The Lighthouse Journal of Social Sciences, Vol. 03, Issue 1, Summer 2024, pp. 146-160

Customer Involvement and Sustainable Product Innovations: The Role of Design Excellence and Technological Capability

Faisal Mahmood[1], Imran Ullah Khan Marwat[2], Sajid Amir Shah[3]

ABSTRACT

The main goal of this research is to examine how customer involvement influences firm ability to shape sustainable product innovation. The study measures the effect of design excellence and firm technological capabilities on the development of sustainable innovations with respect to customer involvement. Drawing the theory of absorptive capacity in the context of innovation, we posit that high firm absorptive capacity focuses largely on product-focused customer involvement (PCI) and information-intensive customer involvement (ICI) practices, which result in a large number of sustainable innovations. To test our hypotheses, we collected data from 105 manufacturing/Services industries. A convenient, purposive sampling technique was used for data collection. In order to examine the relationship between PCI, ICI, Design Excellence, and Technological capabilities, hypotheses were tested by using correlation and regression analysis. According to the study findings, results indicate that customer involvement positively affects sustainable product innovativeness and that such effects are mediated by product design. In a further exploratory analysis, the study finds a positive moderated role by one firm resource i.e. firm technological capability. The primary limitation of the empirical review is the tiny size of the sample. Second, this study focused on firm technological capabilities as a whole, particular technology for a particular product may be considered for further studies. The current study is unique in its kind, focusing on the link between PCI, ICI, Design Excellence and Technological capabilities, within the specific context of Pakistan. Moreover this study contributes to theory and practice by providing understanding of sustainable innovation in the service and manufacturing industries with the help of customer involvement.

Keywords: Customer Involvement, Sustainable Innovations, Design Excellence, Technological Capability

[1]Assistant Professor, Department of Graduate Studies-AUSOM, Air University Islamabad.
[2] PhD Scholar, Faculty of Management Sciences, International Islamic University Islamabad.
Corresponding Author's Email: imranmarwat@gmail.com
[3] Research Associate, Allama Iqbal Open University, Islamabad, Pakistan

Manuscript Submitted: June 02, 2024
Manuscript Accepted: June 29, 2024

INTRODUCTION

Innovations are a mandatory requirement for the firms to achieve sustainable development. To achieve sustainable innovation firms, require changes in traditional ways of product manufacturing. Moreover, sustainable development innovations are more complex as compared to conventional approaches of innovation (Afeltra et al., 2023; Hall & Vredenburg, 2003); since there is more profound involvement of different stakeholders in it such as customers. The capacity of the firms to absorb external knowledge significantly contributes towards sustainable innovations (Xu & Hu, 2024).

Firms invent products for customers wherein customers have a better knowledge about their requirements; therefore involving customers in product development could improve the innovation process. For example, Sony involved customers for the development of Playstation 2 (El Sawy et al., 2016). In today's modern environment, organizational management practices and marketing research characterize the significance of product based customer involvement in innovation process such as design thinking and agile methodologies (Hult et al., 2017).

Nowadays manufacturing firms face the challenge of establishing effective innovation capabilities to meet the demands of their customers. One of the ways to achieve this objective is to develop good customer relationship management between firms and end users. Firms' orientation towards their customers is useful in a way that it provides them the much needed information regarding current trends and future requirements in order to attain competitive advantage (Ogundare et al., 2024). Innovations which are sustainable may be dependent on business models and are always positioned to be a win-win situation (Sengupta et al., 2024). Businesses are increasingly becoming interested in sustainable innovations and many firms have already increased their budget for this purpose. According to a report published by Ethical Markets Media in 2001, $2.4 trillion were spend worldwide on eco innovations for the period 2007-2011; whereas it is expected that this amount will cross $10 trillion mark by 2020 (Montalvo et al., 2011).

Innovations can be taken as revenue generation strategy which is mandatory not only for economy but also for fulfilling customers' requirement and society demands. So the combinations of sustainability and innovation is essential to realize new combinations, which can lead to an innovation process tackling the current sustainability challenges in the market according to the customer requirements. Nidumolu et al. (2015) mentioned sustainability as the significant key driver for innovation in the 21st century.

One of the important factors that could lead to sustainable innovation is design which is a vital feature of product innovation and corporate success (Moultrie et al., 2007). Design experts claim that the designs based on customer input have more market value and contribute positively in the success of the new products (Hajdas, 2024). Highly advance technological driven companies, like Samsung Electronics, Apple and Sony are focusing on effective product designs through which they can compete in the market. Effective product designs are efficient generation of ideas through a process which lead to new products (Morris, 2009). Regardless of this new trend towards design, many manufacturers still ignore design value for the competitive advantage

and take design of the products only for luxury (Buxton, 2007). For example an article related to value of design published in The New York Times highlights NOKIA's problems in smart phone market due to poorly designed products (Bilton, 2011). Even within NOKIA, the employees and specialists (such as product designers) considered design a secondary design lacks a main stream position in the literature; moreover, the design issues have received limited attention from marketing and new product development scholars (Zhang, Hu & Kotabe, 2011).

Technological change or advancement is neither exogenous nor automatic, but rather it is the outcome of determined activities, or technological struggles undertaken by the firms. Technological capabilities in any organization play the role of driving force for innovation as well as the source of competitive advantage (Howcroft, & Taylor, 2023). The issues of technological capabilities at the firm level remain largely hidden in the literature (Morrison et al.; 2008).

In today's advanced technological era there is a paradigm shift in how firms innovate. The focus nowadays is to innovate using external resources (such as partners and customers) unlike the traditional approach of innovation in which the focus was primarily on firm's internal resources (Majchrzak & Malhotra, 2013). According to Adams et al. (1998) firms' competitive advantage and innovative capabilities can be increased if firms are close to their customer. Generally the firms focus on improving their current technologies and production systems through increased supply and resource efficiency, but not on other key drivers of successful sustainable innovations like understanding customer needs to combine technological efficiency with customer benefits (Keskin et al., 2016). This study is undertaken to address this gap in existing literature and to further probe the relationship between customer involvement in achieving design excellence and technological efficiency – the two factors which could play significant role in sustainable development as suggested by different researchers

This study aims at helping to enhance the theoretical understanding of the mediating role of design excellence for sustainable innovations as well as the moderating role of firm technological capabilities between product focused customer involvement and sustainable innovations. The study also highlights the need to carefully consider the role of design excellence to help find out the impact of customer involvement on innovation. The results of this study are expected to benefit the managers who are focusing on sustainable innovations.

LITERATURE REVIEW

Absorptive Capacity Theory

The research model proposed in this study is mainly based on absorptive capacity theory proposed by Aliasghar et al. (2023) states that the ability to identify, assimilate and apply external knowledge contributes in enhancing firm's absorptive capacity which could further lead to innovations. The two main constructs defined in the proposed model (PCI and ICI) basically are the source of tapping external knowledge from customer for sustainable innovations.

It depends upon firm absorptive capabilities how well knowledge and inputs are collected from customers and utilized. So we can argue that the ability of firms transforming knowledge

into actions for innovations lies in their different technological capabilities. Absorptive capacity theory directly support the effect of technological capabilities on innovations that how technological capabilities help in collecting information from the customer and translate that information for the development of the product innovations. For a sustainable innovation it is essential that product should be commercialized so because one of the central factor which is required for sustainable innovation is ease of use (Davis, 1989) which may be possible through customer involvement. Therefore Absorptive capacity enhance the knowledge of firm through which firm achieve design excellence for their upcoming innovations.

Related Studies

Studies proposing positive consequences of customer involvement (CI) for performance

Study	**Key Findings & Sample**
Gupta & Souder, 1998	Finding shows that involvement from the user provide help which reduces cycle time. Study have sample size of 38 manufacturing firms from U.S.
Gruner & Homburg, 2000	The finding of the study shows that customer involvement in new product development during early and late stages enhance new product success but customer involvement in middle stages have no impact on the performance. This study have a sample size of 310 firms from Germany.
Auh et al,. 2007	The outcomes of this study shows that coproduction (with customers) is positively related to attitudinal loyalty but not associated with behavioral loyalty. Study sample is from clients of global financial firm.
Kristensson et al., 2008	Results identified 7 key strategies for user/ customer involvement like user roles, user situations, analytical tool, benefit, expertise brainstorming effects, and heterogeneity. This study conducted on two telecommunications Swedish firms.
Carbonell et al., 2009	This study suggest that customer involvement enhance technical quality as well as speed of innovative products but have no effect on competitive superiority and on sales. Finding also shows that the customer involvement for new service performance is independent of development process stage. Study contain a sample size of 103 service firms from Spain.
Chien & Chen, 2010	Study finds that customer involvement have positive effect on new product development process as well as on cross-functional integration. Study contain a sample size of 125 financial firms from Taiwan.
Terence et al., 2017	Relational information processing capability positively moderates the relationship between PCI and amount of firm innovation. And analytical information processing capability also positively moderates the relationship between ICI and amount of firm innovation. Study have a Sample size of 310 firms from U.S. manufacturing firms.

Studies proposing negative, non-significant, limited, or diverse associations of customer involvement for performance/ Innovation

Study	**Key Findings & Sample**

Ittner & Larcker, 1997	Study findings shows negative relationship between customer involvement and cycle time on growth. Firm's overemphasis on feedback from customers for design, makes firms intention towards reactive approach rather than proactive approach and focused to improve their capabilities and came with a product which fulfill customer need. Study with a sample size of 184 auto firms, computer sector in Canada, Japan, Germany and the U.S.
Bajaj et al., 2004	Findings from this study shows that customers interaction in design stage cause lowers time saving, result in more delays. Specialists and Oversight moderate this relationship. Moreover study outcomes show's that customers interaction has no significant impact on cost saving and study also highlight that there is no moderations impact. Sample size consist of 53 new product development projects from defense company
Lagrosen, 2005	Lagrosen study finding, highlight that customer involvement leads to incremental changes rather than innovative changes. Further customer involvement cause direct or indirect cost related to time.
Fang, 2008	Study highlight that customer connectivity negatively moderates the relationship between customer participation as an information resource (CPI) and new product innovativeness (NPI). Moreover Process interdependence have a positive moderation between customer participation as a co-developer (CPC) and new product innovativeness (NPI). Study consider sample size of 149 NPD projects in electronic, chemical and sectors in industrial project
Foss et al., 2011	Study outcomes shows that there is no link between innovation and customer interaction. This relationship is mediated by organizational practices. Study Sample size is 169 Danish firms.

Customer involvement is the extent to which a firm interacts with representatives of one or more customers in developing products (Carbonell et al., 2009). Prior research has identified several roles of customers in product development: resource, coproduce, buyer and user; of these, the first two are more significant in innovation because they reflect the upstream or input side of innovation activity (Morgan et al., 2024). From this literature, found two types of customer involvement first one is information-intensive customer involvement (ICI) and second one is product-focused customer involvement (PCI). ICI is a type of involvement focused on gathering information from customers via customer opinions and feedback and structured inquiry mechanisms such as focus groups (Nambisan, 2002). Customer involvement of such type take customers as most important resource towards information, feedback and opinions (Nambisan, 2002). In PCI firms takes participative role from a customer as a co-developer of new product, and it manifests in key customers driving product development or doing custom configuration of products (Nambisan, 2002).

H1: *Product Focused Customer Involvement (PCI) and information-intensive customer involvement (ICI) have a significant impact on Sustainable Innovations.*

In firm's context, Technological capability known as the long term roots for competitive advantage. Basically in any type of the firm technological capabilities are the main driving force which cause new product innovations, consist of trade secrets, advance technological knowledge and new unique knowledge from R&D, moreover other technology related intellectual property or patents protected by law. According to Unger and Zagler (2003) institutions and organizations

mattes in innovation with respect to their technological capabilities. In competitive market, firms respond towards customer changing needs and requirements by using new and advance technologies along with improvement in existing product or developed new products or services (Hsieh, 2007).

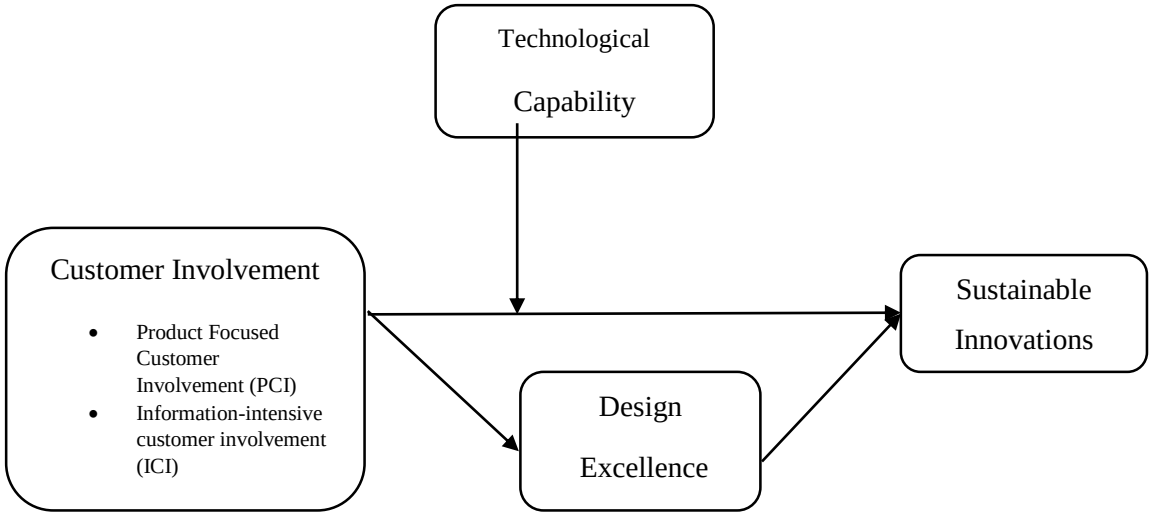
H3: *Technological Capability moderates the relationship between product-focused customer involvement (PCI), information-intensive customer involvement (ICI) and Sustainable Innovations.*

Design excellence, is well-defined as goodness and the quality of observable design characteristics (Talke et al., 2009). For measure design excellence, mostly two types of approaches are used, first one is evaluations from customers and second one is evaluations from peers or experts (Talke et al., 2009). Recent a study conducted by Micheli and Gemser (2016) finds that unique design have a greater market value and acceptance if they get response from field expects which can be seen as a signal of design excellence.

H2: *Design Excellence mediate the relationship between product-focused customer involvement (PCI), information-intensive customer involvement (ICI) and Sustainable Innovations.*

Sustainability driven innovations defined as formation or development of new market, product and service or process driven by environmental, social and sustainability issues (Little, 2005). Horbach, (2005) defined sustainable Innovations as, the innovations which are not consist of environmental dimensions but include social, economic and institutional aspects. They come with the improvement in the realization of the purposes of a sustainable development and indicates a subset of all innovations

Figure 1: Proposed Research Model



METHODOLOGY

This study employs a quantitative research design to investigate the relationship between customer involvement, design excellence, technological capability, and sustainable product innovations. A cross-sectional survey method was used to collect data from manufacturing and service industries in Pakistan. The target population for this study was the manufacturing/Services industries of Pakistan belonging to different sectors. The list of manufacturing/Services firms was collected from the chamber of commerce of Lahore, Faisalabad, and Rawalpindi/Islamabad - all of these three areas are considered manufacturing/Services hubs. 150 companies (50 companies from each region) were randomly selected for data gathering. CEOs, production managers, and other senior-level executives in production were contacted to fill out the questionnaires designed for this study. 105 filled questionnaires were received which were further analyzed using software called Statistical Package for the Social Sciences (SPSS).

The survey instrument covered 40 questions related to respondent's demographics, dependent, independent, mediator and moderator variables questions. The questions related to demographics enquired about the gender, firm type, firm size, and respondent's position in the firm. The scale for Product Focused Customer Involvement (PCI) and Information-intensive customer involvement (ICI) are adopted from Cui & Wu (2017). The scale used to measure Design Excellence is adopted from Menguc et al. (2014). Moreover, the scale for measuring technological capabilities is adopted from Wang et al. (2016) whereas the three items scale measuring sustainable innovations is adopted from Salzberg (2016).

RESULTS

Variables	No of item	Cronbach's Alpha	F(sig)
Information-intensive customer involvement (ICI)	4	0.827	14.693(.000)
Product focused customer involvement (PCI)	5	0.704	4.435(.000)
Design Excellence (DE)	4	0.776	7.143(.011)
Technological Capabilities (TC)	4	0.759	21.256(.000)
Sustainable Innovations (SI)	9	0.722	11.750(.001)

Table 1: Reliability Analysis

The result indicated that Cronbach's Alpha value of all factors are greater 0.7, as well as F test is significant for each factor. That items included in the variables are reliable to use in further analysis.

Variables	**Mean**	**S.D**	**1**	**2**	**3**	**4**	**5**
Information-intensive customer involvement (ICI)	3.0202	.59726	1				
Product focused customer involvement (PCI)	3.4198	.89391	.202**	1			
Design Excellence (DE)	3.8443	1.1237	.211**	.779**	1		
Technological Capabilities (TC)	3.5738	.67431	.171*	.549**	.446**	1	
Sustainable Innovations (SI)	3.1319	.69494	.229**	.304**	.221**	.321**	1

N=105,*p<0.05, and **p<0.01; ***p<0.001

Table 2: Correlation Analysis

Table 2 presents descriptive statistics and correlations among the variables. The output of the analysis shows the correlation coefficient for five variables. The results show that each variable is perfectly correlated with itself because the value of correlation coefficient is one (r = 1). The results also indicate that that sustainable innovations (SI) have a significant positive correlation with Information-intensive customer involvement (ICI), Product focused customer involvement (PCI), Design Excellence (DE) and Technological Capabilities (TC). Psychologically this all mean that, as a customer involvement (ICI, PCI), DE and TC increases SI also increases.

Predictors	B	SI		B	DE	
		R^2	ΔR^2		R^2	ΔR^2
Main effects:						
Step1						
Control variables		.08			.07	
Step2						
ICI	.31***			.34***		
PCI	.41***	.38	.15***	.23**	.54	.44***
Mediation:						
Step1						
Control variables		.08				
Step2						
DE	.47***	.30	.22***			

Table 3: Mediation

Predictors	B	SI	
		R^2	ΔR^2
Step1			
Control variables		.08	
Step2			
Mediation	.47***	.30	.22***
Step3			
ICI	.14		
PCI	.17	.50	.11

Table 4: Mediation

Mediation regression analysis was used to explore mediation effects of design excellence on customer involvement and sustainable innovations. Barren and Kenny (1986) method was used for mediation analysis which can be run if three conditions of mediation are fulfilled suggested by the Barren and Kenny. According to the first condition of Barren and Kenny method the independent variable is a significant predictor of the dependent variable, second condition independent variable is a significant predictor of the mediator. And third condition is achieved when there is a significant relationship between mediator and dependent variable.

Results related to conditions of mediation reported in Table III show that three conditions of mediation were fulfilled. The direct path ICI & PCI ($\beta = .31$ & $.41$, $p<0.001$) was significantly, a positive association with Sustainable innovations (SI). The impact of mediator path design excellence ($\beta = .47$, $p<0.001$) was significantly association with SI. For the path from independent variable to mediator DE is significant positive relationship between DE ($\beta = .41$, $p<0.001$) and SI. Results show that direct impact of independent variables on the dependent variable without mediator was significant (see Table III) and the direct impact of the independent variable on dependent variable with mediator was insignificant (see Table IV). ICI & PCI ($\beta = .14, .17$ $p>0.05$) was an insignificant predictor of SI. Therefore, these finding suggesting that DE was fully mediate the relationship between ICI, PCI and SI. Thus providing support to Hypothesis H2.

Predictors	B	SI	
		R^2	ΔR^2
Step1			
Control variables		.10	
Step2			
ICI	.31***		
PCI	.41***		
TC	.34**	45	.28***
Step3			
ICIxTC	.93*		
PCIxTC	.97**	.60	.08*

Table 5: Moderation

Moderated regression analysis was used to examine the effects of technological capabilities on ICI, PCI and sustainable innovations. Barren and Kenny (1986) method was used for moderation analysis. Firstly, gender age, qualification, and experience were entered as control variables. In the second step, we entered ICI & PCI along with technological Capabilities (TC) to sustainable innovations (SI). After that in third step, the interaction terms between ICI, PCI and TC were entered.

Results presented in Table 5 show that main effect ICI & PCI (β = .31 & .41 $p<0.001$) was a significant predictor of SI and the moderator TC (β = .34, $p<0.001$) was also significant predictor of SI. For interaction terms a significant positive relationship between interaction terms (β =. 93 & .97, $p<0.05$) and investment decision (SI) was found. These findings provides acceptance to Hypothesis H3 predict that Technological capabilities (TC) moderate the relationship between intensive customer involvements (ICI), product focused customer involvement (PCI) and Sustainable innovations (SI).

DISCUSSION

This study examines the relationship between Product Focused Customer Involvement and Information Intensive Customer Involvement in Sustainable Innovations as well as moderating and mediating role of technological capabilities and design excellence. First the outcomes of statistical analyses for this study show that customer involvement (both ICI & PCI) has a significant positive impact on the sustainable product innovations in both service and manufacturing industries. The outcomes that customer involvement (both ICI & PCI) have a positive impact on innovations for service and manufacturing firms is similar with past studies outcomes (Atuahene-Gima, 1996; Grinstein, 2008; Hult et al., 2004; Kristensson et al. 2008; Chien and Chen 2010). Therefore, these results provide support to recognize underlying mechanism that how customer involvement is beneficial and affects innovations.

Further the result suggests strong mediation of design excellence toward sustainable innovations. Significance shows that the importance of design in sustainable innovations. Study conducted by Menguc, Auh & Yannopoulos, (2014) find that customer involvement in design phase has a strong positive relationship with new product performance. Therefore the study shows that design excellence mediates the relationship between customer involvement and sustainable product innovations, meaning customer input enhances design, which in turn drives innovation. Additionally, technological capability moderates this relationship, with firms that possess stronger technological capabilities benefiting more from customer involvement in achieving sustainable innovations.

Moreover, absorptive capacity theory, state that the ability to identify, assimilate and apply external knowledge contributes in enhancing firm's absorptive capacity which could lead to innovations (Cohen and Levinthal 1990). With reference to this theory, customer involvement always improve design of any product as they know well what they require, so we can't ignore customer requirement while developing new products. Thus supporting our next hypothesis that

design excellence positively mediate the relationship between product-focused customer involvement (PCI), information-intensive customer involvement (ICI) and Sustainable Innovations.

Further result also shows that technological capabilities stronger the relationship between customer involvement and sustainable innovations. Those Firms which have more focuses on external knowledge have more absorptive capacity as well as more advance technologies which lead firm to sustainable innovations this findings supports our last hypothesis that technological Capability positively moderates the relationship between PCI, ICI and sustainable innovations.

Particle Implications, Limitations and Conclusion

The result help the underlying mechanism through which customer orientation affects innovation. First firms should involve customer for design which result in sustainable innovations while developing new products. Further firms must invest some portion of the budget on their technological capabilities for improving innovation capabilities and product performance in the market.

The sample size is only 105 firms may larger sample size have differ in result, future studies should enhance their sample size. Only customer involvement are consider, future studies may considers suppliers or whole seller involvement. This study focused on firm technological capabilities as a whole, which may have made it more difficult to detect differences in technologies. It is possible that particular technology for a particular product may be more influential or finding impact of particular technology, on specific industry sector.

Finally, primary data were used in this study but the promptly changing environment in technological areas may have affected innovation through different mechanisms and the outcomes found by this study. So, it would be remarkable and necessary if more recent and big data is used to test whether the results of this study can hold over time, and whether there is a changing pattern in the mechanisms that customer involvement as a strategic orientation impacts the growth of capabilities as well as performance and innovation.

REFERENCES

Adams, M.E., Day, G.S., Dougherty, D., 1998. Enhancing new product development performance: An organizational learning perspective. *Journal of Product Innovation Management* 15(5), 403-422.

Afeltra, G., Alerasoul, S. A., & Strozzi, F. (2023). The evolution of sustainable innovation: from the past to the future. *European Journal of innovation management*, *26*(2), 386-421.

Aliasghar, O., Sadeghi, A., & Rose, E. L. (2023). Process innovation in small-and medium-sized enterprises: The critical roles of external knowledge sourcing and absorptive capacity. *Journal of Small Business Management*, 61(4), 1583-1610.

Atuahene-Gima, K., 1996. Market orientation and innovation. *Journal of Business Research* 35(2), 93-103.

Auh, S., Bell, S. J., McLeod, C. S., and Shih, E. 2007. "Co-Production and Customer Loyalty in Financial Services," *Journal of Retailing* (83:3), pp. 359-370.

Bajaj, A., Kekre, S., and Srinivasan, K. 2004. "Managing NPD: Cost and Schedule Performance in Design and Manufacturing," *Management Science* (50:4), pp. 527-536.

Bilton, N. 2011. *The Engineer-driven culture of Nokia.* The New York Times. February 11.

Buxton, B. 2007. Sketching user experience: Getting the design right and the right design. Boston, MA: Morgan Kaufmann Publishers.

Carbonell, P., Rodríguez Escudero, A. I., and Pujari, D. 2009. "Customer Involvement in New Service Development: An Examination of Antecedents and Outcomes," *Journal of Product Innovation Management* (26:5), pp. 536-550.

Chien, S.-H., and Chen, J.-j. 2010. "Supplier Involvement and Customer Involvement Effect on New Product Development Success in the Financial Service Industry," *The Service Industries Journal* (30:2), pp. 185-201.

Cohen, W. M., and Levinthal, D. A. 1990. "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly* (35:1), pp. 128-152

Cui, A. S., & Wu, F. (2017). The Impact of Customer Involvement on New Product Development: Contingent and Substitutive Effects. *Journal of Product Innovation Management*, *34*(1), 60-80.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340.

El Sawy, O. A., Kraemmergaard, P., Amsinck, H., and Vinther, A. L. 2016. "How Lego Built the Foundations and Enterprise Capabilities for Digital Leadership," *MIS Quarterly Executive* (15:2), pp. 141-166.

Fang, E. 2008. "Customer Participation and the Trade-Off Between New Product Innovativeness and Speed to Market," *Journal of Marketing* (72:4), pp. 90-104.

Foss, N. J., Laursen, K., and Pedersen, T. 2011. "Linking Customer Interaction and Innovation: The Mediating Role of New Organizational Practices," *Organization Science* (22:4), pp. 980-999.

Grinstein, A., 2008. The effect of market orientation and its components on innovation consequences: A meta-analysis. *Journal of the Academy of Marketing Science* 36(2), 166-173.

Gruner, K. E., and Homburg, C. 2000. "Does Customer Interaction Enhance New Product Success?" *Journal of Business Research* (49:1), pp. 1-14.

Gupta, A. K., and Souder, W. E. 1998. "Key Drivers of Reduced Cycle Time," *Research Technology Management* (41:4), pp. 38-43.

Hajdas, M. (2024). Service Design, Marketing and Automotive Aftermarket: Perspectives from a Polish Study. *Management for Professionals*, 247-273.

Hall, J. and Vredenburg, H. (2003), "The challenges of innovating for sustainable development", *MIT Sloan Management Review*, Vol. 45 No. 1, pp. 61-8

Horbach, J. (2005). Methodological aspects of an indicator system for sustainable innovation. In Indicator systems for sustainable innovation (pp. 1-19). Physica-Verlag HD.

Howcroft, D., & Taylor, P. (2023). Automation and the future of work: A social shaping of technology approach. *New Technology, Work and Employment*, 38(2), 351-370.

Hsieh, M.-H., Tsai, K.-H., 2007. Technological capability, social capital and the launch strategy for innovative products. *Industrial Marketing Management* 36(4), 493-502.

Ittner, C. D., and Larcker, D. F. 1997. "Product Development Cycle Time and Organizational Performance," *Journal of Marketing Research* 34:1), pp. 13-23.

Keskin, D., Diehl, J. C., & Molenaar, N. (2016). Innovation process of new ventures driven by sustainability. *Journal of Cleaner Production*, 45, 50-60.

Kristensson, P., Matthing, J., and Johansson, N. 2008. "Key Strategies for the Successful Involvement of Customers in the Co-Creation of New Technology-Based Services," International *Journal of Service Industry Management* (19:4), pp. 474-491.

Lagrosen, S. 2005. "Customer Involvement in New Product Development: A Relationship Marketing Perspective," *European Journal of Innovation Management* (8:4), pp. 424-436.

Little, Arthur D. "How leading companies are using sustainability-driven innovation to win tomorrow's customers." *Innovation High Ground Report* (2005).

Majchrzak, A., and Malhotra, A. 2013. "Towards an Information Systems Perspective and Research Agenda on Crowdsourcing for Innovation," *Journal of Strategic Information Systems* (22:4), pp. 257-268.

Menguc, B., Auh, S., & Yannopoulos, P. (2014). Customer and supplier involvement in design: The moderating role of incremental and radical innovation capability. *Journal of Product Innovation Management*, 31(2), 313-328.

Micheli, P., Gemser, G., 2016. Signaling strategies for innovative design: a study on design tradition and expert attention. J. Product. Innov. Manag.

Montalvo, C., 2012. The Role of Markets, Policy and Regulation on Innovation e Horizontal Analysis in Nine Sectors. Report for the Europe INNOVA Innovation Watch. European Commission DG Enterprise and Industry, Brussels.

Morgan, T., Friske, W., Kohtamäki, M., & Mills, P. (2024). Customer participation in manufacturing firms' new service development: the moderating role of CRM technology. *Journal of Business & Industrial Marketing, 39(4), 857-870.*

Morrison, A., Pietrobelli, C., & Rabellotti, R. (2008). Global value chains and technological capabilities: a framework to study learning and innovation in developing countries. *Oxford development studies*, 36(1), 39-58.

Moultrie, J., P. J. Clarkson, and D. Probert. 2007. Development of a design audit tool for SMEs. *Journal of Product Innovation Management* 24 (4): 335–68.

Nambisan, S. 2002. "Designing Virtual Customer Environments for New Product Development: Toward a Theory," *Academy of Management Review* (27:3), pp. 392-413.

Nidumolu, R., Prahalad, C. K., & Rangaswami, M. R. (2015). Why sustainability is now the key driver of innovation. *IEEE Engineering Management Review*, 43(2), 85-91.

Ogundare, J. A., & van der Merwe, S. (2024). The role of competitor orientation and proactiveness in competitive advantage for small-and medium-sized enterprises performance. *The Southern African Journal of Entrepreneurship and Small Business Management*, 16(1), 786.

Porter, M., Kramer, M., 2011. Creating shared value. How to reinvent capitalism –and unleash the wave of innovation and growth. *Harvard Business Review* (JanuaryeFebruary) 17.

Saldanha, T., Mithas, S., & Krishnan, M. S. (2017). Leveraging customer involvement for fueling innovation: The role of relational and analytical information processing capabilities.

Salzberg, A. (2016). Adopting sustainability innovations in restaurants: An Evaluation of the Factors Influencing Owner-Managers' Decisions in Richmond, Virginia

Sengupta, S., Choudhary, S., Obayi, R., & Nayak, R. (2024). Reducing food loss through sustainable business models and agricultural innovation systems. *Supply Chain Management: An International Journal*.

Talke, K., Salomo, S., Wieringa, J. E., & Lutz, A. (2009). What about design newness? Investigating the relevance of a neglected dimension of product innovativeness. *Journal of Product Innovation Management*, 26(6), 601-615.

Unger, B., & Zagler, M. (2003). Institutional and organizational determinants of product innovations. Innovation: *The European Journal of Social Science Research*, 16(3), 293-310.

Wang, Q., Zhao, X., & Voss, C. (2016). Customer orientation and innovation: A comparative study of manufacturing and service firms. *International Journal of Production Economics*, 171, 221-230.

Xu, J., & Hu, W. (2024). How do external resources influence a firm's green innovation? A study based on absorptive capacity. *Economic Modelling*, 133, 106660.

Zhang, D., P. Hu, and M. Kotabe. 2011. Marketing-industrial design integration in new product development. *Journal of Product Innovation Management* 28 (3): 360–73.