubruc, 2019). The move from being a product manufacturer to becoming a customer service company requires learning and effectively using customer relationship management (CRM) software.

K. Information - Lack Of Clarity On Economic Potential

This obstacle has been the most substantial risk area reflected in multiple articles. "The intangible nature of services and the hybrid architecture of product and service modules, however, increase the complexity of exploiting the benefits of a platform approach and can result in high costs." (Cenamor, Rönnberg Sjödin, & Parida, 2017). Lack of understanding of the economic potential, higher revenues and lower profit margins with servitization, increased need for investment towards business transformation, and need for higher labor costs and working capital are all facets reflected in various articles as obstacles to servitization (Ambroise et al., 2018; Gebauer & Friedli, 2005; Lin, Luo, Ieromonachou, Rong, & Huang, 2019; Rymaszewska et al., 2017).

L. Information - Technological Complexity

Citing various authors, Peillon and Dubruc (2019) have talked about the complex nature of technologies such as the Internet of things (IoT), data and analytics, cloud computing, cybersecurity, artificial intelligence, etc. The authors go on to explain that traditional manufacturing companies do not have the technical resources available to assist with servitization.

M. Information - Lack Of Servitization Intent

Reliance on historical revenue models and lack of motivation to disrupt the existing models can create dissonance within the organization and hence, the lack of cohesive intent to servitize (Crowley et al., 2018). A business strategy supported by effective change management, training, and communication is needed to motivate employees to support the servitization intent.

N. Innovation - Lack Of Strategic Vision

Servitization is not a standalone product or service and needs to be deeply integrated within the existing organizational structure, which generates its own set of challenges (Vandermerwe & Rada, 1988). "The nature of manufacturing and the limiting implication of offering a tangible product that has little potential to create opportunities for profit generation – rather than during the sales process itself – have led to a shift towards bundling a product and service together." (Rymaszewska et al., 2017). A comprehensive roadmap supporting the servitization vision and organizational change is needed to overcome this obstacle.

O. Critical Success Factors Attributing to Successful Implementation of Servitization

There are numerous examples of organizations that are leveraging servitization concepts. Ricoh (Crowley et al., 2018), Xerox, Voith industrial services (Kowalkowski, Gebauer, Kamp, & Parry, 2017), Rolls-Royce Aerospace (T. Baines et al., 2011), Lien Chang Saxophone (Yang & Chiu, 2014), Alstom (T. S. Baines et al., 2009), IKEA (Wen & Zhou, 2016), and Volvo (Vandermerwe & Rada, 1988) are some of the examples reflected in the articles selected as part of this systematic review. The following sections present the 17 findings that support critical success factors attributing to the successful implementation of servitization.

P. Resources - Investing In Organizational Talent And Change Management Activities

Implementing servitization requires a service-oriented skill set that is typically not available in a product-oriented manufacturing firm, hence the need to invest in organizational talent and change management activities (Doni, Corvino, & Bianchi Martini, 2019; Luz Martín-Peña, Díaz-Garrido, & Sánchez-López, 2018; Turunen & Finne, 2014). A well-coordinated and phased approach to change is needed across all departments such as services, sales, delivery, marketing, operations, governance, etc. (Crowley et al., 2018; Raddats et al., 2019, 2017).

Q. Resources - Leadership Driven Transformation

Transformational leadership is needed to change the existing business models towards servitization and provide confidence to the employees of the intent to change (Crowley et al., 2018; Gebauer & Friedli, 2005). "Leadership is also central to the other themes discussed in this special issue; in the face of opportunities and threats such as acquisition and divestment options, new and disruptive technologies, and the uncertainties of multiple strategic positions and business models, executives must know how to set priorities in deciding what service growth routes to pursue."(Kowalkowski et al., 2017).

©IJRASET: All Rights are Reserved

R. Resources - Training Existing And Hiring New Leaders

Training existing leaders or providing executive education to existing leaders to drive change as well as potentially hiring new leaders that have the experience to drive change has been defined as a success factor towards the move to servitization. (Crowley et al., 2018). The move to the services-oriented business model is a relatively newer concept and requires education and training to ensure that barriers to servitization can be overcome.

S. Resources - Mitigating Upstream And Downstream Risks

Risk management is inherent to all mid-size to large organizations. New service offerings as part of servitization should be designed to manage both the upstream and downstream risks, or both the customer side and supplier side risks (Raddats et al., 2019).

T. Capabilities - Building And Leveraging Partner Relationships To Co-Create Value

The move to being a service provider from product manufacture can be complicated and requires capabilities and support far beyond the organization and from a multitude of actors to make the strategy a success (Raddats et al., 2019). “Service development involves the joint capabilities of manufacturers and partners being turned into activities that neither party could develop or deliver on their own, thereby creating new sales opportunities.”(Raddats et al., 2017). Building and leveraging partner relationships to co-create value is a critical success factor towards servitization success.

U. Capabilities - Creating Separate Services-Oriented Entities

Creating separate service-oriented entities or spinoffs is one of the ways to transition from being a product manufacture to a service provider and thereby overcome the change management challenges (Crowley et al., 2018). Another way is for companies to pool resources or create joint ventures for greater operational efficiencies in areas wherein it is not possible to do it alone (Sharma & Singh, 2017). A separate or outside entity can help bring in the desired talent to make a move to servitization successful.

V. Capabilities - Investing In Services Delivery

Service-oriented delivery to customers consists of not just the manufactured product or goods but also the combination of services, support, self-service, and knowledge (Vandermerwe & Rada, 1988). Investing in service delivery can help organizations overcome the product manufacturing-oriented processes to a service delivery oriented processes (Raddats et al., 2019).

W. Capabilities - M&A As An Avenue To Bring Relevant Expertise

Mergers and acquisition can be one of the avenues to bring relevant services-oriented skillset in house for the product based organizations that are contemplating the move to servitization (Raddats et al., 2019; Xing, Liu, Tarba, & Cooper, 2017). “There are several means to servitize, with acquisitions and mergers seeming to be among the successful ones“ (Turunen & Finne, 2014). One of the critical success factors to make servitization a success is to bring in external talent that has the experience in this domain, and M&A can be one of the potential avenues to fast track onboarding a service, delivery-oriented team.

X. Capabilities - Revamping The Sales Process

With new revenue streams being created as part of the services business, there is a need to train the sales team and revamp the sales management practice, including making account managers skilled at understanding and interpreting customer needs (Raddats et al., 2019). The successful value proposition of a sales team is an essential success factor to enable servitization or any product-based organization.

Y. Information - Leveraging the latest Technologies

One common theme emerging from various studies has been the ability of digital technologies to enable manufacturing firms to deliver services as part of their offerings (Cenamor et al., 2017; Green, Davies, & Ng, 2017; Peillon & Dubruc, 2019; Raddats et al., 2019). “Technological innovations can change the competitive positions within the servitized population, as well as between it and rival populations.” (Turunen & Finne, 2014). The intersection of digital technologies including industry 4.0 technologies (Frank, Mendes, Ayala, & Ghezzi, 2019a) such as IoT (Rymaszewska et al., 2017), sensors (Green et al., 2017) etc. with servitization models is opening up new potentials for manufacturing firms that were not available just in recent past.

©IJRASET: All Rights are Reserved

Z. Information - Growth And Revenue Potential

Servitization can enable stable, and higher-margin revenue potential streams with services (Ambroise et al., 2018). Servitization enables product-based firms to provide additional value add with their service offerings (Vandermerwe & Rada, 1988) and hence more stickiness in business with the customer that can enable not only future upsell and cross-sell abilities but also be less sensitive to price-based competition (Baines et al., 2009).

AA. Information - Gathering Data And Performing Analytics On Customer's Needs

With the move to services, there is a more significant potential to gather insights into customer's behavior and usage of the products to create tailored offerings for customers that can provide further value proposition to the move towards servitization (Baines et al., 2009). With the use of IoT devices, a more substantial amount of big data can be gathered that can be analyzed to predict product maintenance needs and identify breakdown before it happens. The convergence of technology and data and analytics with servitization models is a critical success factor towards the move to servitization.

BB. Innovation - Strategy And Organizational Alignment

There can be many different ways and strategies to move towards servitization (Crowley et al., 2018), and the alignment between strategy and organizational impact needs to be planned along with determining the most optimal future trajectory (Raddats et al., 2019). "Understanding manufacturers' organizational environment is of the utmost importance for managers of industrial organization's to be able to decide on strategic actions and resource allocations, such as to what extent to broaden the offering from pure products towards service provision." (Turunen & Finne, 2014). The principles of change management and communication can assist with dispersing the message, including mission, vision, and values to the entire organization.

CC. Innovation - Integrating End To End Value Chain

By citing multiple authors, Sharma and Singh (2017) state that product based manufacturing has proved to be relatively easy to imitate by competitors. In contrast, servitization is less easy to replicate, which has pushed many manufacturers to recognize the strategic integration of services as a source of sustainable competitive advantage and corporate profitability. The entire customer value proposition journey starting with product manufacturing to the end of value chain customer experience, needs to planned, mapped, and executed upon to retain the competing and differentiating advantage within the industry.

DD. Innovation - Co-Creating Value With Customers

Co-creating value with customers creates a joint value proposition and a stickiness in relationship that is difficult to imitate by the competitors as well as provide insights on the customer behavior to the manufacturing firm (Ambroise et al., 2018). "The value of service lies in the cooperation of the provider and the customer, rather than the creation of the product by the producer and the delivery of products to the customer." (Yang & Chiu, 2014). Servitization is for the customers, guided by customer's preferences, and provides value to the customers; hence, it should be co-created with customers for the most significant impact and aid in making servitization a success.

EE. Innovation - Retention Of Product Ownership

With the move from being a product manufacturer to a service provider, and with leveraging pay per use models, the manufacturer retains the product ownership and hence retains the customer relationship (Ambroise et al., 2018). This move also leads to changing the business models on both customer and manufacturer's side and is considered one of the critical success factors for servitization.

FF. Innovation – Outcome-Based Contracts

Servitization has enabled outcome-based contracts and continuous service as opposed to selling the product once (Batista et al., 2017). "The research has also shown that when an organization is contracting for outcomes, relationships are a key factor in the performance of the contract." (Batista et al., 2017).

This brings challenges to the business models for both the producer and customer, but this also provides additional value add to the entire relationship. Outcome-based contracts also forces the manufacturers to prioritize product features and work on those that solve the end outcome for the customer.

©IJRASET: All Rights are Reserved

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue V May 2020- Available at www.ijraset.com

V. DISCUSSION

Servitization concepts and examples have been available for years; however, with the convergence of servitization and industry 4.0 (Frank, Mendes, Ayala, & Ghezzi, 2019b), the concepts have advanced, especially, when considering the European Union. "The Services Directive aimed to offer advantages to businesses providing services in the EU, while the more recent communication on the "European Industrial Renaissance" highlighted the increasing links between manufacturing and services that have created new jobs" (Doni et al., 2019). As reflected in the study selection section earlier, a large amount of existing literature on servitization has been created in the last few years, which generates the need for additional scholar-practitioner literature in this area.

A. Addressing the Research Question

The twofold purpose of this research is to identify the critical success factors that contribute to the successful implementation of servitization models in manufacturing companies and the obstacles that impact the adoption of servitization models within the manufacturing industry. By understanding the obstacles and identifying the critical success factors, as part of future studies, a holistic roadmap may be created to support the move towards servitization.

The synthesis of 22 selected studies as part of this systematic review have been reflected as part of a conceptual framework (Appendix G). All four lens of resources, capabilities, innovation, and information as derived from four guiding theories are interrelated to each other, i.e., understanding the obstacles can help create the critical success factors in all four areas. This article has synthesized and systematically presented the results by leveraging the principles of evidence-based management and striving to display academic rigor and transparency.

B. Management Implications

The 13 obstacles and 17 critical success factors can help the management of manufacturing firms to create a roadmap around these areas to successfully move towards servitization. While all barriers and all critical success factors may not be applicable, this at least will help to ensure that all the areas are reviewed. The results have been presented in a checklist format in Appendix H. The implications for managers for a manufacturing firm are to be aware of various obstacles and critical success areas as part of the strategic planning process towards move to servitization. The implications for consultants assisting the management industry are to be aware of the various facets of barriers and critical success factors towards move to servitization within the manufacturing industry.

C. Implementation Risk Areas

There are limitations and challenges to implementing servitization models. "Across industries, there is evidence that firms may have overextended themselves in moving toward service, and some are withdrawing from certain service initiatives—a process we refer to as deservitization" (Kowalkowski et al., 2017). The move to servitization may not make a product manufacturer successful in the services business. While the digital and industry 4.0 manufacturing technologies will aid in the move to servitization, there are additional needs that have to be considered. Selling products-as-a-service instead of products generate the need for financing or product leasing in order to create services. Changing business models from capital expense to operational expense brings the need for financial and tax aspects. The possibility of risk in implementation generates the need for insurance, such as business interruption and liability, etc.

VI. LIMITATIONS AND FURTHER RESEARCH

There are limitations to the research conducted as part of this literature review. The results have been gathered via a systematic review of existing literature and have not been validated with industry leaders via interviews. The scope of this study is vast, and focus can be narrowed with future studies with regards to the specific areas within the manufacturing industry as well as concentrating on a particular geographic location such as European Union, or North America, or emerging economies such as India, China, Brazil, etc.

Two specific recommendations have emerged from this study. First is the need to have a strategic roadmap in place to assist the manufacturing organizations in becoming successful with their servitization journey. The second is to research the convergence of servitization and industry 4.0 related manufacturing technologies for a particular segment of firms such as small to mid-size (SME), large manufacturing firms, etc. accommodating either or both horizontal and vertical areas of domain.

©IJRASET: All Rights are Reserved

VII. CONCLUSION

This systematic research has attempted to bridge the gap in existing knowledge by identifying obstacles towards adoption and recommending critical success factors to be considered as part of the successful implementation of servitization models within the manufacturing industry. Entire research has been presented from the lens of four guiding theories in the areas of resources, capabilities, innovation, and information. A total of 22 academic articles were synthesized to formulate the recommendations. A conceptual framework and a managerial checklist have been presented to aid with the decision making within the strategic domain of servitization. The academic literature in the servitization domain is relatively scarce, and so is the adoption of servitization models. However, with the advent of industry 4.0 related manufacturing technologies, the move towards servitization and its adoption is becoming easier. There is a continuous need for scholar-practitioner knowledge in the domain of servitization. While the academic literature pace is picking up, there is much that needs to be established in terms of processes, procedures, playbooks, and toolkits to aid towards the successful move to servitization by the manufacturing firms.

The move from product-centric to service-centric business model, directly impacts the end-users, i.e., customers, in terms of getting superior value-added services and experiences in using products. The details presented in this article and the managerial recommendations will lead to a better understanding of obstacles and barriers that management faces and the critical success factors that can lead to successful implementation or servitization models, thereby benefiting the end consumers of products.

ACKNOWLEDGMENTS

The author would like to acknowledge the efforts of students and faculty of UMGC, Maryland, in reviewing this manuscript. This manuscript would not have been possible without the guidance and input of Dr. Walter McCollum, professor UMGC, and dean of student affairs/executive director Walden University. Gratitude is also due to Ron Giuntini president of G35 Software Inc. for providing industry guidance on the topic of servitization. The author also acknowledges the support and opportunities presented by Greg Barats, president and CEO of HSB, and Josef Brunner, CEO of relayr Inc.

REFERENCES

[1] Ambroise, L., Prim-Allaz, I., & Teyssier, C. (2018). Financial performance of servitized manufacturing firms: A configuration issue between servitization strategies and customer-oriented organizational design. Industrial Marketing Management, 71(August 2016), 54–68. https://doi.org/10.1016/j.indmarman.2017.11.007

[2] Baines, T., Lightfoot, H., & Smart, P. (2011). Servitization within manufacturing: Exploring the provision of advanced services and their impact on vertical integration. Journal of Manufacturing Technology Management, 22(7), 947–954. https://doi.org/10.1108/17410381111160988

[3] Baines, T. S., Lightfoot, H. W., Benedettini, O., & Kay, J. M. (2009). The servitization of manufacturing: A review of literature and reflection on future challenges. Journal of Manufacturing Technology Management, 20(5), 547–567. https://doi.org/10.1108/17410380910960984

[4] Barends, E., Rousseau, D., & Briner, R. (2014). Evidence-Based Management: The basic Principles. Amsterdam: Center for Evidence-Based Management.

[5] Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17, 99–120.

[6] Batista, L., Davis-Poynter, S., Ng, I., & Maull, R. (2017). Servitization through outcome-based contract – A systems perspective from the defence industry. International Journal of Production Economics, 192(October 2015), 133–143. https://doi.org/10.1016/j.ijpe.2016.12.005

[7] Cenamor, J., Rönnberg Sjödin, D., & Parida, V. (2017). Adopting a platform approach in servitization: Leveraging the value of digitalization. International Journal of Production Economics, 192(December 2016), 54–65. https://doi.org/10.1016/j.ijpe.2016.12.033

[8] Crowley, E., Burton, J., & Zolkiewski, J. (2018). Servitization intent as a factor in the servitization process. Journal of Business and Industrial Marketing, 33(8), 1125–1140. https://doi.org/10.1108/JBIM-08-2016-0199

[9] Doni, F., Corvino, A., & Bianchi Martini, S. (2019). Servitization and sustainability actions. Evidence from European manufacturing companies. Journal of Environmental Management, 234(January), 367–378. https://doi.org/10.1016/j.jenvman.2019.01.004

[10] Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A. (2019a). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. Technological Forecasting and Social Change, 141(January), 341–351. https://doi.org/10.1016/j.techfore.2019.01.014

[11] Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A. (2019b). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. Technological Forecasting and Social Change, 141(July 2018), 341–351. https://doi.org/10.1016/j.techfore.2019.01.014

[12] Gebauer, H., & Friedli, T. (2005). Behavioral implications of the transition process from products to services. Journal of Business and Industrial Marketing, 20(2), 70–78. https://doi.org/10.1108/08858620510583669

[13] Gough, D. (2007). Weight of evidence: a framework for the appraisal of the quality and relevance of evidence. J. Furlong, A. Oancea (Eds.) Applied and Practice-Based Research. Special Edition of Research Papers in Education, 213–228.

[14] Green, M. H., Davies, P., & Ng, I. C. L. (2017). Two strands of servitization: A thematic analysis of traditional and customer co-created servitization and future research directions. International Journal of Production Economics, 192(January), 40–53. https://doi.org/10.1016/j.ijpe.2017.01.009

[15] Kowalkowski, C., Gebauer, H., Kamp, B., & Parry, G. (2017). Servitization and deservitization: Overview, concepts, and definitions. Industrial Marketing Management, 60, 4–10. https://doi.org/10.1016/j.indmarman.2016.12.007

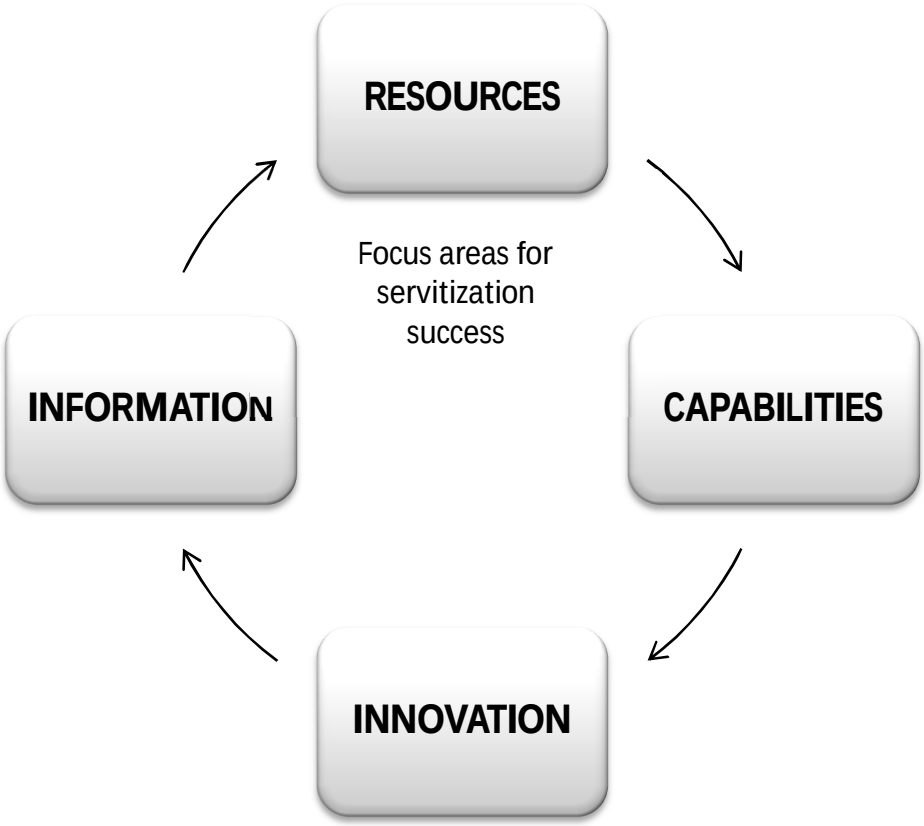
[16] Lin, Y., Luo, J., Ieromonachou, P., Rong, K., & Huang, L. (2019). Strategic orientation of servitization in manufacturing firms and its impacts on firm performance. Industrial Management and Data Systems, 119(2), 292–316. https://doi.org/10.1108/IMDS-10-2017-0485

©IJRASET: All Rights are Reserved

[17] Luz Martín-Peña, M., Díaz-Garrido, E., & Sánchez-López, J. M. (2018). The digitalization and servitization of manufacturing: A review on digital business models. Strategic Change, 27(2), 91–99. https://doi.org/10.1002/jsc.2184
[18] Peillon, S., & Dubruc, N. (2019). Barriers to digital servitization in French manufacturing SMEs. Procedia CIRP, 83, 146–150. https://doi.org/10.1016/j.procir.2019.04.008
[19] Raddats, C., Kowalkowski, C., Benedettini, O., Burton, J., & Gebauer, H. (2019). Servitization: A contemporary thematic review of four major research streams. Industrial Marketing Management, (March), 1–17. https://doi.org/10.1016/j.indmarman.2019.03.015
[20] Raddats, C., Zolkiewski, J., Story, V. M., Burton, J., Baines, T., & Ziaee Bigdeli, A. (2017). Interactively developed capabilities: evidence from dyadic servitization relationships. International Journal of Operations and Production Management, 37(3), 382–400. https://doi.org/10.1108/IJOPM-08-2015-0512
[21] Rogers, E. (2003). Diffusion of Innovations (Fifth edit). Free Press: New York.
[22] Rymaszewska, A., Helo, P., & Gunasekaran, A. (2017). IoT powered servitization of manufacturing – an exploratory case study. International Journal of Production Economics, 192(October 2015), 92–105. https://doi.org/10.1016/j.ijpe.2017.02.016
[23] Sharma, M. G., & Singh, K. N. (2017). Servitization, Coopetition, and Sustainability: An Operations Perspective in Aviation Industry. Vikalpa, 42(3), 145–152. https://doi.org/10.1177/0256090917721772
[24] Simon, H. (1972). Theories of Bounded Rationality. C. B. McGuire, & R. Radner (Eds.), Decisionand Organization (pp. 161-176). Amsterdam: North-Holland.
[25] Teece, D. J. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. Journal of International Business Studies, 45(1), 8–37. https://doi.org/10.1057/jibs.2013.54
[26] Turunen, T., & Finne, M. (2014). The organisational environment's impact on the servitization of manufacturers. European Management Journal, 32(4), 603–615. https://doi.org/10.1016/j.emj.2013.11.002
[27] Vandermerwe, S., & Rada, J. (1988). Servitization of business: Adding value by adding services. European Management Journal, 6(4), 314–324. https://doi.org/10.1016/0263-2373(88)90033-3
[28] Wen, X., & Zhou, X. (2016). Servitization of manufacturing industries based on cloud-based business model and the down-to-earth implementary path. International Journal of Advanced Manufacturing Technology, 87(5–8), 1491–1508. https://doi.org/10.1007/s00170-014-6348-8
[29] Xing, Y., Liu, Y., Tarba, S., & Cooper, S. C. L. (2017). Servitization in mergers and acquisitions: Manufacturing firms venturing from emerging markets into advanced economies. International Journal of Production Economics, 192(December 2016), 9–18. https://doi.org/10.1016/j.ijpe.2016.12.010
[30] Yang, Y. Y., & Chiu, K.-H. (2014). Servitization Strategies of Manufacturing Businesses: a Case Study of Lien Cheng Saxophone Company. International Journal of Electronic Business Management, 12(1), 26–32.

APPENDIX A

Theoretical Framework to Guide the Research



©IJRASET: All Rights are Reserved

APPENDIX B

Boolean Search String

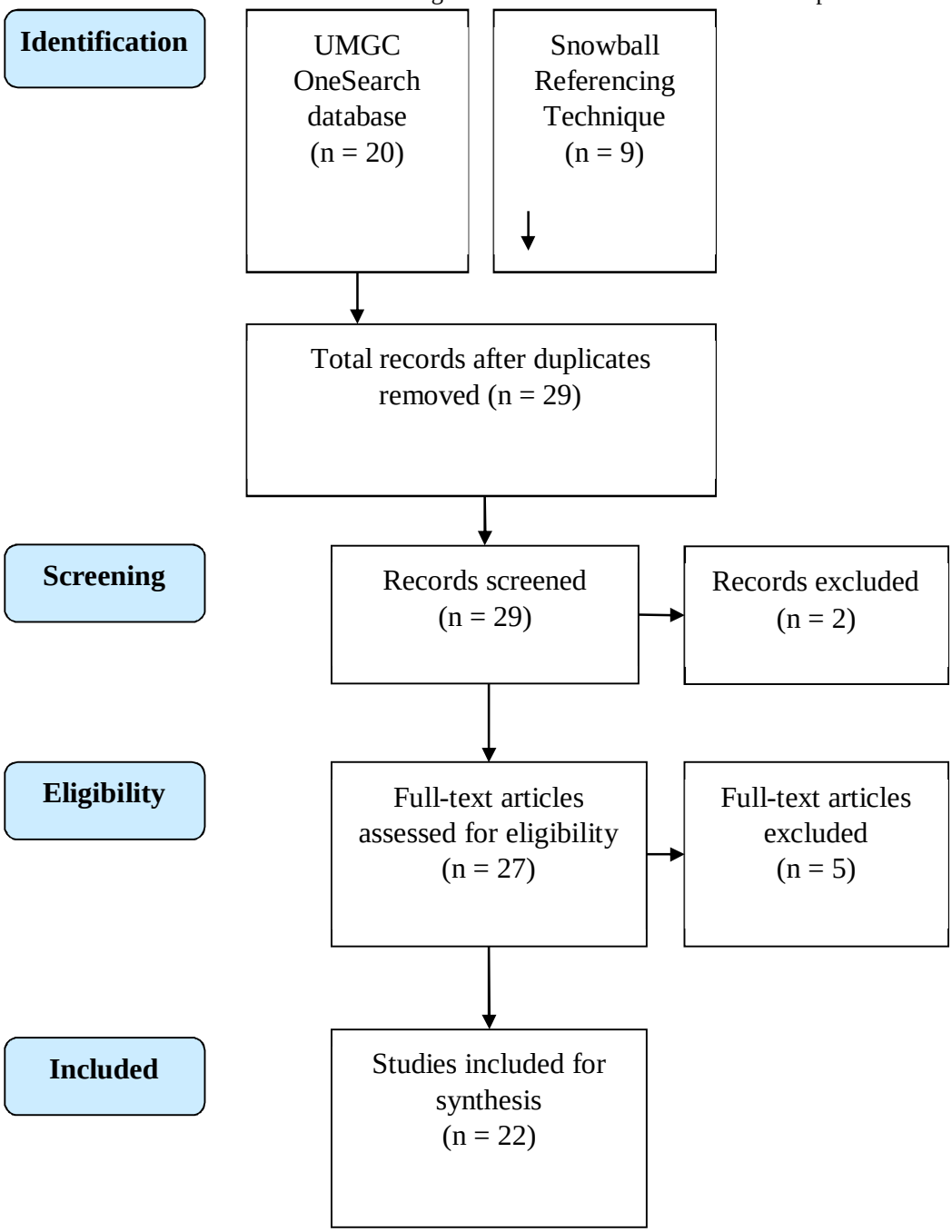
Boolean query leveraged to find relevant articles

(servitization OR servitisation) AND (manufactur* OR industr* OR machine) AND (assessmen* OR leaders* OR model OR strateg* OR Barrier* OR Hindrance* OR Issue* OR implement* OR concern* OR sustain* OR coopetition OR perform* OR impact* OR transition* OR transform* OR obstacle* OR adoption OR Challeng* OR Success*)

APPENDIX C

PRISMA Flow Diagram

PRISMA flow diagram for literature search and selection process



©IJRASET: All Rights are Reserved

APPENDIX D

List of Selected Articles

S.No	Journal	Year	Article	Author	Type	Selection
1	International Journal of Production Economics	2017	Adopting a platform approach in servitization: Leveraging the value of digitalization	Cenamor, J., Rönnberg Sjödin, D., & Parida, V.	Selected	Search String
2	Procedia CIRP	2019	Barriers to digital servitization in French manufacturing SMEs	Peillon, S., & Dubruc, N.	Selected	Search String
3	Industrial Marketing Management	2018	Financial performance of servitized manufacturing firms: A configuration issue between servitization strategies and customer-oriented organizational design	Ambroise, L., Prim-Allaz, I., & Teyssier, C.	Selected	Search String
4	International Journal of Operations and Production Management	2017	Interactively developed capabilities: evidence from dyadic servitization relationships	Raddats, C., Zolkiewski, J., Story, V. M., Burton, J., Baines, T., & Ziaee Bigdeli, A.	Selected	Search String
5	International Journal of Production Economics	2017	IoT powered servitization of manufacturing – an exploratory case study	Rymaszewska, A., Helo, P., & Gunasekaran, A.	Selected	Search String
6	Industrial Marketing Management	2017	Servitization and deservitization: Overview, concepts, and definitions	Kowalkowski, C., Gebauer, H., Kamp, B., & Parry, G.	Selected	Search String
7	Technological Forecasting and Social Change	2019	Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective	Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A.	Selected	Search String
8	Journal of Environmental Management	2019	Servitization and sustainability actions. Evidence from European manufacturing companies	Doni, F., Corvino, A., & Bianchi Martini, S.	Selected	Search String
9	International Journal of Production Economics	2017	Servitization in mergers and acquisitions: Manufacturing firms venturing from emerging markets into advanced economies	Xing, Y., Liu, Y., Tarba, S., & Cooper, S. C. L.	Selected	Search String
10	Journal of Business and Industrial Marketing	2018	Servitization intent as a factor in the servitization process	Crowley, E., Burton, J., & Zolkiewski, J.	Selected	Search String
11	International Journal of Production Economics	2017	Servitization through outcome-based contract – A systems perspective from the defence industry	Batista, L., Davis-Poynter, S., Ng, I., & Maull, R.	Selected	Search String
12	Vikalpa	2017	Servitization, Coopetition, and Sustainability: An Operations Perspective in Aviation Industry	Sharma, M. G., & Singh, K. N.	Selected	Search String
13	Industrial Marketing Management	2019	Servitization: A contemporary thematic review of four major research streams	Raddats, C., Kowalkowski, C., Benedettini, O., Burton, J., & Gebauer, H.	Selected	Search String
14	Industrial Management and Data Systems	2019	Strategic orientation of servitization in manufacturing firms and its impacts on firm performance	Lin, Y., Luo, J., Ieromonachou, P., Rong, K., & Huang, L.	Selected	Search String
15	Strategic Change	2018	The digitalization and servitization of manufacturing: A review on digital business models	Luz Martín-Peña, M., Díaz-Garrido, E., & Sánchez-López, J. M.	Selected	Search String
16	International Journal of Production Economics	2017	Two strands of servitization: A thematic analysis of traditional and customer co-created servitization and future research directions	Green, M. H., Davies, P., & Ng, I. C. L.	Selected	Search String
17	Journal of Business and Industrial Marketing	2005	Behavioral implications of the transition process from products to services	Gebauer, H., & Friedli, T.	Selected	Snowball
18	European Management Journal	1988	Servitization of business: Adding value by adding services	Vandermerwe, S., & Rada, J.	Selected	Snowball
19	International Journal of Advanced Manufacturing Technology	2016	Servitization of manufacturing industries based on cloud-based business model and the down-to-earth implementary path	Wen, X., & Zhou, X.	Selected	Snowball
20	International Journal of Electronic Business Management	2014	Servitization Strategies of Manufacturing Businesses: a Case Study of Lien Cheng Saxophone Company	Yang, Y. Y., & Chiu, K.-H.	Selected	Snowball
21	European Management Journal	2014	The organisational environment's impact on the servitization of manufacturers	Turunen, T., & Finne, M.	Selected	Snowball
22	Journal of Manufacturing Technology Management	2009	The servitization of manufacturing: A review of literature and reflection on future challenges	Baines, T. S., Lightfoot, H. W., Benedettini, O., & Kay, J. M.	Selected	Snowball
23	International Journal of Computer Integrated Manufacturing	2017	Requirements for models, methods and tools supporting servitisation of products in manufacturing service ecosystems	Wiesner, S., & Thoben, K. D.	Rejected	Search String
24	Systems	2017	Research vs. Practice on Manufacturing Firms' Servitization Strategies: A Gap Analysis and Research Agenda	Perona, M., Saccani, N., & Bacchetti, A.	Rejected	Search String
25	Journal of Economics and Management Strategy	2017	Should everybody be in services? The effect of servitization on manufacturing firm performance	Crozet, M., & Milet, E.	Not Selected	Search String
26	International Journal of	2017	Territorial servitization: Exploring the virtuous circle	Lafuente, E., Vaillant, Y.,	Not	Search String

©IJRASET: All Rights are Reserved

	Production Economics		connecting knowledge-intensive services and new manufacturing businesses	& Vendrell-Herrero, F.	Selected	
27	Long Range Planning	2010	Business model innovation: Opportunities and barriers	Chesbrough, H.	Not Selected	Snowball
28	Strategic Change	2006	Servitization as a Driver for Organizational Change	Vendrell-Herrero, F., Parry, G., Bustinza, O. F., & O'Regan, N.	Not Selected	Snowball
29	Journal of Manufacturing Technology Management	2011	Servitization within manufacturing: Exploring the provision of advanced services and their impact on vertical integration	Baines, T., Lightfoot, H., & Smart, P.	Not Selected	Snowball

APPENDIX E

Weight of Evidence for Selected Articles

	Article # 1	Article # 2	Article # 3	Article # 4	Article # 5
WoE A: Generally appropriate research method	✓	✓	✓	✓	✓
WoE B: Methods appropriate to the specific research question	✓	✓	✓	✓	✓
WoE C: Evidence appropriate to the research question	High	High	High	High	High
WoE D: Overall Assessment	High	High	High	High	High

	Article # 6	Article # 7	Article # 8	Article # 9	Article # 10
WoE A: Generally appropriate research method	✓	✓	✓	✓	✓
WoE B: Methods appropriate to the specific research question	✓	✓	✓	✓	✓
WoE C: Evidence appropriate to the research question	High	High	Medium	Medium	Medium
WoE D: Overall Assessment	High	High	High	High	High

	Article # 11	Article # 12	Article # 13	Article # 14	Article # 15
WoE A: Generally appropriate research method	✓	✓	✓	✓	✓
WoE B: Methods appropriate to the specific research question	✓	✓	✓	✓	✓
WoE C: Evidence appropriate to the research question	Medium	Medium	High	High	High
WoE D: Overall Assessment	High	High	High	High	High

	Article # 16	Article # 17	Article # 18	Article # 19	Article # 20
WoE A: Generally appropriate research method	✓	✓	✓	✓	✓
WoE B: Methods appropriate to the specific research question	✓	✓	✓	✓	✓
WoE C: Evidence appropriate to the research question	High	Medium	Medium	Medium	Medium
WoE D: Overall Assessment	High	High	High	High	High

	Article # 21	Article # 22	Article # 23	Article # 24	Article # 25
WoE A: Generally appropriate research method	✓	✓	n/a	n/a	✕
WoE B: Methods appropriate to the specific research question	✓	✓	n/a	n/a	✕
WoE C: Evidence appropriate to the research question	Medium	High	Low	Low	Low
WoE D: Overall Assessment	High	High	n/a	n/a	Medium

	Article # 26	Article # 27	Article # 28	Article # 29
WoE A: Generally appropriate research method	✕	✕	✕	✓
WoE B: Methods appropriate to the specific research question	✕	✕	✕	✓
WoE C: Evidence appropriate to the research question	Low	Low	Low	Low
WoE D: Overall Assessment	Medium	Medium	Medium	High

APPENDIX F

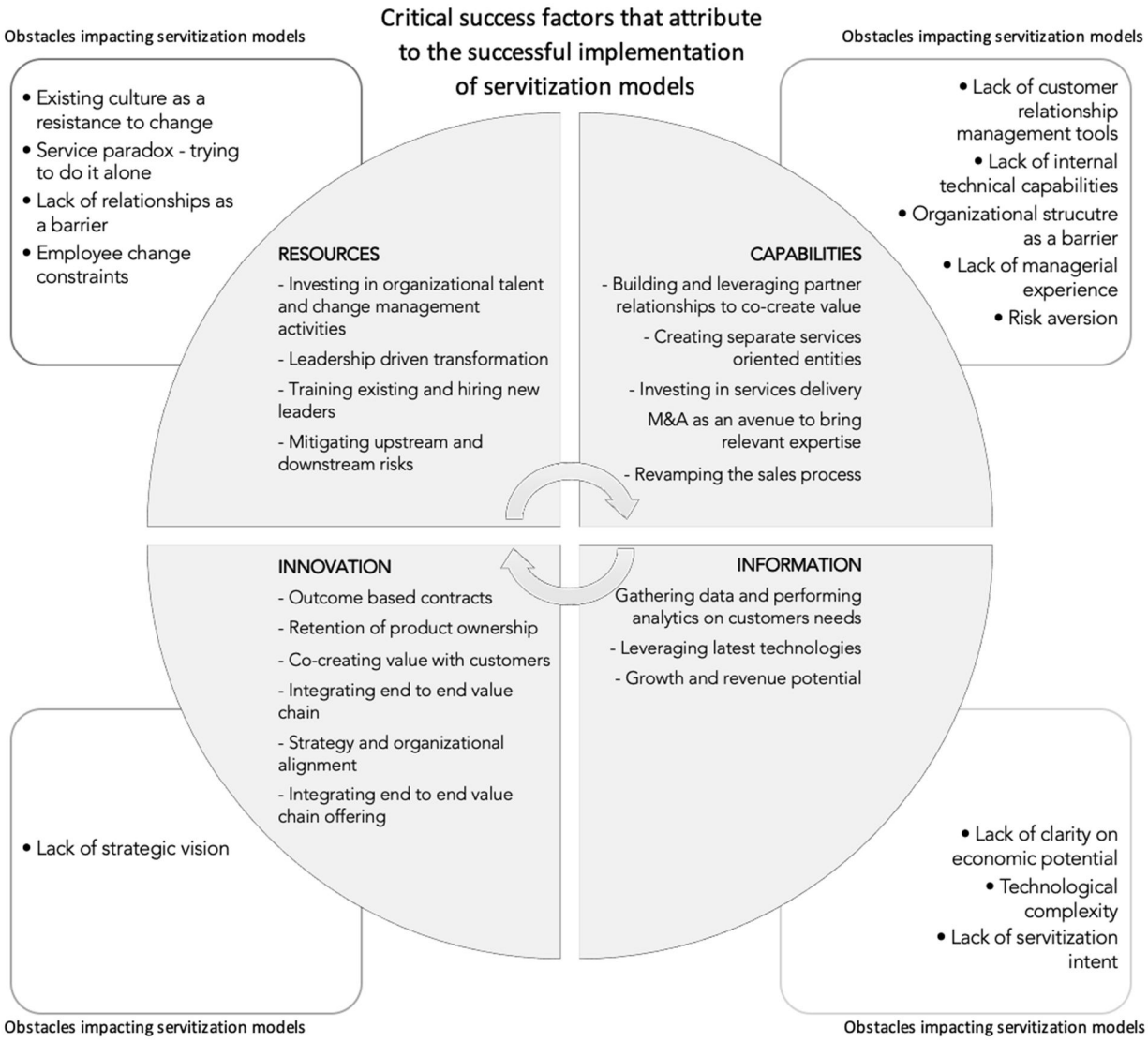
Codes Used as Part of Article Analysis

Article_Written_Year
Article_Sample
Article_Research_Type
Article_Limitations
Article_Guiding_Theory
Article_Future_Research
Servitization_Barrier
Servitization_Company
Servitization_Definition
Servitization_Geo
Servitization_Industry
Servitization_Statements
Servitization_Success
Servitization_Type

©IJRASET: All Rights are Reserved

APPENDIX G

Conceptual Framework with the Systematic Review Results

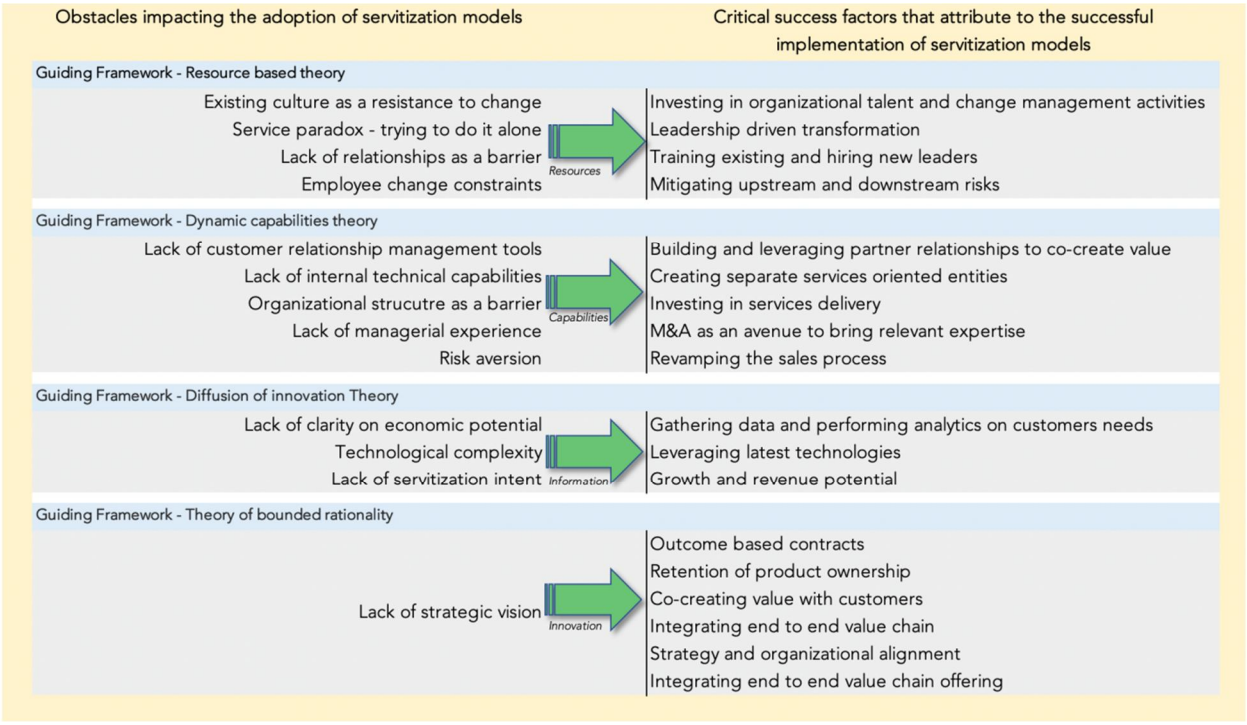


©IJRASET: All Rights are Reserved

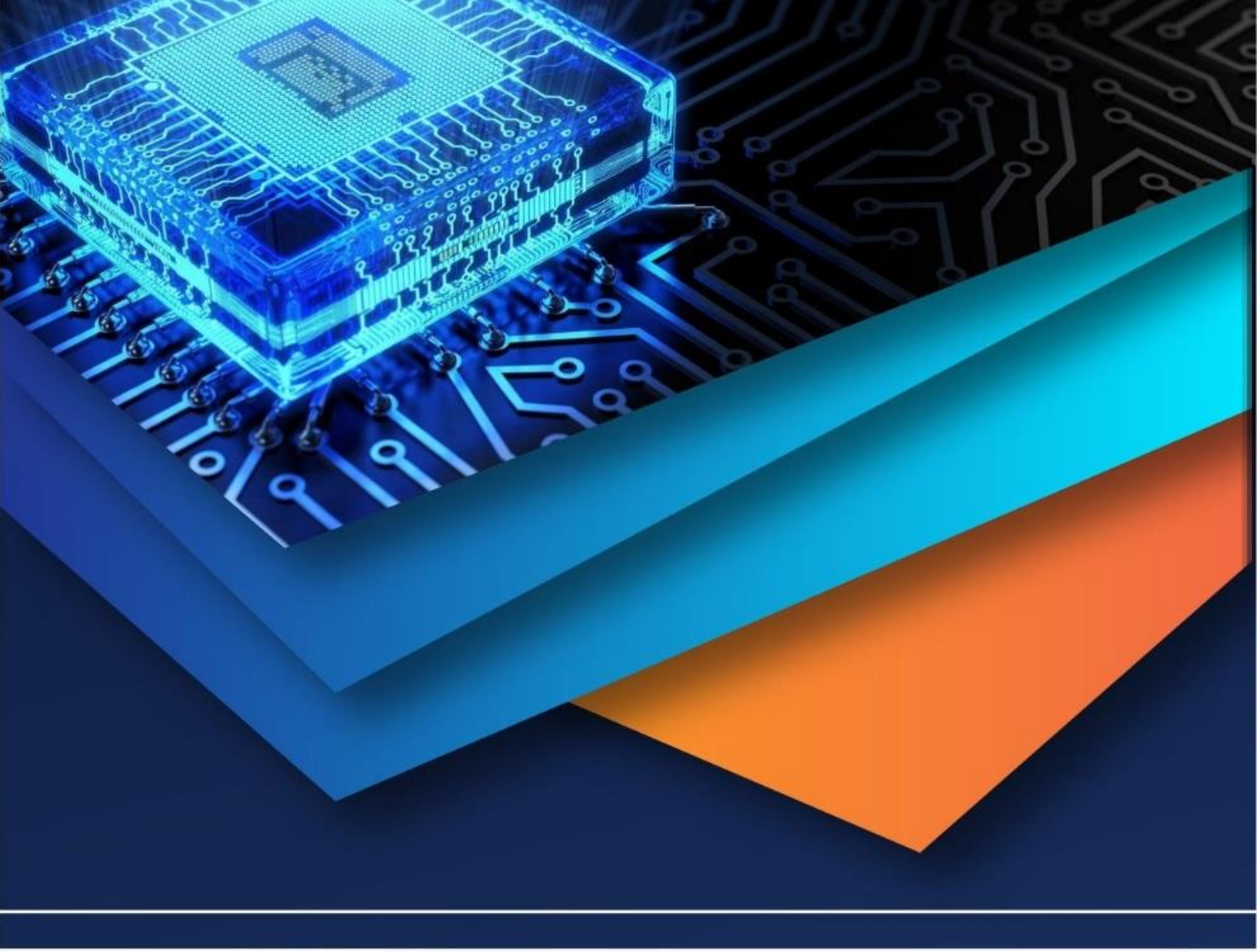
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue V May 2020- Available at www.ijraset.com

APPENDIX H

Management Checklist to Assist with Move Towards Servitization



©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)